KF

PROJECT PAPER

Number 16 (Second Series) Febuary 1981

Innovations in Medical Records in the UK

Report on a Survey of Innovations in Medical Records in the UK

King Edward's Hospital Fund for London is an independent charity founded in 1897 and incorporated by Act of Parliament. It seeks to encourage good practice and innovation in health care through research, experiment, education and direct grants.

The King's Fund Centre was established in 1963 to provide an information service and a forum for discussion of hospital problems and for the advancement of inquiry, experiment and the formation of new ideas. The Centre now has a broader interest in problems of health and related social care and its permanent accommodation in Camden Town has excellent facilities for conferences and meetings. Allied to the Centre's work is the Fund's Project Committee which sponsors work of an experimental nature.

Published by the King's Fund Centre, 126 Albert Street, London NW1 7NF. Printed in England by Trident Services, London SE1.

KING'S FUND PROJECT PAPER

INNOVATIONS IN MEDICAL RECORDS

IN THE U.K.

Report to King Edward's Hospital Fund
on a survey of Innovations in
Medical Records in the U.K.

A.L. Rector
D.H.H. Metcalfe
A.D. Clayden
L. Hallam
Department of Community Health
University Hospital & Medical School
University of Nottingham

June 1980

This Gazetteer was prepared and typed
in the Department of Community Health,
University of Nottingham Medical School,
and duplicated, collated and distributed
by the King's Fund Centre, 126 Albert Street,
London, NW1 7NF.

CONTENTS

ACKNOWLEDGMENTS

The project team would like to thank the many people who have co-operated with and contributed to this survey. More particularly, thanks are due to all those who sent information, specimen forms and background papers, and those who were kind enough to act as hosts to members of the team when they visited various projects throughout the country.

The project team would also like to express its gratitude to the members of the Department of Community Health, University Hospital and Medical School, University of Nottingham for their advice, support and practical assistance throughout, especially Mrs. P. Barnes.

INNOVATIONS IN MEDICAL RECORDS IN THE U.K.

Introduction to the Second Edition

The authors have been most gratified with the response to the first edition of this Gazetteer, and were most pleased to be asked to prepare an updated version. The field has developed very quickly since the publication of the first edition, especially during the past 18 months. The rapid fall in the cost of microprocessors has produced a great deal of excitement. It has also meant that it is possible for applications to be developed without the paraphernalia of large research organisations. It has certainly meant that no study of this type can hope to be exhaustive.

As in the previous edition the most difficult single task has been to choose limits to keep the scope of the work manageable. Some new peripheral topics such as patient interviewing and decision aids have been added, but in general we have attempted to stick to our original brief of covering, primarily, projects which had an impact on the clinical notes themselves or at least illustrated techniques which we believed might do so in the foreseeable future. However, inevitably some of the decisions have been arbitrary. A few fields, such as nursing records and drug monitoring really require separate studies in their own right. Finally, the authors again wish to express their thanks to all those who have given so generously of their time to help in the preparation of this edition and to the King's Fund for their continuing support.

INNOVATIONS IN MEDICAL RECORDS IN THE U.K.

REPORT

Foreword

This survey was commissioned by the Fund in 1975 in the belief that the time had come for a major advance in medical records and medical information systems; and that many projects were being undertaken in isolation, so that there might be duplication of effort on the one hand, and gaps between potentially complementary projects on the other.

Projects have been identified by enquiries within the appropriate departments of the D.H.S.S., of Regional Medical Officers and Specialists in Community Medicine (Information) and the Association of Medical Records Officers; a comprehensive review of the literature has been carried out and a search for reports of relevant work in the handbook "Scientific Research in British Universities and Colleges." Requests for notification of projects were also published in "The Medical Record" and in "Update", which elicited some response. Finally, others were identified by personal reports on the 'grapevine'. Even so, we are well aware that we will have failed to identify and report on some projects, and that others may have come into being while we have been compiling this report, unknown to us and unknowing of the Fund's interest.

Early in the survey it became apparent that it was necessary to decide which, of a wide variety of projects, should be included. The criterion which we have adopted is that the project should be concerned with the development of medical records or information systems which have, as their main concern, the improvement of clinical care (rather than the improvement of administrative efficiency in medical care). It was also decided that the related fields of medical decision making and patient monitoring were outside the brief of the current survey, except where projects have a major component involving the medical record.

In compiling this report, we are aware that it will be of use to two main categories of user: those without previous experience in the field of medical record development and those already working in the field. While their requirements of this report will be different, we have tried to write it in such a way as to provide both groups with appropriate information. Accordingly it is presented in three sections:

Following this foreword is an explanation of the cross indexing system adopted and the index itself.

Next follows the body of the gazetteer: the descriptions of each of the projects which we have identified and about which data has been compiled by correspondence and, where appropriate, site visit. (Each of these entries has been cleared by the project leader as being factually correct and up to date at 1st September, 1976.) Briefer descriptions are given of projects less central to the concerns of this gazetteer or projects for which the format of the full entries would be inappropriate (e.g. projects early in development or discontinued). The entries have been grouped according to the medical areas in which the applications have been implemented, and each section is preceded by a brief introduction.

Finally there is a bibliography, index by project leader, and glossary.

We are convinced, by the interest in this survey evinced by all the project leaders to whom we have talked, most of whom have urgently requested copies of the report, that it will meet a real need, and are most grateful to the Fund for initiating the survey, providing the resources, and giving us advice and encouragement throughout.

KING'S FUND MEDICAL RECORDS PROJECT

HOW TO USE THE GAZETTEER

The gazetteer which follows contains an entry for each of the more relevant projects located in the course of this survey. The criteria used in selecting them are discussed within the introductions to individual sections.

An index to the gazetteer has been provided, organised by 'key topics'. A project may be relevant to one or to very many of these topics. The topics chosen reflect the interests of this particular study, and do not necessarily reflect all, or even the most important, aspects of a particular project, as seen by its own staff.

The index may be used in one of two ways, depending upon the needs of the user. Those concerned with any aspect of records in a particular area of care will wish to familiarise themselves with all the project reference numbers listed under that area; those who have a more general interest in, say, problem orientated medical records, will wish to select those project reference numbers which are indicated in the POMR column, regardless of their care area.

The gazetteer is divided into six sections:

A. Hospital Clinical Records

B. Hospital Speciality Systems
(subdivided into specialities)

C. High Dependency Medicine

D. Hospital Information Systems

E. Interface
(subdivided into record linkage and health service intercommunication)

F. Primary Care
(subdivided into record format and organisation and primary care systems and practice aids)

G. Automatic Patient Interviewing

H. Computer Aided Decision Making

Each section is provided with an introduction giving background information and a general view of the work in hand and the difficulties encountered. Following the gazetteer entries for that section, there appears a brief mention of other projects within

that care area which, for a variety of reasons, were not felt to be suitable for full descriptions.

Each entry in the gazetteer contains the information required to locate the project, followed by its 'key topics' and a summary of the relevant aspects of that project. Where appropriate, we have endeavoured to provide indications of the resources required, the transferability of the methods used, any on-site evaluation systems, and other comments aimed at placing the work in perspective. A list of documents on file and a selected bibliography has been added where possible.

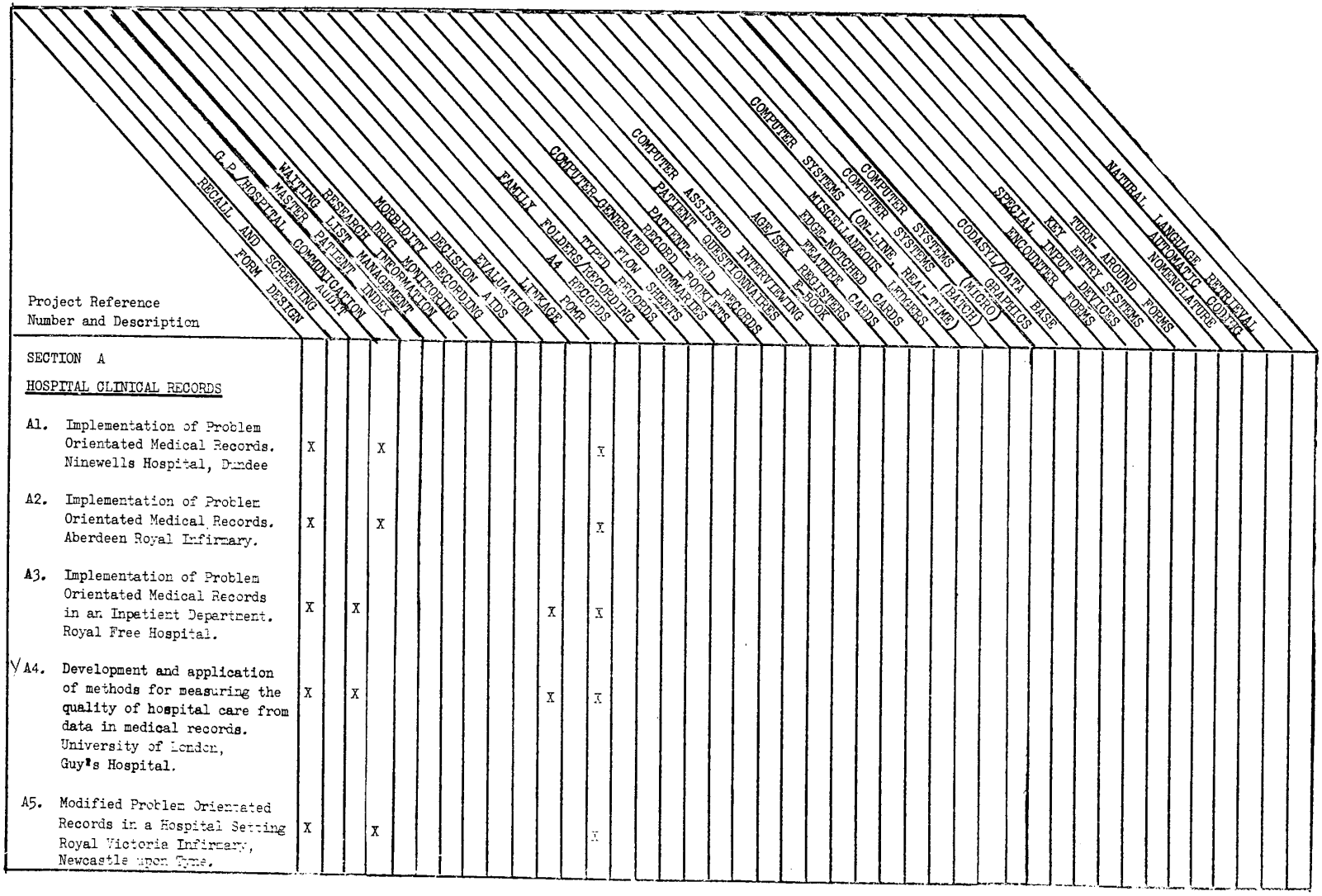
Because many projects share resources with other institutions or have a large service component, allocation of costs is extremely difficult. This is particularly true of the large, experimental computer projects whose developmental costs have been extremely high. We have attempted to provide some indication of the resources in terms of staff and computer time required in actually operating many of the projects, especially in data capture and preparation. In a few cases, indications have been given concerning hardware dedicated to a particular application, but it should be borne in mind that hardware costs change very rapidly.

Notes on the Index

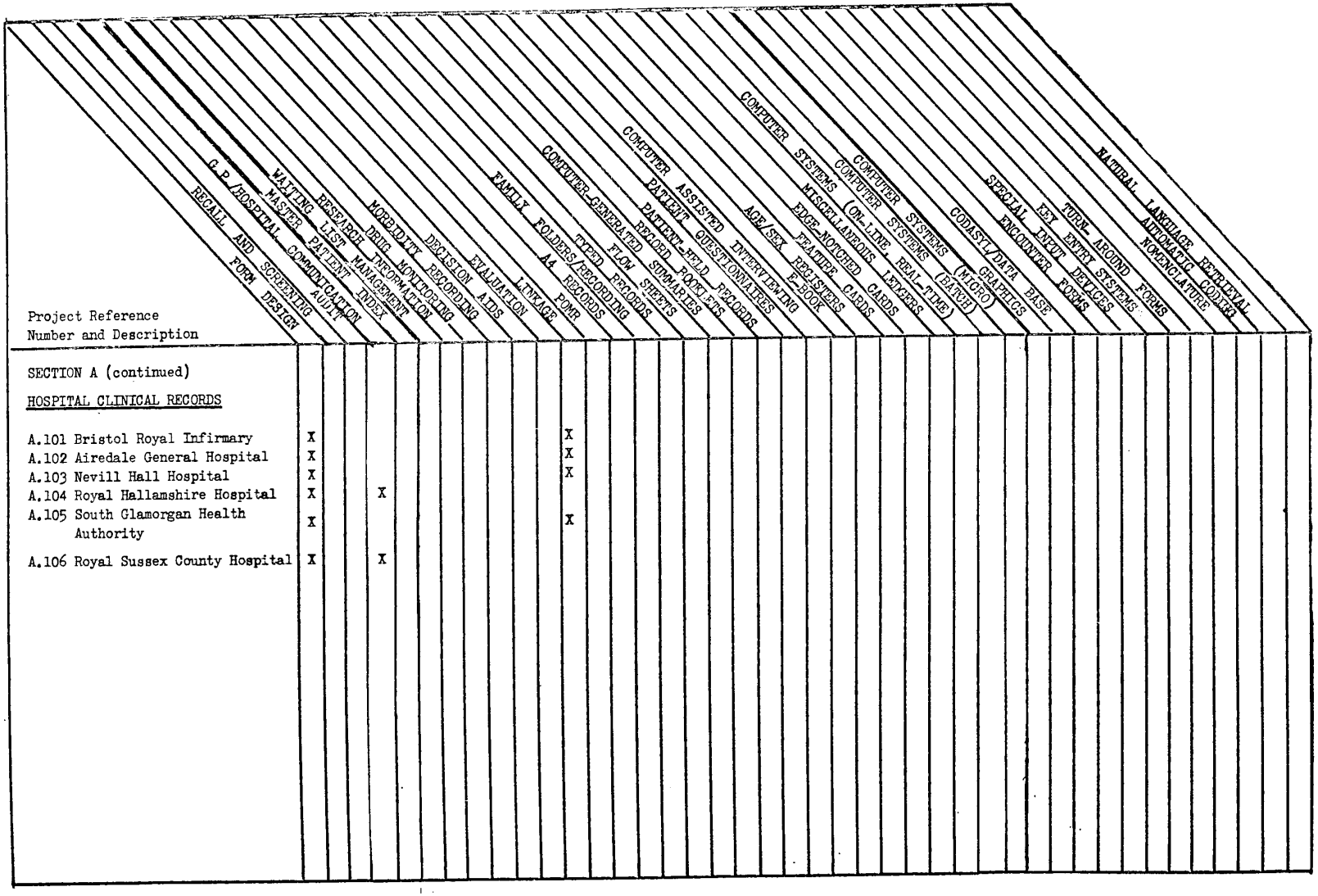
"Special Input Devices" - Mark sense form, badge readers, bar code readers, etc.

"Key Entry Systems" - Key to disc, key to tape and similar, devices.

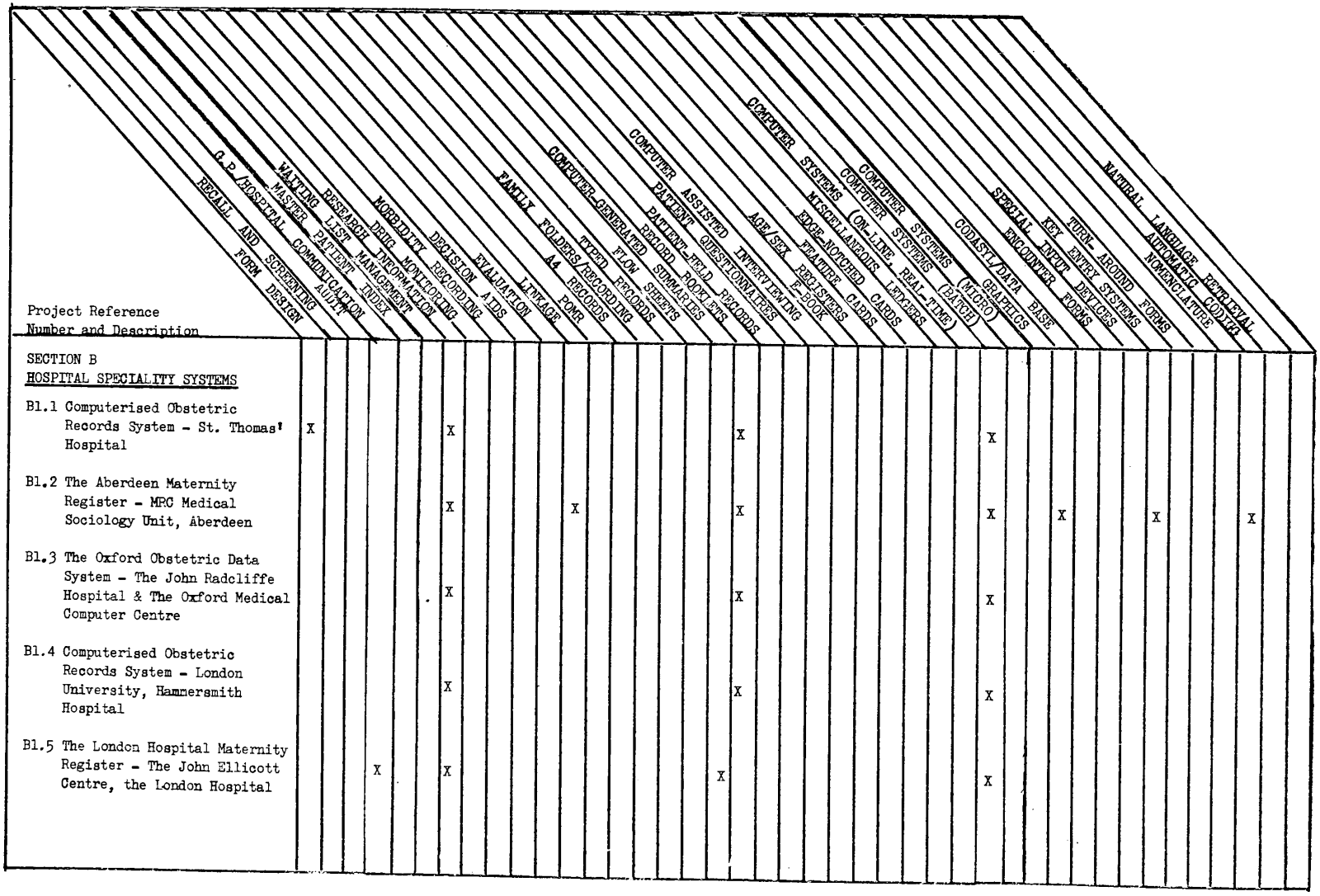
"'E' Book" - Includes various morbidity recording systems, 'E' book, 'W' book, 'F' book, etc.



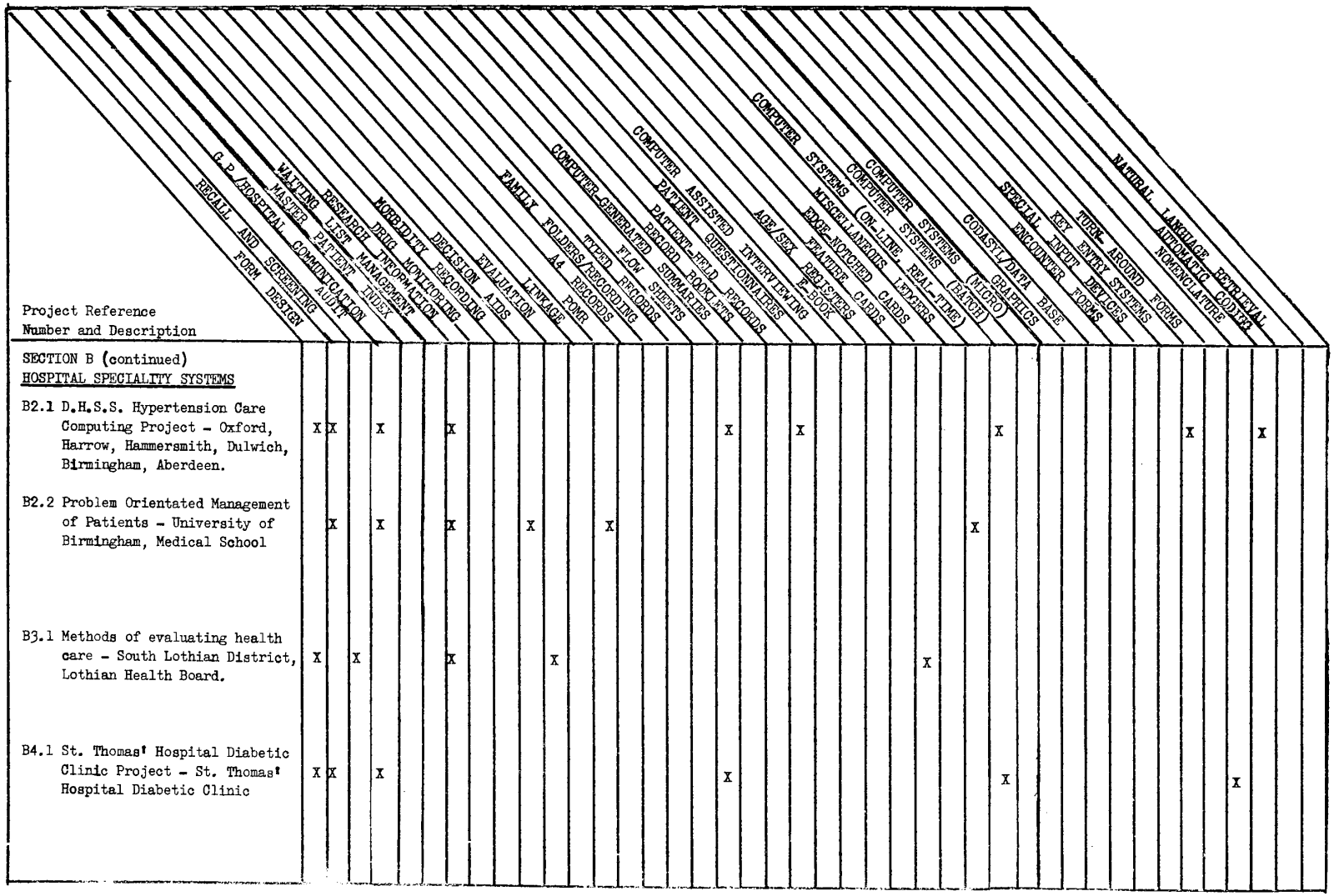
Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	G.P./HOSPITAL COMMUNICATION	AUDIT	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH	DRUG INFORMATION	MORBIDITY MONITORING	RECORDING	DECISION AIDS	EVALUATION	LINKAGE	FAMILY FOLDERS/RECORDING	A4 RECORDS	COMPUTER-GENERATED PRINT	TYPED RECORDS	FLOW SHEETS	COMPUTER ASSISTED PATIENT RECORD SUMMARIES	PATIENT HELD RECORDS	QUESTIONNAIRES	INTERVIEWING	AGE/SEX REGISTERS	EDGE-NOTCHED CARDS	PEGBOARD CARDS	E-BOOK	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE	GRAPHICOS	SPECIAL ENCOUNTER FORMS	KEY INPUT DEVICES	TURN-AROUND ENTRY SYSTEMS	AUTOMATIC FORMS	NOMENCLATURE CODING	NATURAL LANGUAGE RETRIEVAL
SECTION A																																				
HOSPITAL CLINICAL RECORDS																																				
A1. Implementation of Problem Orientated Medical Records. Ninewells Hospital, Dundee	X			X												X																				
A2. Implementation of Problem Orientated Medical Records. Aberdeen Royal Infirmary.	X			X												X																				
A3. Implementation of Problem Orientated Medical Records in an Inpatient Department. Royal Free Hospital.	X				X									X		X																				
A4. Development and application of methods for measuring the quality of hospital care from data in medical records. University of London, Guy's Hospital.	X				X									X		X																				
A5. Modified Problem Orientated Records in a Hospital Setting Royal Victoria Infirmary, Newcastle upon Tyne.	X				X											X																				

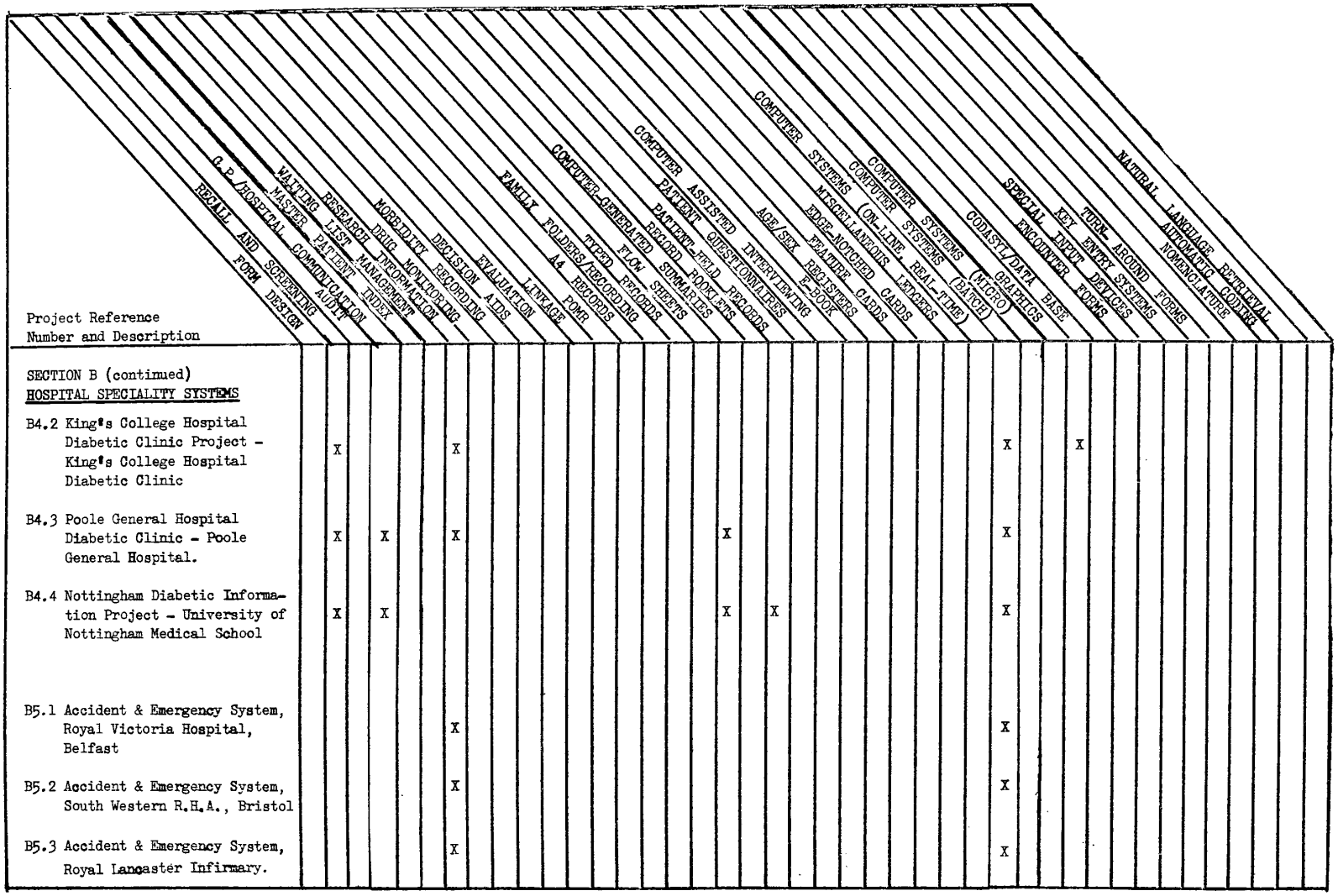


Project Reference Number and Description	RECALL AND SCREENING	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR	A4 RECORDS	FAMILY FOLDERS/RECORDING	COMPUTER-GENERATED FLOW SHEETS	TYPED RECORDS	PATIENT SUMMARIES	RECORD POCKETS	PATIENT-HELD RECORDS	COMPUTER ASSISTED INTERVIEWING	QUESTIONNAIRES	AGE/SEX REGISTERS	EDGE-NOTCHED CARDS	FEATURE CARDS	E-BOOK	COMPUTER SYSTEMS (ON-LINE REAL-TIME)	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	GODASYL/DATA BASE	GRAPHICS	SPECIAL ENCOUNTER FORMS	KEY ENTRY DEVICES	INPUT TURN-AROUND SYSTEMS	NATURAL LANGUAGE RETRIEVAL	AUTOMATIC CODING	NOMENCLATURE
SECTION A (continued)																																				
HOSPITAL CLINICAL RECORDS																																				
A.101 Bristol Royal Infirmary	X										X																									
A.102 Airedale General Hospital	X										X																									
A.103 Nevill Hall Hospital	X										X																									
A.104 Royal Hallamshire Hospital	X				X																															
A.105 South Glamorgan Health Authority	X										X																									
A.106 Royal Sussex County Hospital	X				X																															

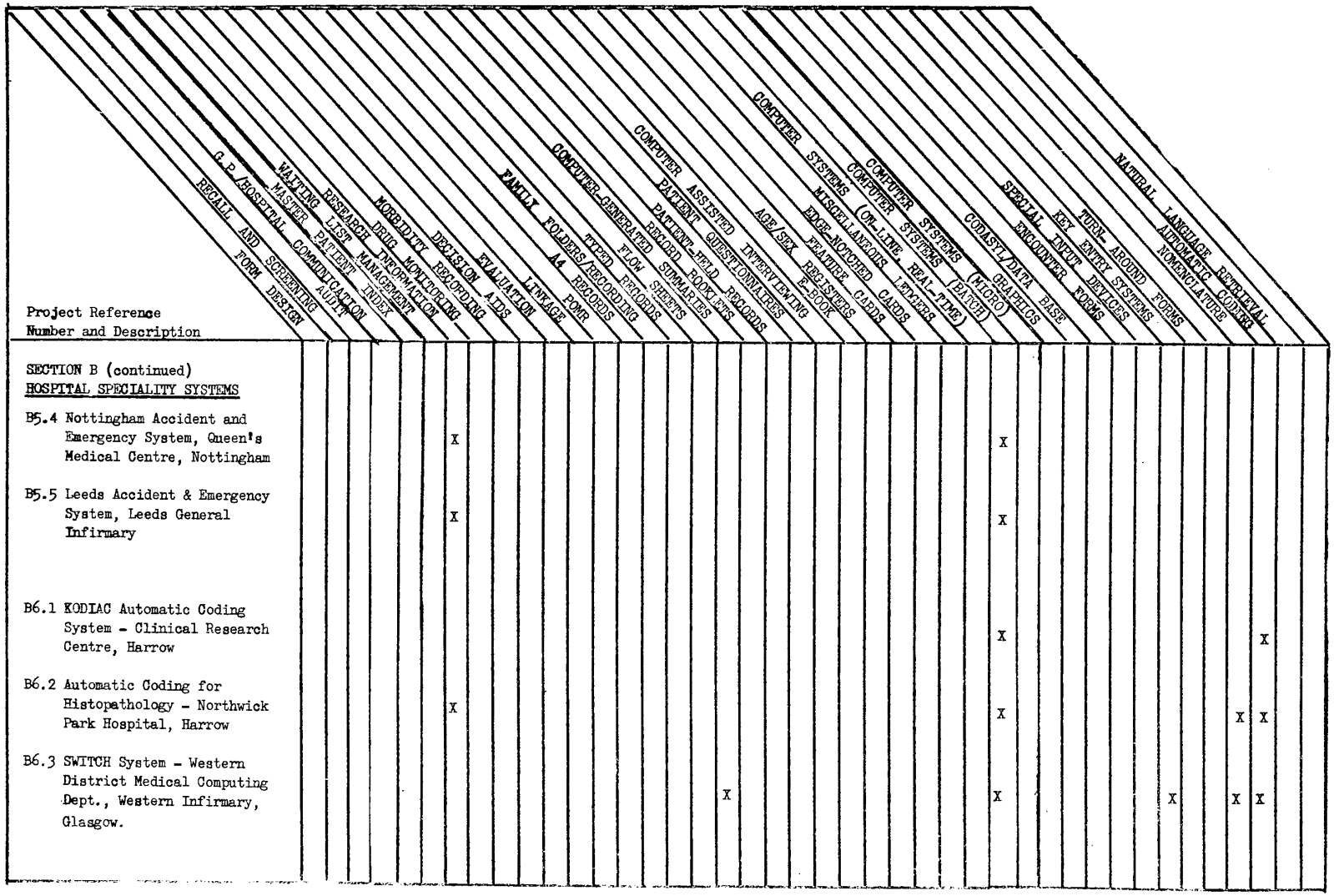

Project Reference Number and Description
SECTION B
HOSPITAL SPECIALITY SYSTEMS
B1.1 Computerised Obstetric Records System - St. Thomas' Hospital
B1.2 The Aberdeen Maternity Register - MRC Medical Sociology Unit, Aberdeen
B1.3 The Oxford Obstetric Data System - The John Radcliffe Hospital & The Oxford Medical Computer Centre
B1.4 Computerised Obstetric Records System - London University, Hammersmith Hospital
B1.5 The London Hospital Maternity Register - The John Ellicott Centre, the London Hospital
G.P./HOSPITAL COMMUNICATION
RECALL AND SCREENING
FORM DESIGN
AUDIT
WAITING LIST
MASTER PATIENT INDEX
RESEARCH
DRUG INFORMATION
MORBIDITY MONITORING
DECISION RECORDING AIDS
EVALUATION
LINKAGE
FAMILY FOLDERS/RECORDING
POMR
A4 RECORDS
COMPUTER-GENERATED TYPED RECORDS
FLOW SHEETS
PATIENT-HELD SUMMARIES
RECORD BOOKLETS
PATIENT QUESTIONNAIRES
AGE/SEX REGISTERS
INTERVIEWING
EDGE-NOTCHED CARDS
FEATURE CARDS
E-BOOK
COMPUTER SYSTEMS (ON-LINE, REAL-TIME) (BATCH)
MISCELLANEOUS LEDGERS
COMPUTER SYSTEMS (MICRO)
CODASYL/DATA BASE
GRAPHICS
SPECIAL INPUT ENCODING FORMS
KEY ENTRY DEVICES
TURN-AROUND SYSTEMS
AUTOMATIC FORMS
NOMENCLATURE
NATURAL LANGUAGE
CODING
RETRIEVAL
B1.1: X X X X X X
B1.2: X X X X X X X
B1.3: X X X X
B1.4: X X X X
B1.5: X X X X

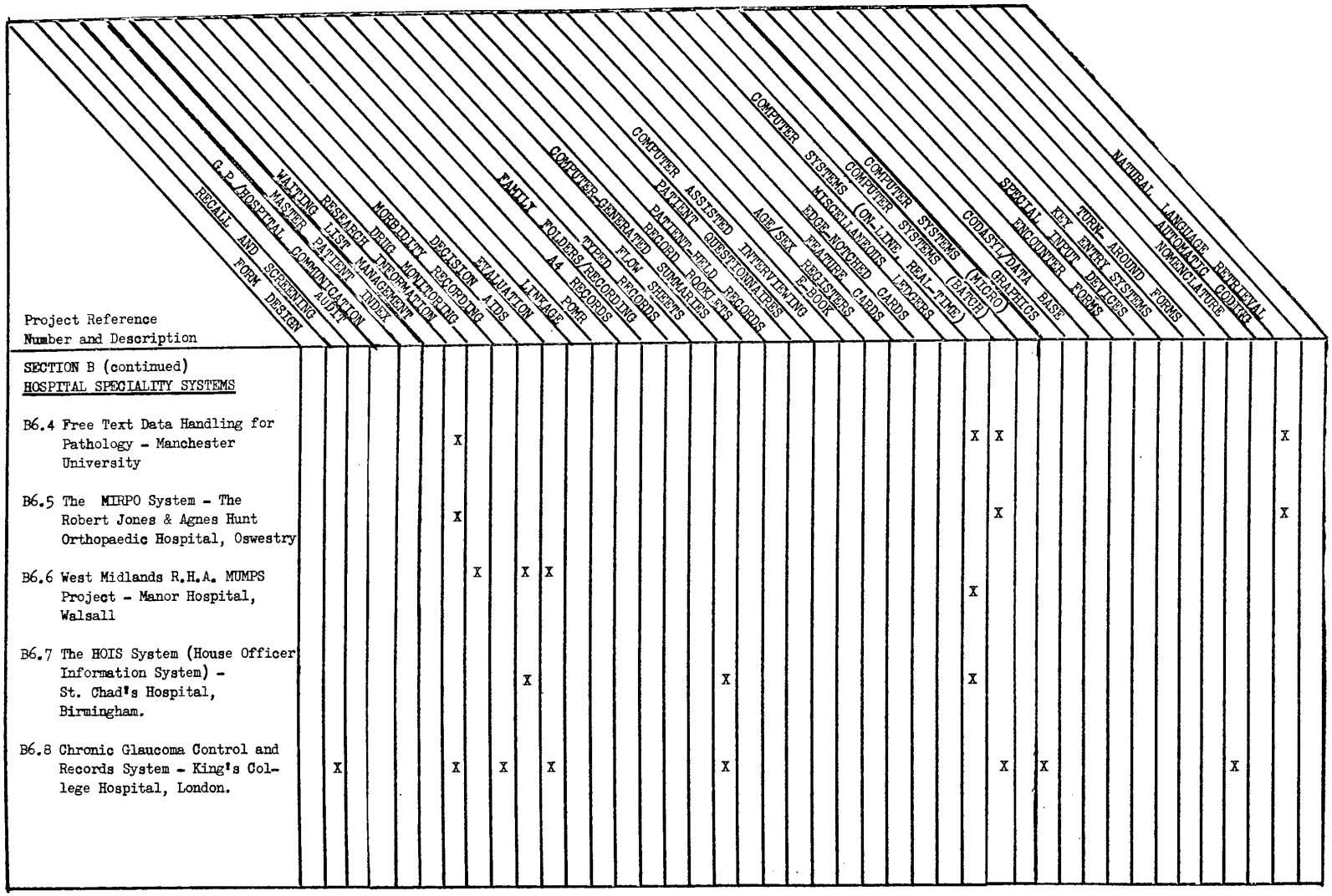
Project Reference Number and Description	WAITING LIST	RESEARCH	MORBIDITY	DRUG MONITORING	DECISION AIDS	EVALUATION	LINKAGE	FAMILY FOLDERS/RECORDING	COMPUTER-GENERATED FLOW SHEETS	COMPUTER ASSISTED PATIENT QUESTIONNAIRES	PATIENT-HELD RECORD SUMMARIES	PROMPTS	DIFFERENTIAL AGE/SEX REGISTERS	EDGE-NOTCHED CARDS	MISCELLANEOUS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE	GRAPHICS	SPECIAL KEY INPUT DEVICES	TURN-AROUND FORMS	AUTOMATIC NOMENCLATURE	NATURAL LANGUAGE RETRIEVAL
SECTION B HOSPITAL SPECIALITY SYSTEMS																						
B1.6 Birmingham Maternity Hospital Project - Queen Elizabeth Medical Centre, Birmingham					X								X				X	X				
B1.7 Scottish Unified Neonatal Record System (SMR11) Scottish Home & Health Dept.								X										X				


Project Reference Number and Description
G.P./HOSPITAL COMMUNICATION
RECALL AND SCREENING
FORM DESIGN
AUDIT
WAITING LIST MANAGEMENT
RESEARCH PATIENT INDEX
MASTER INFORMATION
DRUG MONITORING
MORBIDITY RECORDING
DECISION AIDS
EVALUATION
LINKAGE
FAMILY FOLDERS/RECORDS
POMR
A4 RECORDING
COMPUTER-GENERATED RECORDS
TYPED FLOW SHEETS
PATIENT-HELD SUMMARIES
RECORD BOOKLETS
COMPUTER ASSISTED QUESTIONNAIRES
PATIENT INTERVIEWING
AGE/SEX REGISTERS
FEATHER EDGE-NOTCHED CARDS
E-BOOK CARDS
MISCELLANEOUS INDEXERS
COMPUTER SYSTEMS (ON-LINE, REAL-TIME)
COMPUTER SYSTEMS (BATCH)
CODASYL/DATA BASE
GRAPHICS
SPECIAL ENCOUNTER FORMS
KEY INPUT DEVICES
TURN-AROUND ENTRY SYSTEMS
AUTOMATIC FORMS NOMENCLATURE
NATURAL LANGUAGE RETRIEVAL CODING
SECTION B (continued)
HOSPITAL SPECIALITY SYSTEMS
B2.1 D.H.S.S. Hypertension Care Computing Project - Oxford, Harrow, Hammersmith, Dulwich, Birmingham, Aberdeen.
B2.2 Problem Orientated Management of Patients - University of Birmingham, Medical School
B3.1 Methods of evaluating health care - South Lothian District, Lothian Health Board.
B4.1 St. Thomas' Hospital Diabetic Clinic Project - St. Thomas' Hospital Diabetic Clinic

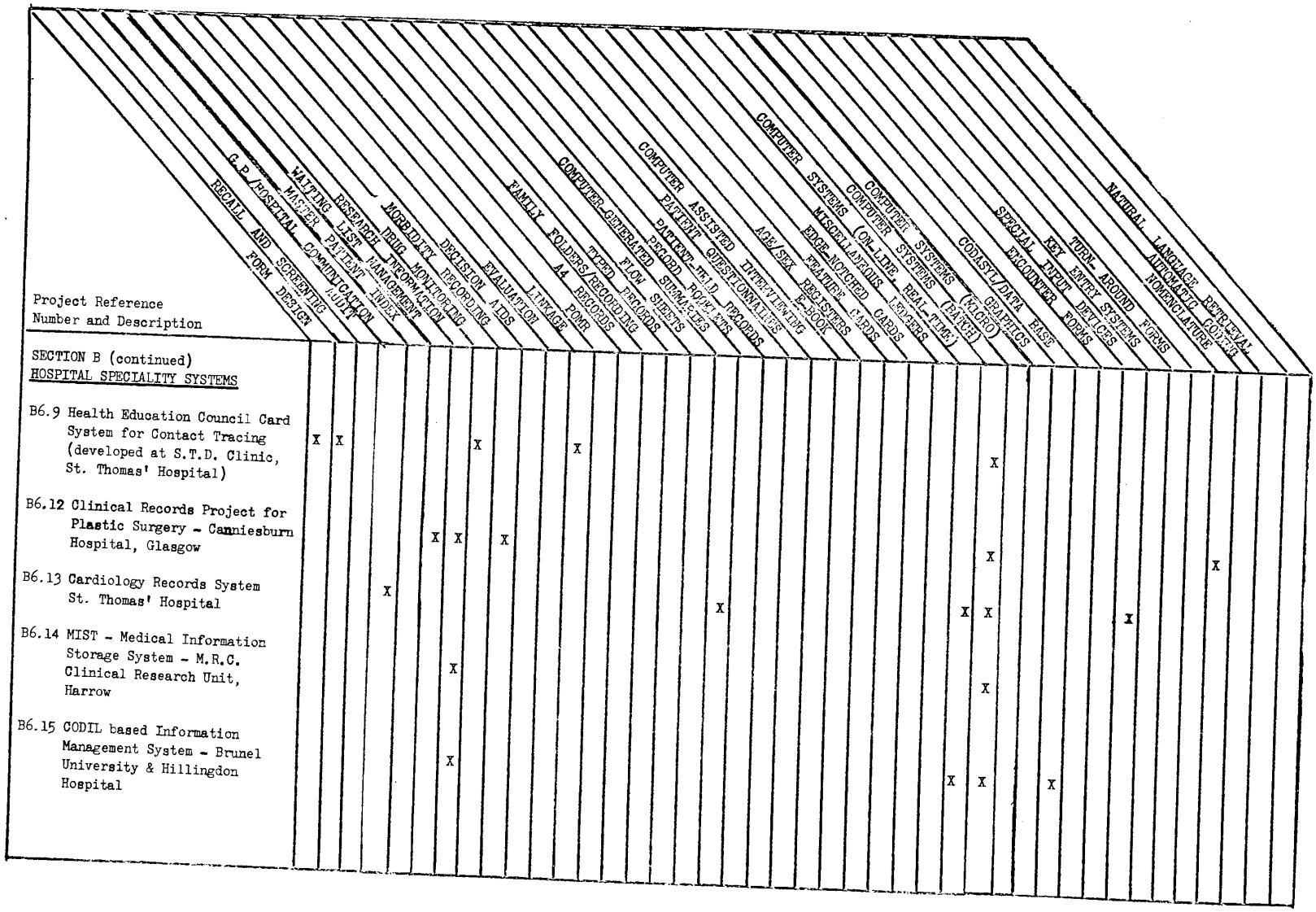


Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	FAMILY FOLDERS/RECORDING	A4 RECORDS	COMPUTER-GENERATED FLOW SHEETS	TYPED RECORDS	PATIENT RECORD SUMMARIES	PATIENT-HELD BOOKLETS	COMPUTER ASSISTED QUESTIONNAIRES	AGE/SEX REGISTERS	INTERVIEWING FEATURE	EDGE-NOTCHED CARDS	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE (MICRO)	GRAPHICS	SPECIAL KEY ENCOUNTER FORMS	TURN-AROUND INPUT DEVICES	ENTRY SYSTEMS	NATURAL LANGUAGE AUTOMATIC NOMENCLATURE	RETRIEVAL CODING
SECTION B (continued) HOSPITAL SPECIALITY SYSTEMS																															
B4.2 King's College Hospital Diabetic Clinic Project - King's College Hospital Diabetic Clinic			X					X																	X		X				
B4.3 Poole General Hospital Diabetic Clinic - Poole General Hospital.			X		X			X										X							X						
B4.4 Nottingham Diabetic Information Project - University of Nottingham Medical School			X		X													X	X						X						
B5.1 Accident & Emergency System, Royal Victoria Hospital, Belfast								X																	X						
B5.2 Accident & Emergency System, South Western R.H.A., Bristol								X																	X						
B5.3 Accident & Emergency System, Royal Lancaster Infirmary.								X																	X						


Project Reference Number and Description
G.P./HOSPITAL COMMUNICATION
RECALL AND SCREENING
FORM DESIGN
AUDIT
WAITING LIST MANAGEMENT
RESEARCH PATIENT INDEX
DRUG MONITORING
MORBIDITY INFORMATION
DECISION RECORDING
EVALUATION AIDS
LINKAGE
FAMILY FOLDERS/RECORDING
A4 RECORDS
POMR
COMPUTER-GENERATED TYPED RECORDS
FLOW SHEETS
COMPUTER ASSISTED PATIENT RECORD SUMMARIES
PATIENT-HELD BOOKLETS
QUESTIONNAIRES
INTERVIEWING
AGE/SEX REGISTERS
FEATURE CARDS
EDGE-NOTCHED CARDS
E-BOOK
COMPUTER SYSTEMS
COMPUTER SYSTEMS (ON-LINE, REAL-TIME)
MISCELLANEOUS LEDGERS
CODASYL/DATA BASE
(MICRO) GRAPHICS
(BATCH) FORMS
SPECIAL INPUT DEVICES
ENCOUNTER FORMS
KEY ENTRY SYSTEMS
TURN-AROUND FORMS
AUTOMATIC CODERS
NOMENCLATURE
NATURAL LANGUAGE RETRIEVAL
SECTION B (continued)
HOSPITAL SPECIALITY SYSTEMS
B5.4 Nottingham Accident and Emergency System, Queen's Medical Centre, Nottingham
B5.5 Leeds Accident & Emergency System, Leeds General Infirmary
B6.1 KODIAC Automatic Coding System - Clinical Research Centre, Harrow
B6.2 Automatic Coding for Histopathology - Northwick Park Hospital, Harrow
B6.3 SWITCH System - Western District Medical Computing Dept., Western Infirmary, Glasgow.



Project Reference Number and Description	WAITING LIST MANAGEMENT	RESEARCH PATIENT INDEX	MASTER PATIENT INDEX	G.P./HOSPITAL COMMUNICATION	RECALL AND SCREENING	FORM DESIGN	MORBIDITY MONITORING	DRUG INFORMATION	DECISION RECORDING	EVALUATION AIDS	LINKAGE	FAMILY FOLDERS/RECORDING	COMPUTER-GENERATED A4 RECORDS	TYPED RECORDS	COMPUTER ASSISTED PATIENT RECORD SUMMARIES	PATIENT-HELD RECORDS	QUESTIONNAIRES	INTERVIEWING	AGE/SEX REGISTERS	EDGE-NOTCHED FEATHER CARDS	E-BOOK	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE REAL-TIME)	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	CODASYL/DATA BASE	GRAPHICS	SPECIAL ENCOUNTER FORMS	KEY INPUT DEVICES	TURN-AROUND ENTRY SYSTEMS	AUTOMATIC NOMENCLATURE	CODING	NATURAL LANGUAGE RETRIEVAL
SECTION B (continued) HOSPITAL SPECIALITY SYSTEMS																																
B6.4 Free Text Data Handling for Pathology - Manchester University									X																X	X						X
B6.5 The MIRPO System - The Robert Jones & Agnes Hunt Orthopaedic Hospital, Oswestry									X																	X						X
B6.6 West Midlands R.H.A. MUMPS Project - Manor Hospital, Walsall										X		X		X											X							
B6.7 The HOIS System (House Officer Information System) - St. Chad's Hospital, Birmingham.												X				X									X							
B6.8 Chronic Glaucoma Control and Records System - King's College Hospital, London.		X							X		X			X			X									X		X				X


Project Reference Number and Description
RECALL AND SCREENING
G.P./HOSPITAL COMMUNICATION
WAITING LIST MANAGEMENT
RESEARCH PATIENT INDEX
DRUG INFORMATION
MORBIDITY MONITORING
DECISION RECORDING AIDS
EVALUATION
LINKAGE
FAMILY FOLDERS/RECORDING
COMPUTER-GENERATED A4 RECORDS
COMPUTER ASSISTED PATIENT RECORD SHEETS
PATIENT HELD RECORDS
PATIENT QUESTIONNAIRES
INTERVIEWING AIDS
AGE/SEX REGISTERS
FEATURE E-BOOK CARDS
EDGE-NOTCHED CARDS
MISCELLANEOUS LEDGERS
COMPUTER SYSTEMS (ON-LINE - REAL-TIME)
COMPUTER SYSTEMS (BATCH)
CODASYL/DATA (MICRO) GRAPHICS EASE
SPECIAL INPUT ENCOUNTER DEVICES
KEY ENTRY SYSTEMS
TURN-AROUND FORMS
AUTOMATIC NOMENCLATURE CODING
NATURAL LANGUAGE RETRIEVAL
SECTION B (continued)
HOSPITAL SPECIALITY SYSTEMS
B6.9 Health Education Council Card System for Contact Tracing (developed at S.T.D. Clinic, St. Thomas' Hospital)
B6.12 Clinical Records Project for Plastic Surgery - Canniesburn Hospital, Glasgow
B6.13 Cardiology Records System St. Thomas' Hospital
B6.14 MIST - Medical Information Storage System - M.R.C. Clinical Research Unit, Harrow
B6.15 CODIL based Information Management System - Brunel University & Hillingdon Hospital

SECTION B (continued)

HOSPITAL SPECIALITY SYSTEMS

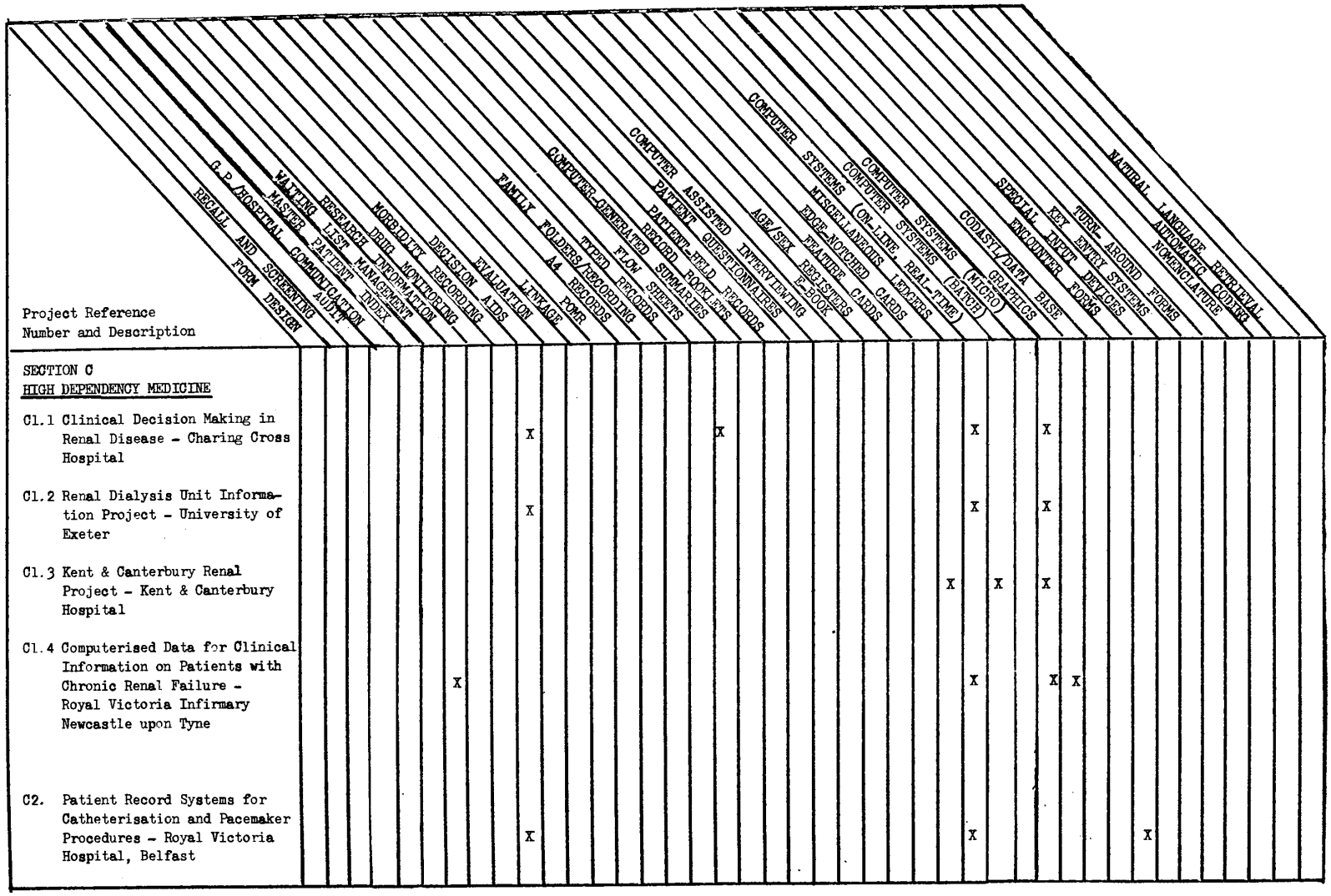
Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	AUDIT	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR	A4 RECORDS	FAMILY FOLDERS/RECORDING	TYPED RECORDS	FLOW SHEETS	COMPUTER-GENERATED SUMMARIES	RECORD BOOKLETS	PATIENT-HELD RECORDS	PATIENT QUESTIONNAIRES	COMPUTER ASSISTED INTERVIEWING	E-BOOK	AGE/SEX REGISTERS	FEATURE CARDS	EDGE-NOTCHED CARDS	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	GRAPHICS	CODASYL/DATA BASE	ENCOUNTER FORMS	SPECIAL INPUT DEVICES	KEY ENTRY SYSTEMS"	TURN-AROUND FORMS	NOMENCLATURE	AUTOMATIC CODING	NATURAL LANGUAGE RETRIEVAL
B6.16 Computer based radio therapy clinical records system - Addenbrooke's Hospital																		X											X										
B6.17 ORLCODE Automatic Coding System - Oxford R.H.A.							X																						X									X	
B6.18 Drug Monitoring Study - Hampshire A.H.A. & Southampton General Hospital							X	X																					X								X		
B6.19 Institute of Cancer Research Royal Marsden Hospital MUMPS System							X																					X										X	X
B6.20 Hospital Medical Record in King's College Dept. of Medicine	X		X				X																									X							

SECTION B (continued)
HOSPITAL SPECIALITY SYSTEMS

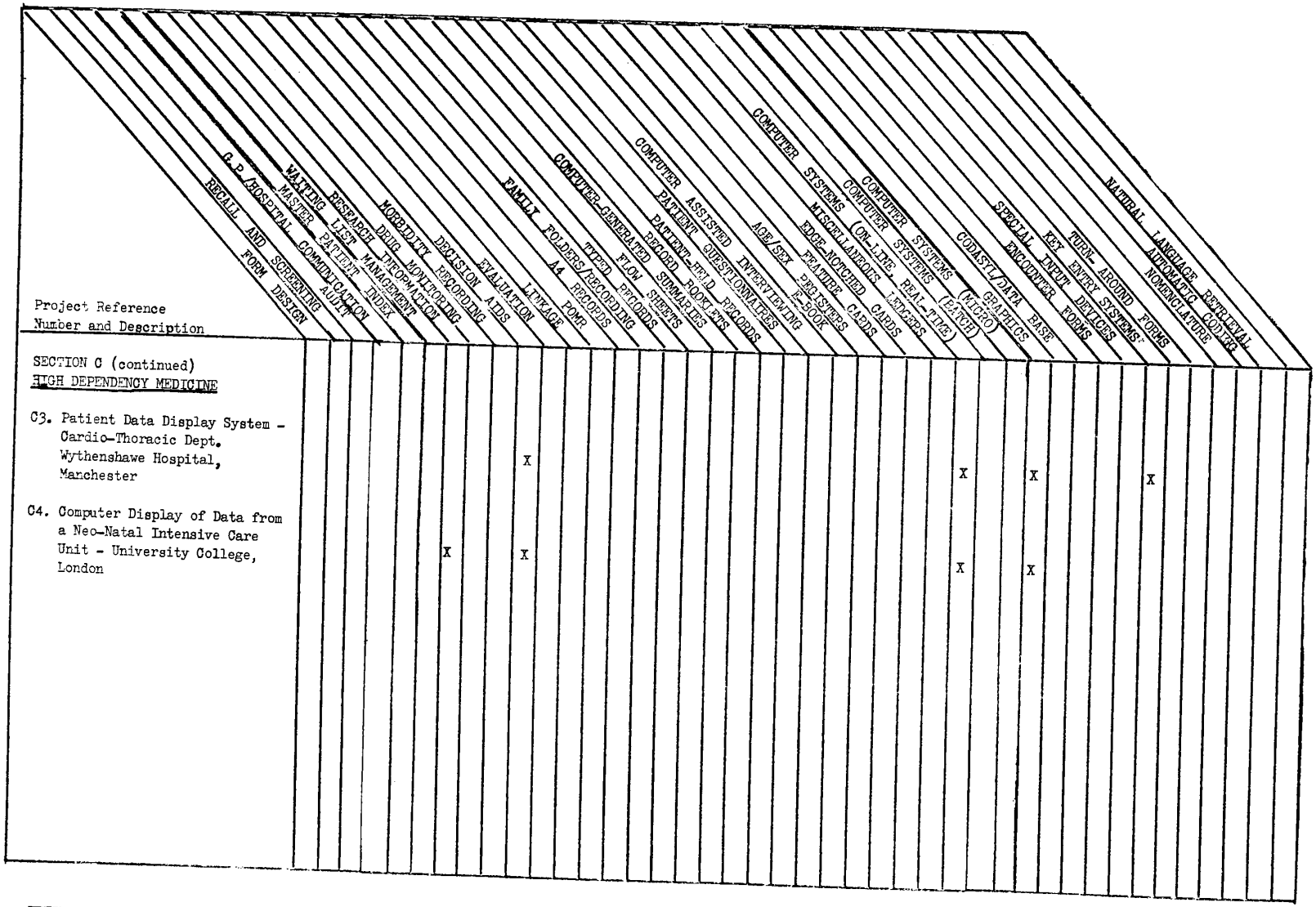
Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	AUDIT	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR
B.101 Royal Sussex County Hospital	X						X						X
B.102 Glasgow Royal Maternity Hospital										X			
B.103 St. Bartholomew's Hospital							X			X			
B.104 Chesterfield Royal Hospital	X						X						
B.105 Royal Infirmary, Edinburgh	X						X						

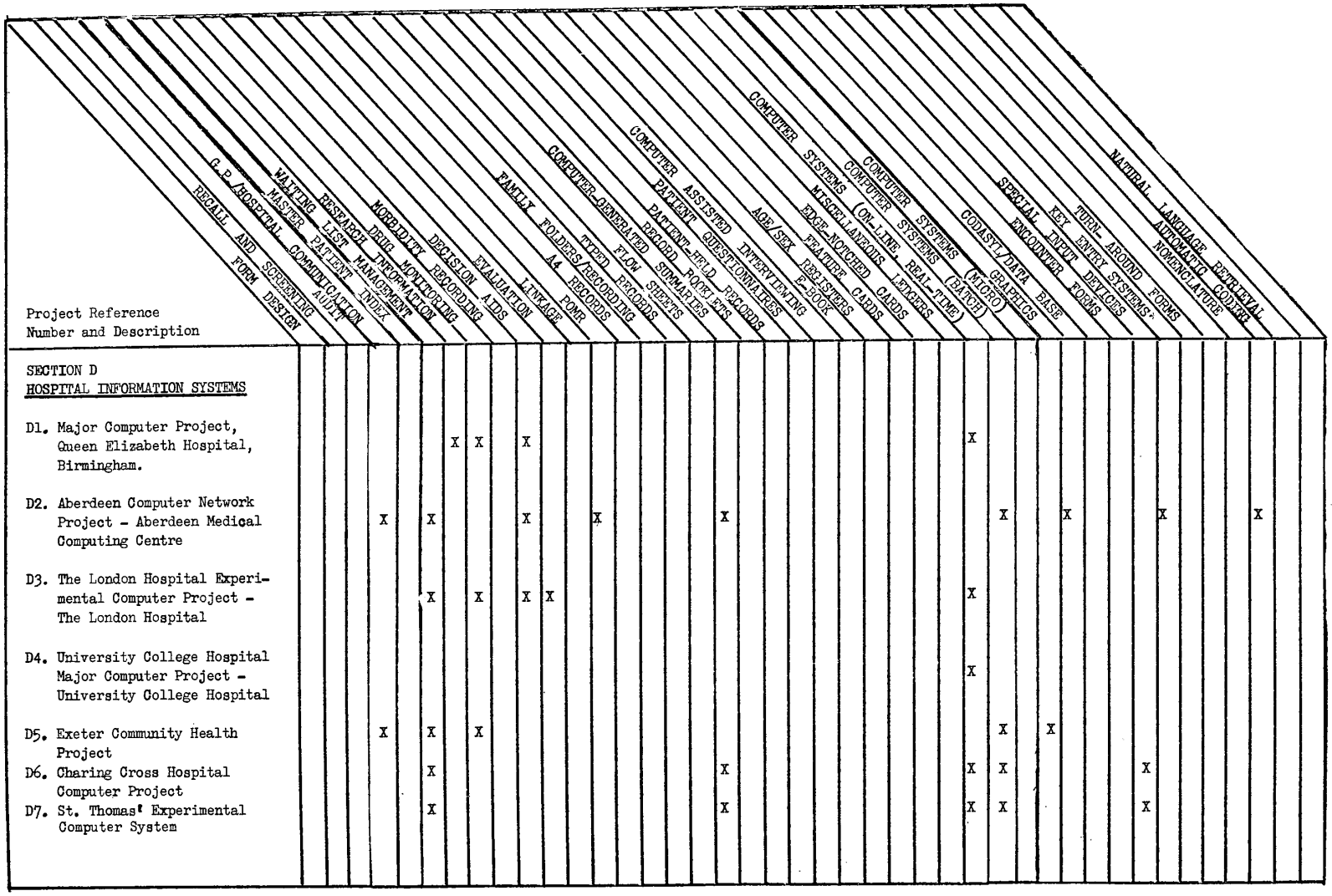
Project Reference Number and Description	A4 RECORDS	FAMILY FOLDERS/RECORDING	TYPED RECORDS	FLOW SHEETS	COMPUTER-GENERATED SUMMARIES	RECORD BOOKLETS	PATIENT-HELD RECORDS	PATIENT QUESTIONNAIRES	COMPUTER ASSISTED INTERVIEWING	E-BOOK	AGE/SEX REGISTERS	FEATURE CARDS	EDGE-NOTCHED CARDS
B.101 Royal Sussex County Hospital						X							
B.102 Glasgow Royal Maternity Hospital													
B.103 St. Bartholomew's Hospital													
B.104 Chesterfield Royal Hospital													
B.105 Royal Infirmary, Edinburgh						X							

Project Reference Number and Description	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	GRAPHICS	CODASYL/DATA BASE	ENCOUNTER FORMS	SPECIAL INPUT DEVICES	KEY ENTRY SYSTEMS:	TURN-AROUND FORMS	NOMENCLATURE	AUTOMATIC CODING	NATURAL LANGUAGE RETRIEVAL
B.101 Royal Sussex County Hospital			X										
B.102 Glasgow Royal Maternity Hospital													
B.103 St. Bartholomew's Hospital				X									
B.104 Chesterfield Royal Hospital										X			
B.105 Royal Infirmary, Edinburgh				X						X			

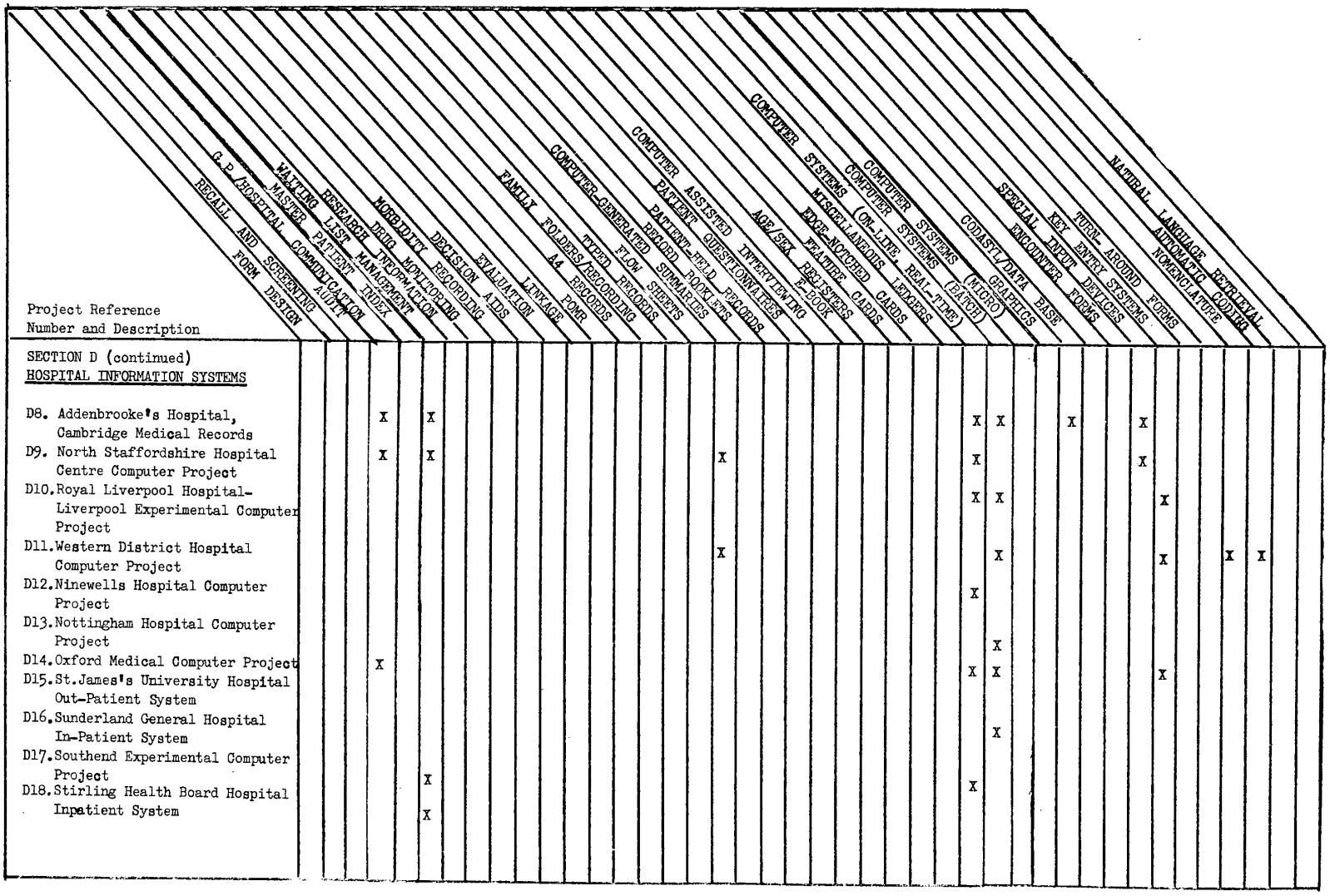


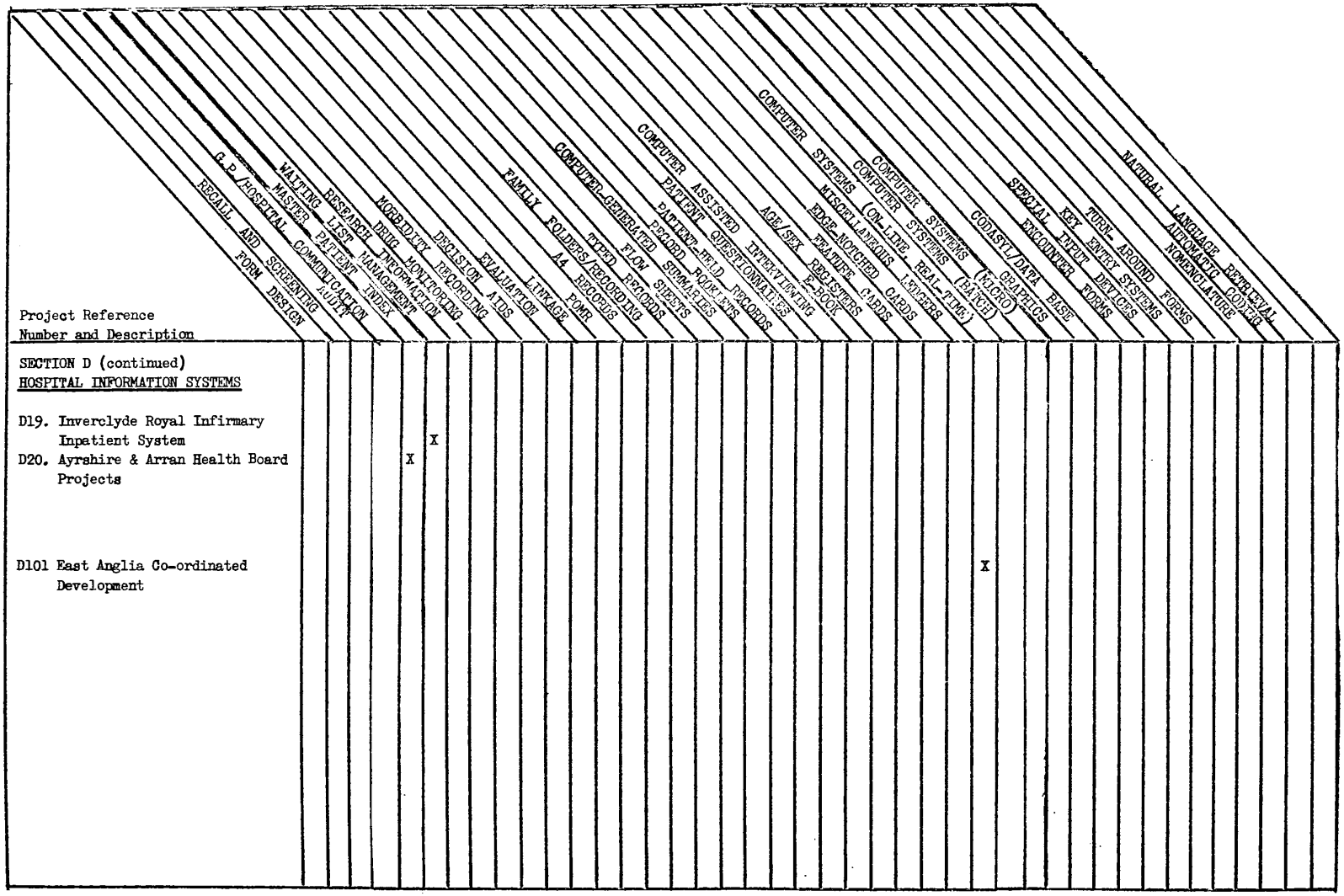
Project Reference Number and Description	RECALL AND SCREENING	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH AUDIT	MORBIDITY INFORMATION	DRUG MONITORING	DECISION RECORDING AIDS	EVALUATION	LINKAGE	FAMILY FOLDERS/RECORDING	POMR	COMPUTER-GENERATED A4 RECORDS	TYPED RECORDS	FLOW STERNS	PATIENT-HELD RECORD SUMMARIES	PATIENT-HELD BOOKLETS	COMPUTER ASSISTED QUESTIONNAIRES	INTERVIEWING	AGE/SEX REGISTERS	E-BOOK FEATURE	EDGE-NOTCHED CARDS	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE (MICRO)	GRAPHICS	SPECIAL ENCOUNTER FORMS	KEY INPUT DEVICES	TURN AROUND FORMS	ENTRY SYSTEMS	AUTOMATIC NOMENCLATURE	NATURAL LANGUAGE CODING	RETRIEVAL
SECTION C HIGH DEPENDENCY MEDICINE																																		
C1.1 Clinical Decision Making in Renal Disease - Charing Cross Hospital										X							X									X		X						
C1.2 Renal Dialysis Unit Information Project - University of Exeter										X																X		X						
C1.3 Kent & Canterbury Renal Project - Kent & Canterbury Hospital																								X		X		X						
C1.4 Computerised Data for Clinical Information on Patients with Chronic Renal Failure - Royal Victoria Infirmary Newcastle upon Tyne								X																		X		X	X					
C2. Patient Record Systems for Catheterisation and Pacemaker Procedures - Royal Victoria Hospital, Belfast										X														X							X			


Project Reference Number and Description
GP/HOSPITAL COMMUNICATION
RECALL AND SCREENING
FORM DESIGN
WAITING LIST MANAGEMENT
RESEARCH DRUG INFORMATION
MORBIDITY MONITORING
DECISION RECORDING AIDS
EVALUATION
LINKAGE
FAMILY FOLDERS/RECORDING
COMPUTER-GENERATED A4 RECORDS
TYPED RECORDS
FLOW SHEETS
PATIENT RECORD SUMMARIES
PATIENT ASSISTED QUESTIONNAIRES
COMPUTER ASSISTED INTERVIEWING
AGE/SEX REGISTERS
EDGE-NOTCHED CARDS
FEATHER CARDS
LEDGERS
COMPUTER SYSTEMS (ON-LINE, REAL-TIME)
COMPUTER SYSTEMS (BATCH)
MTS/CELLATRONICS (MICRO)
CODASYL/DATA BASE
SPECIAL KEY ENTRY SYSTEMS
ENCOUNTER FORMS
TURN AROUND DEVICES
NATURAL LANGUAGE RETRIEVAL
AUTOMATIC CODING
NOMENCLATURE
SECTION C (continued)
HIGH DEPENDENCY MEDICINE
C3. Patient Data Display System - Cardio-Thoracic Dept. Wythenshawe Hospital, Manchester
C4. Computer Display of Data from a Neo-Natal Intensive Care Unit - University College, London
X
X
X
X
X
X
X
X



Project Reference Number and Description	RECALL AND SCREENING	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	FAMILY FOLDERS/RECORDING	COMPUTER-GENERATED RECORDS	TYPED A4 RECORDS	FLOW SHEETS	PATIENT RECORD SUMMARIES	COMPUTER ASSISTED PATIENT QUESTIONNAIRES	PATIENT HELD RECORDS	POINT EPOS	AGE/SEX INTERVIEWING	FRACTURE REGISTERS	EDGE-NOTCHED CARDS	E-BOOK LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	MISCELLANEOUS (MICRO)	CODASYL/DATA BASE	GRAPHICS	SPECIAL ENCOUNTER FORMS	KEY ENTRY SYSTEMS	TURN-AROUND DEVICES	AUTOMATIC FORMS NOMENCLATURE	NATURAL LANGUAGE RETRIEVAL	CODIFIER
SECTION D **HOSPITAL INFORMATION SYSTEMS**																																	
D1. Major Computer Project, Queen Elizabeth Hospital, Birmingham.							X	X		X														X									
D2. Aberdeen Computer Network Project - Aberdeen Medical Computing Centre					X		X			X		X				X									X		X		X		X		
D3. The London Hospital Experimental Computer Project - The London Hospital							X		X		X	X												X									
D4. University College Hospital Major Computer Project - University College Hospital																								X									
D5. Exeter Community Health Project					X		X		X																X		X						
D6. Charing Cross Hospital Computer Project							X										X							X	X				X				
D7. St. Thomas' Experimental Computer System							X										X							X	X				X				

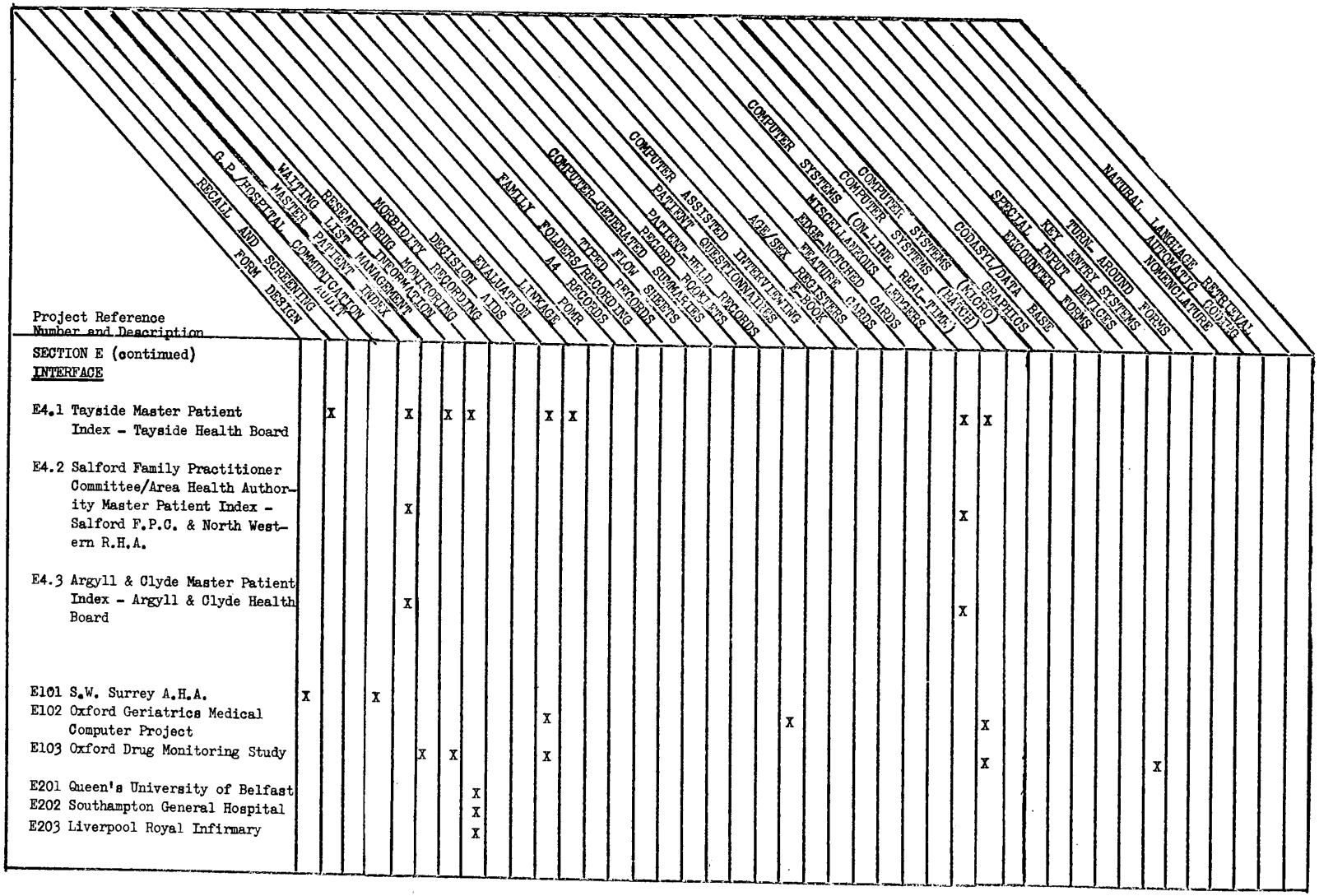

Project Reference Number and Description
FORM DESIGN
RECALL AND SCREENING
G.P./HOSPITAL COMMUNICATION
MASTER PATIENT INDEX
WAITING LIST MANAGEMENT
RESEARCH DRUGS INFORMATION
MORBIDITY MONITORING
DECISION RECORDING AIDS
EVALUATION
LINKAGE
A4 RECORDS
POMR
FAMILY FOLDERS RECORDING
COMPUTER-GENERATED TYPED FLOW RECORDS
PATIENT-HELD SUMMARIES RECORD BOOKLETS
COMPUTER ASSISTED QUESTIONNAIRES
INTERVIEWING
AGE/SEX REGISTERS
EDGE-NOTCHED CARDS
FEATURE E-BOOK CARDS
MISCELLANEOUS LEDGERS
COMPUTER SYSTEMS (ON-LINE, REAL-TIME)
COMPUTER SYSTEMS (BATCH)
CODASYL/DATA BASE (MICRO)
GRAPHICS
SPECIAL KEY ENCOUNTER FORMS
TURN-AROUND INPUT DEVICES
ENTRY SYSTEMS
AUTOMATIC CODING
NOMENCLATURE
NATURAL LANGUAGE RETRIEVAL
SECTION D (continued)
HOSPITAL INFORMATION SYSTEMS
D8. Addenbrooke's Hospital, Cambridge Medical Records
D9. North Staffordshire Hospital Centre Computer Project
D10. Royal Liverpool Hospital-Liverpool Experimental Computer Project
D11. Western District Hospital Computer Project
D12. Ninewells Hospital Computer Project
D13. Nottingham Hospital Computer Project
D14. Oxford Medical Computer Project
D15. St.James's University Hospital Out-Patient System
D16. Sunderland General Hospital In-Patient System
D17. Southend Experimental Computer Project
D18. Stirling Health Board Hospital Inpatient System

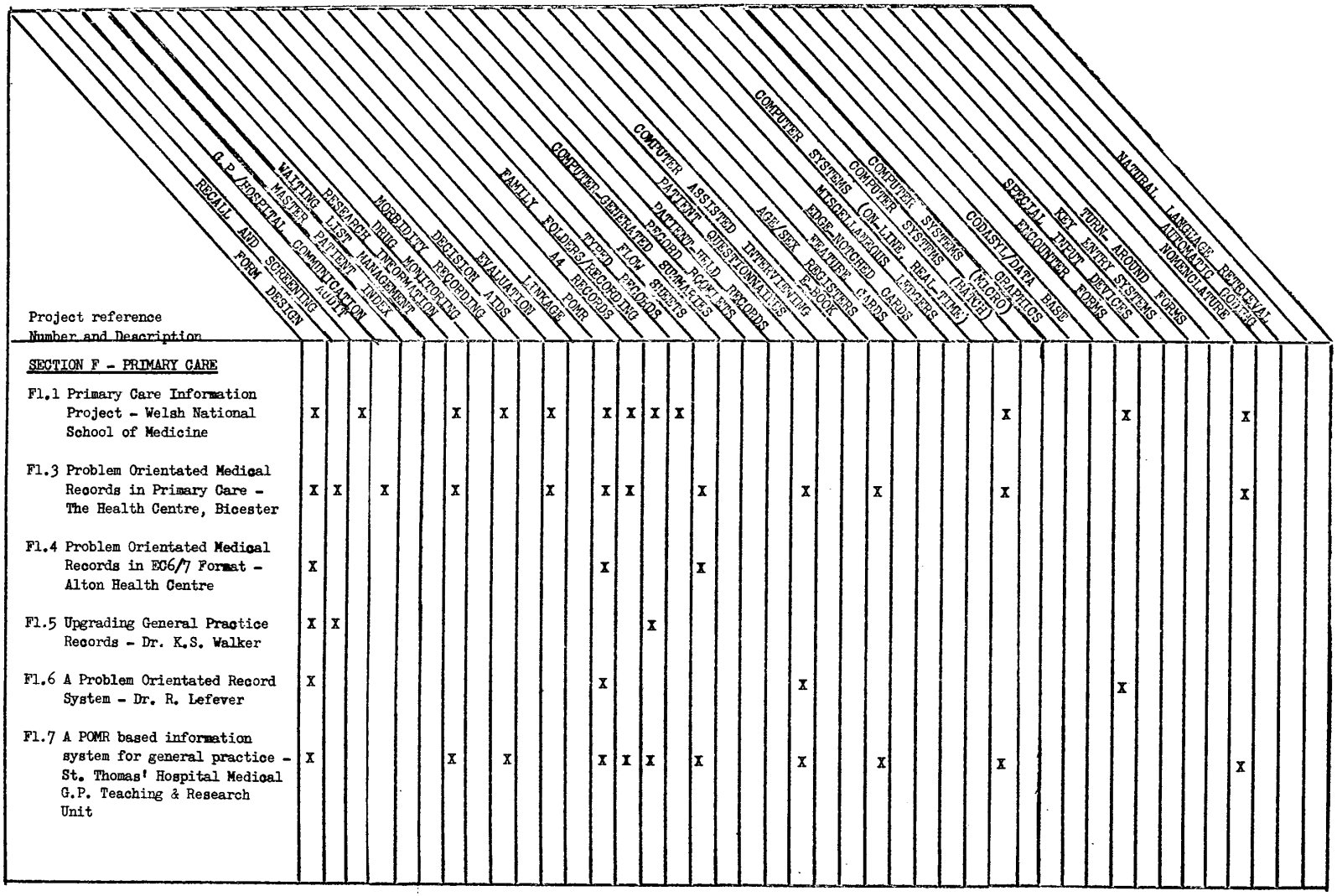


Project Reference Number and Description	RECALL AND SCREENING	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH AUDIT	DRUG MONITORING	MORBIDITY INFORMATION	DECISION RECORDING	EVALUATION AIDS	LINKAGE	FAMILY FOLDERS/RECORDS	POMR	A4 RECORDS	TYPED FLOW SHEETS	COMPUTER-GENERATED PATIENT RECORD SUMMARIES	COMPUTER ASSISTED PATIENT-HELD BOOKLETS	INTERVIEWING QUESTIONNAIRES	AGE/SEX REGISTERS	EDGE-NOTCHED FEATURE BOOK	MISCELLANEOUS CARDS	COMPUTER SYSTEMS (ON-LINE REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE (MICRO)	GRAPHICS	SERIAL KEY ENTRY DEVICES	FUTURE AROUND ENCOUNTER FORMS	NATURAL LANGUAGE AUTOMATIC NOMENCLATURE	RETRIEVAL CONTENT
SECTION D (continued)																												
HOSPITAL INFORMATION SYSTEMS																												
D19. Inverclyde Royal Infirmary Inpatient System								X																				
D20. Ayrshire & Arran Health Board Projects							X																					
D101 East Anglia Co-ordinated Development																						X						

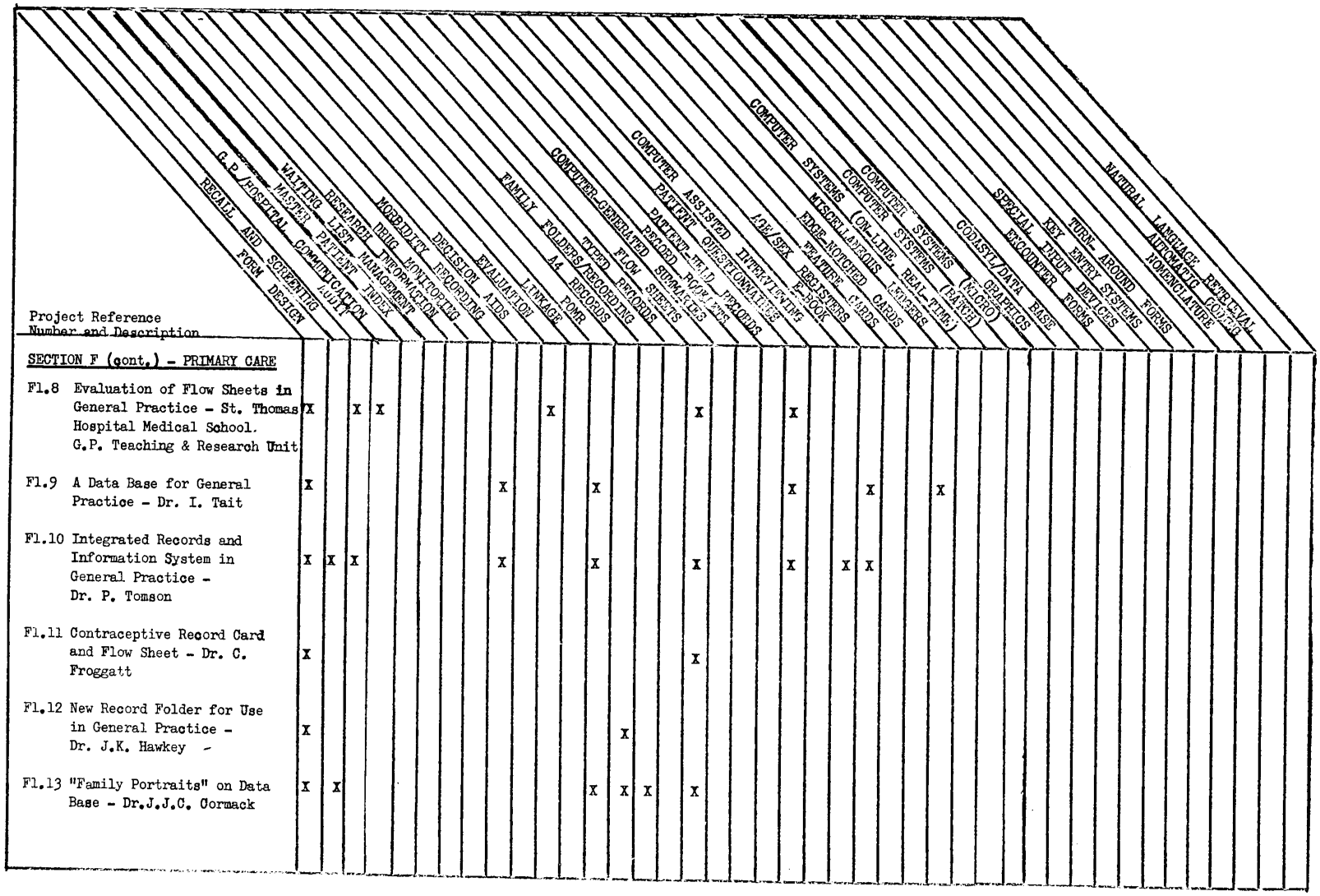
Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	AUDIT	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR	A4 RECORDS	FAMILY FOLDERS/RECORDING	TYPED RECORDS	FLOW SHEETS	COMPUTER-GENERATED SUMMARIES	RECORD BOOKLETS	PATIENT-HELD RECORDS	PATIENT QUESTIONNAIRES	COMPUTER ASSISTED INTERVIEWING	E-BOOK	AGE/SEX REGISTERS	FEATURE CARDS	EDGE-NOTCHED CARDS	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	GRAPHICS	CODASYL/DATA BASE		ENCOUNTER FORMS	SPECIAL INPUT DEVICES	KEY ENTRY SYSTEMS	TURN-AROUND FORMS		NOMENCLATURE	AUTOMATIC CODING	NATURAL LANGUAGE RETRIEVAL	
SECTION E - INTERFACE																																										
E1.1 Oxford Record Linkage Study Oxford R.H.A.							X					X																	X							X				X		
E1.2 Northern Ireland Medical Record Linkage Project - Queen's University, Belfast							X					X																	X							X						
E1.3 Leeds Information Project - The University of Leeds							X					X																	X		X											
E1.4 Care of the Elderly - Royal Devon & Exeter Hospital	X	X																																								
E2.1 Patients as Record Holders - St. Mary's Maternity Hospital Portsmouth				X																X																						
E2.2 Combined General Practice & Community Hospital Records Wallingford Medical Centre and Community Hospital	X			X													X																									
E2.3 Integration of General Practice and Hospital Obstetric Care - St. Thomas' Hospital Medical School				X																X																						

Project Reference Number and Description	G.P./HOSPITAL COMMUNICATION	RECALL AND SCREENING	FORM DESIGN	AUDIT	WAITING LIST MANAGEMENT	RESEARCH PATIENT INDEX	DRUG MONITORING	MORBIDITY INFORMATION	DECISION RECORDING	EVALUATION AIDS	FAMILY LINKAGE	FOLDERS/RECORDING A4	COMPUTER-GENERATED RECORDS	TYPED FLOW RECORDS	COMPUTER ASSISTED PATIENT RECORD SUMMARIES	PATIENT-HELD POOLED RECORDS	QUESTIONNAIRES	INTERVIEWING AGE/SEX REGISTERS	E-BOOK FEATURE CARDS	EDGE-NOTCHED CARDS	COMPUTER SYSTEMS MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE	GRAPHICS	SPECIAL ENCOUNTER FORMS	KEY ENTRY SYSTEMS	TURN-AROUND DEVICES	FORMS	NATURAL LANGUAGE RETRIEVAL	AUTOMATIC NOMENCLATURE CODERS
SECTION E (continued)																															
INTERFACE																															
E2.4 Hypertension Co-operation Sheet - Royal Infirmary, Newcastle upon Tyne				X		X												X													
E3.1 Scottish Automated Follow-up Register (SAFUR) - University of Aberdeen	X			X		X																		X							
E3.2 Welsh Automated Follow-up Register (WAFUR) - Welsh National School of Medicine	X			X		X																		X					X		
E3.3 Sheffield Thyroid Follow-up System - Trent R.H.A.	X			X		X																		X							
E3.4 Birmingham Thyroid Follow-up System - Queen Elizabeth Hospital, Birmingham	X			X																				X							
E3.5 Doncaster Thyroid Follow-up Register.- Doncaster Royal Infirmary				X		X																									


Project Reference Number and Description
SECTION E (continued)
INTERFACE
E4.1 Tayside Master Patient Index - Tayside Health Board
E4.2 Salford Family Practitioner Committee/Area Health Authority Master Patient Index - Salford F.P.C. & North Western R.H.A.
E4.3 Argyll & Clyde Master Patient Index - Argyll & Clyde Health Board
E101 S.W. Surrey A.H.A.
E102 Oxford Geriatrics Medical Computer Project
E103 Oxford Drug Monitoring Study
E201 Queen's University of Belfast
E202 Southampton General Hospital
E203 Liverpool Royal Infirmary
RECALL AND SCREENING
G.P./HOSPITAL COMMUNICATION
MASTER PATIENT INDEX
WAITING LIST MANAGEMENT
RESEARCH INFORMATION
MORBIDITY MONITORING
DRUG RECORDING
DECISION AIDS
EVALUATION
LINKAGE
FAMILY FOLDERS/RECORDING
A4 RECORDS
COMPUTER-GENERATED FLOW SHEETS
COPIED RECORDS
PATIENT RECORD SUMMARIES
PATIENT HELD RECORDS
COMPUTER ASSISTED PATIENT QUESTIONNAIRES
AGE/SEX REGISTERS
EDGE-NOTCHED CARDS
FEATURE CARDS
E-BOOK
COMPUTER SYSTEMS (ON-LINE REAL-TIME) (MATCH)
COMPUTER SYSTEMS (ON-LINE REAL-TIME) (MICRO)
MISCELLANEOUS
CODASYL/DATA BASE
GRAPHICS
SPECIAL KEYS
ENCOUNTER FORMS
TURN-AROUND INPUT DEVICES
NATURAL LANGUAGE ENTRY SYSTEMS
AUTOMATIC FORMS
NOMENCLATURE RETRIEVAL
CODING



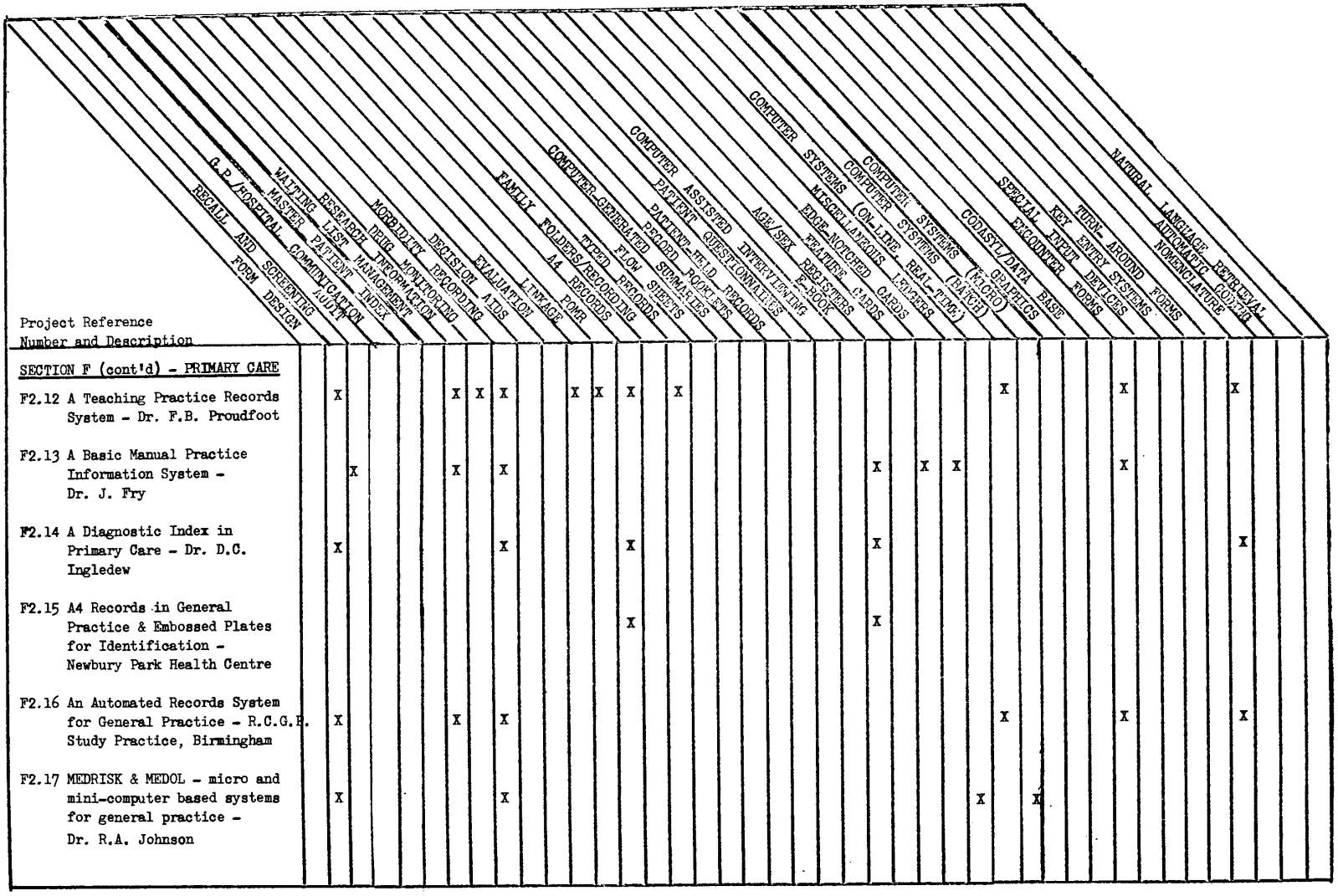
Project reference Number and Description	Q.P./HOSPITAL COMMUNICATION	RECALL AND SCREENING	MASTER PATIENT INDEX	WAITING LIST	RESEARCH	MORBIDITY	DRUG MONITORING	DECISION RECORDING	AIDS	EVALUATION	LINKAGE	FAMILY FOLDERS/RECORDING	POMR	A4 RECORDS	COMPUTER-GENERATED FLOW SHEETS	TYPED PROBLEM RECORDS	COMPUTER ASSISTED PATIENT QUESTIONNAIRES	PATIENT HELD RECORDS	AGE/SEX REGISTERS	EDGE-NOTCHED CARDS	E-BOOK	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE	SPECIAL INPUT DEVICES	KEY ENTRY SYSTEMS	TURN-AROUND FORMS	NATURAL LANGUAGE RETRIEVAL	AUTOMATIC NOMENCLATURE CODING
SECTION F - PRIMARY CARE																													
F1.1 Primary Care Information Project - Welsh National School of Medicine	X		X			X		X		X			X	X	X	X								X			X		X
F1.3 Problem Orientated Medical Records in Primary Care - The Health Centre, Bicester	X	X		X		X			X			X	X			X				X			X						X
F1.4 Problem Orientated Medical Records in EC6/7 Format - Alton Health Centre	X												X				X												
F1.5 Upgrading General Practice Records - Dr. K.S. Walker	X	X													X														
F1.6 A Problem Orientated Record System - Dr. R. Lefever	X												X							X							X		
F1.7 A POMR based information system for general practice - St. Thomas' Hospital Medical G.P. Teaching & Research Unit	X							X		X			X	X	X		X			X			X						X


Project Reference Number and Description
SECTION F (cont.) - PRIMARY CARE
F1.8 Evaluation of Flow Sheets in General Practice - St. Thomas Hospital Medical School. G.P. Teaching & Research Unit
F1.9 A Data Base for General Practice - Dr. I. Tait
F1.10 Integrated Records and Information System in General Practice - Dr. P. Tomson
F1.11 Contraceptive Record Card and Flow Sheet - Dr. C. Froggatt
F1.12 New Record Folder for Use in General Practice - Dr. J.K. Hawkey
F1.13 "Family Portraits" on Data Base - Dr.J.J.C. Cormack
RECALL AND SCREENING
G.P./HOSPITAL COMMUNICATION
MASTER PATIENT INDEX
WAITING LIST MANAGEMENT
RESEARCH INFORMATION
DRUG MONITORING
MORBIDITY RECORDING
DECISION AIDS
EVALUATION
LINKAGE
FAMILY FOLDERS/RECORDS
A4 RECORDS
POMR
COMPUTER-GENERATED FLOW SHEETS
TYPED RECORDING
PATIENT-HELD RECORDS
PATIENT QUESTIONNAIRES
COMPUTER ASSISTED INTERVIEWING
PATIENT-HELD RECORD SUMMARIES
AGE/SEX REGISTERS
FINGER-NOTCHED CARDS
E-BOOK
KEYPUNCH
MISCELLANEOUS LEDGERS
COMPUTER SYSTEMS (ON-LINE, REAL-TIME)
COMPUTER SYSTEMS (BATCH)
CODASYL/DATA BASE
GRAPHICS
RECOUNTER FORMS
SPECIAL INPUT DEVICES
KEY ENTRY SYSTEMS
TURN-AROUND FORMS
AUTOMATED HOMENCLATURE CODING
NATURAL LANGUAGE RETRIEVAL

Project Reference Number and Description	RECALL AND SCREENING	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	FAMILY FOLDERS/RECORDING	COMPUTER-GENERATED A4 RECORDS	TYPED RECORDING	FLOW SHEETS	PERIOD SUMMARIES	PATIENT QUESTIONNAIRES	COMPUTER ASSISTED PATIENT HISTORY	AGE/SEX REGISTERS	MISCELLANEOUS E-BOOK	EDGE-NOTCHED CARDS	COMPUTER SYSTEMS (ON-LINE REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE	SPECIAL ENCOUNTER FORMS	TURN-AROUND KEY ENTRY SYSTEMS	NATURAL LANGUAGE AUTOMATIC NOMENCLATURE	RETRIEVAL FORMS DESIGN
SECTION F (cont'd.) - PRIMARY CARE																											
F.100 Dr. C. Salisbury	X																										
F.101 Dr. A. Murphy	X											X	X		X					X	X						
F.102 Dr. T. Venables	X											X	X								X		X				
F.103 Aberdeen University Dept. Public Health & Social Medicine																											
F.104 Dr. P. Walford																							X				
F2.1 Oxford Community Health Project - Oxford R.H.A.		X	X	X		X		X			X		X								X			X			X
F2.2 Edge-Notched Cards in General Practice - Dr. M.J.V. Bull		X				X																X					
F2.4 Data Collection in General Practice - The Health Centre Bearsden, Glasgow.								X													X			X			
F2.5 Information Systems for General Practice - Craigshill Health Centre	X	X		X			X	X	X				X	X		X	X			X	X	X		X			X

Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	AUDIT	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR	A4 RECORDS	FAMILY FOLDERS/RECORDING	TYPED RECORDS	FLOW SHEETS	COMPUTER-GENERATED SUMMARIES	RECORD BOOKLETS	PATIENT-HELD RECORDS	PATIENT QUESTIONNAIRES	COMPUTER ASSISTED INTERVIEWING
SECTION F (cont'd.) - PRIMARY CARE																						
F2.6 Exeter Community Health Computer Project				X	X				X									X				
F2.7 Computer Based Record System for General Practice - University of Southampton, Dept. of Primary Care	X	X	X	X			X	X	X			X	X	X		X		X				
F2.8 Group Practice Medical Information System using the 'F-Book' - West Granton Medical Group, Edinburgh							X		X						X							
F2.9 A Data Processing System for Use in General Practice - Dr. G.M. Clayton		X					X		X													
F2.10 A Manual Records System for General Practice - R.C.G.P. Research Unit, Birmingham		X							X					X						X		
F2.11 Improved Record Keeping in General Practice - Dr. J.O. Woods	X	X							X					X	X							

Project Reference Number and Description	F-BOOK	AGE/SEX REGISTERS	FEATURE CARDS	EDGE-NOTCHED CARDS	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	GRAPHICS	CODASYL/DATA BASE		ENCOUNTER FORMS	SPECIAL INPUT DEVICES	KEY ENTRY SYSTEMS	TURN-AROUND FORMS		NOMENCLATURE	AUTOMATIC CODING	NATURAL LANGUAGE RETRIEVAL	
SECTION F (cont'd.) - PRIMARY CARE																				
F2.6 Exeter Community Health Computer Project						X			X										X	
F2.7 Computer Based Record System for General Practice - University of Southampton, Dept. of Primary Care		X					X					X		X			X			
F2.8 Group Practice Medical Information System using the 'F-Book' - West Granton Medical Group, Edinburgh					X												X			
F2.9 A Data Processing System for Use in General Practice - Dr. G.M. Clayton		X					X					X					X			
F2.10 A Manual Records System for General Practice - R.C.G.P. Research Unit, Birmingham	X	X															X			
F2.11 Improved Record Keeping in General Practice - Dr. J.O. Woods																				



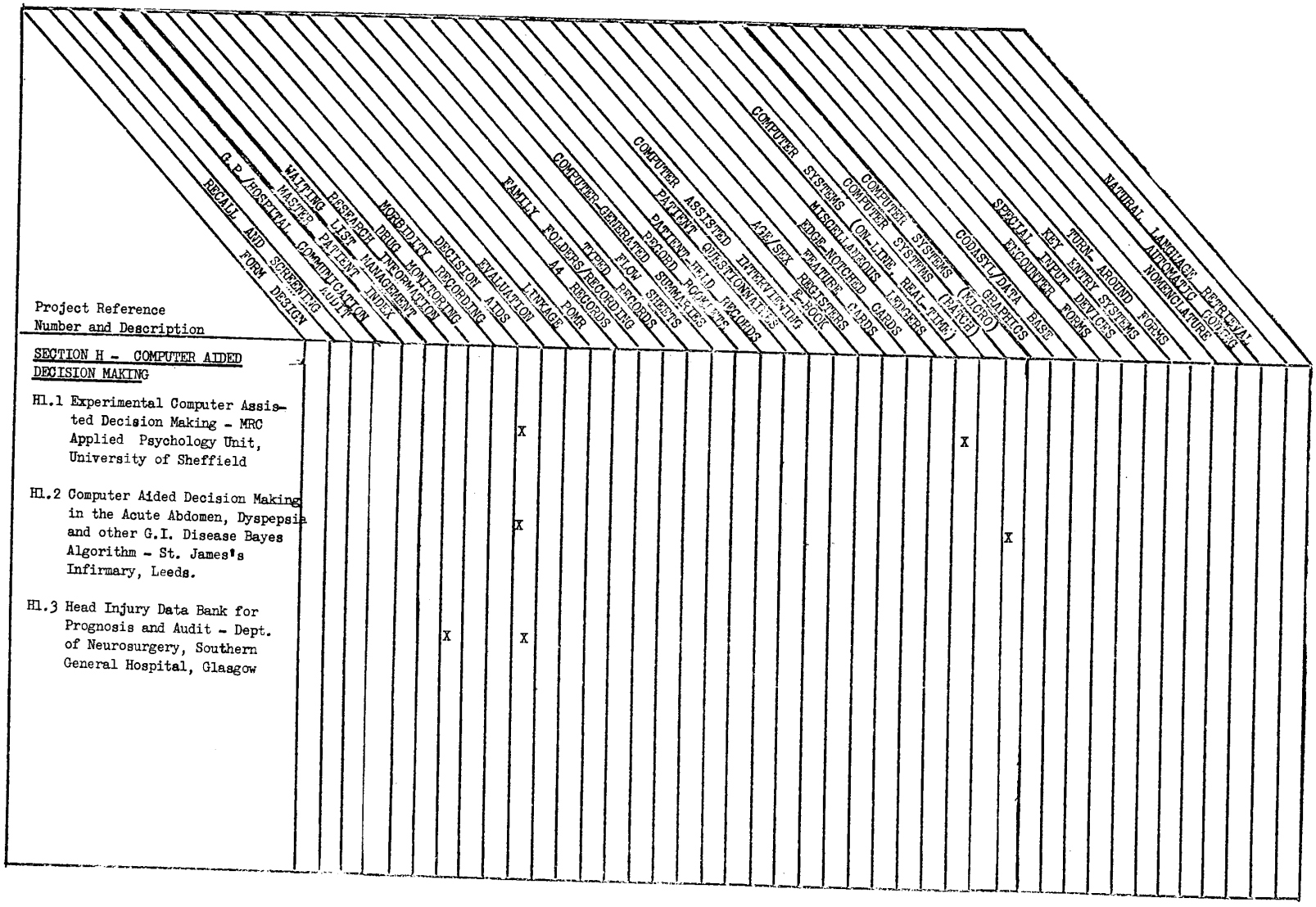
Project Reference Number and Description	RECALL AND SCREENING	PRINT DESIGN	COMMUNICATION AUDIT	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR	A4 RECORDS	TYPED RECORDING	COMPUTER-GENERATED RECORDS	FLOW SHEETS	PATIENT SUMMARIES	PATIENT-HELD RECORDS	COMPUTER ASSISTED QUESTIONNAIRES	INTERVENTIONS	AGE/SEX REGISTERS	EDGE-NOTCHED CARDS	FEATURE HEADS	E-BOOK	MISCELLANEOUS (ON-LINE)	COMPUTER SYSTEMS (REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE	GRAPHICS	SPECIAL ENCOUNTER FORMS	KEY INPUT DEVICES	TURN-AROUND ENTRY SYSTEMS	AUTOMATIC NOMENCLATURE FORMS	NATURAL LANGUAGE CONTROL	RETRIEVAL
SECTION F (cont'd) - PRIMARY CARE																																		
F2.12 A Teaching Practice Records System - Dr. F.B. Proudfoot			X						X	X	X			X	X	X		X										X			X			X
F2.13 A Basic Manual Practice Information System - Dr. J. Fry				X					X		X												X			X	X				X			
F2.14 A Diagnostic Index in Primary Care - Dr. D.C. Ingledew			X								X					X							X										X	
F2.15 A4 Records in General Practice & Embossed Plates for Identification - Newbury Park Health Centre																X							X											
F2.16 An Automated Records System for General Practice - R.C.G.P. Study Practice, Birmingham			X						X		X																	X			X			X
F2.17 MEDRISK & MEDOL - micro and mini-computer based systems for general practice - Dr. R.A. Johnson			X								X																X		X					

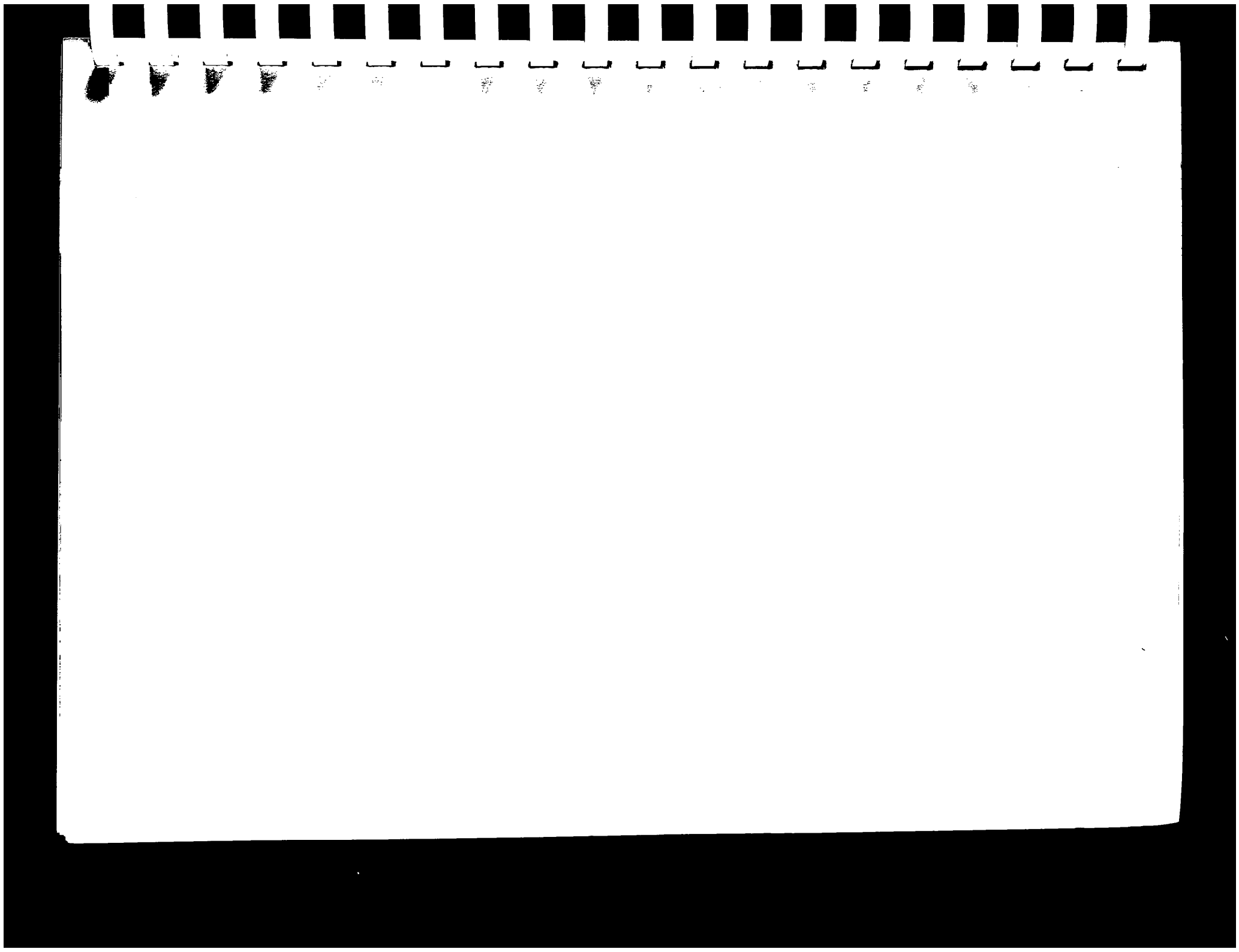
Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	AUDIT	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR	A4 RECORDS	FAMILY FOLDERS/RECORDING	TYPED RECORDS	COMPUTER-GENERATED FLOW SHEETS	RECORD SUMMARIES	RECORD BOOKLETS	PATIENT-HELD RECORDS	PATIENT QUESTIONNAIRES	COMPUTER ASSISTED INTERVIEWING	E-BOOK	AGE/SEX REGISTERS	FEATURE CARDS	EDGE-NOTCHED CARDS	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	GRAPHICS	CODASYL/DATA BASE	ENCOUNTER FORMS	SPECIAL INPUT DEVICES	KEY ENTRY SYSTEMS	TURN-AROUND FORMS		NOMENCLATURE	AUTOMATIC CODING	NATURAL LANGUAGE RETRIEVAL		
SECTION F (cont'd.) - PRIMARY CARE																																										
F2.18 Installation of a large Micro-computer system in a Group Practice - Dr. Robin While		X							X																			X		X												
F2.19 General Practice Records - St. Mary's Hospital Medical School								X	X																					X												
F2.20 Feature Card Information System for General Practice - The Health Centre, March, Cambridge.		X	X						X																X																	
F2.21 Milton Keynes Medical Records System - Wolverton Health Centre	X												X	X															X													
F2.22 Micro-computer System for General Practice - Eaton Socon Health Centre								X	X					X				X						X						X				X								
F2.23 The Use of the MEDIDATA System for General Practice - Romsey, Hampshire								X	X									X						X						X				X								

Project Reference Number and Description	RECALL AND SCREENING	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH AUDIT	MORBIDITY DRUG INFORMATION	DECISION MONITORING	EVALUATION RECORDING	FAMILY AIDS	LINKAGE FOLDERS/RECORDING	POMR A4 RECORDS	COMPUTER-GENERATED TYPED RECORDING	PROMPTED FLOW RECORDS	COMPUTER ASSISTED PATIENT STUDIES	PATIENT-HELD QUESTIONNAIRES	DIFFERENTIATING AGE/SEX REGISTERS	E-BOOK FEATURE CARDS	EDGE-NOTCHED CARDS	MISCELLANEOUS COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	CODASYL/DATA BASE (MICRO)	GRAPHICS	SPECIAL ENCOUNTER FORMS	KEY INPUT DEVICES	TURN-AROUND ENTRY SYSTEMS	AUTOMATIC FORMS NOMENCLATURE CODING	NATURAL LANGUAGE RETRIEVAL	FORM DESIGN
SECTION F (cont'd.) - PRIMARY CARE																												
F2.24 Drug Usage in a Rural Community - The Health Centre Deddington, Oxford								X	X						X			X					X					
F2.25 The Nottingham General Practice Information Project University of Nottingham Medical School		X	X						X	X		X			X						X		X				X	
F2.26 Medical Records in a General Practice Health Centre - The Health Centre, Streatham	X																						X					
F2.27 Epidemic Observation Unit of the R.C.G.P.							X	X														X	X					
F2.28 Heuristic Approach to General Practice Information Systems - G.P. in Durham & Teesside Polytechnic							X																X					
F.200 The Woodside Health Centre	X						X					X						X				X				X		
F.201 Dr. S. Allen, London	X	X																X				X				X		
F.202 Dr. H.P. Dinwoodie, Edinburgh							X	X										X				X			X			
F.203 University of Dundee							X	X																	X			
F.204 Hightown Rd. Surgery, Banbury	X	X					X	X	X			X	X	X	X		X	X				X							
F.205 The University of Leeds							X				X													X					
F.206 Dr. Lishman, Pontefract																		X		X								

Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	AUDIT	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR	A4 RECORDS	FAMILY FOLDERS/RECORDING	TYPED RECORDS	FLOW SHEETS	COMPUTER-GENERATED SUMMARIES	RECORD BOOKLETS	PATIENT-HELD RECORDS	PATIENT QUESTIONNAIRES	COMPUTER ASSISTED INTERVIEWING	E-BOOK	AGE/SEX REGISTERS	FEATURE CARDS	EDGE-NOTCHED CARDS	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	GRAPHICS	CODASYL/DATA BASE	ENCOUNTER FORMS	SPECIAL INPUT DEVICES	KEY ENTRY SYSTEMS	TURN-AROUND FORMS	NOMENCLATURE	AUTOMATIC CODING	NATURAL LANGUAGE RETRIEVAL
SECTION F (cont'd.) - PRIMARY CARE																																							
F.207 Dr. M.A. Basker, Leigh-on-Sea	X								X																		X												
F.208 M.R.C. Clinical & Population Cytogenetics Unit, Western General Hospital, Edinburgh		X					X																	X				X											
F.209 The Surgery, Ferry Road, Edinburgh	X						X	X																X															

Project Reference Number and Description	FORM DESIGN	RECALL AND SCREENING	AUDIT	G.P./HOSPITAL COMMUNICATION	MASTER PATIENT INDEX	WAITING LIST MANAGEMENT	RESEARCH INFORMATION	DRUG MONITORING	MORBIDITY RECORDING	DECISION AIDS	EVALUATION	LINKAGE	POMR	A4 RECORDS	FAMILY FOLDERS/RECORDING	TYPED RECORDS	COMPUTER-GENERATED FLOW SHEETS	SUMMARIES	RECORD BOOKLETS	PATIENT-HELD RECORDS	PATIENT QUESTIONNAIRES	COMPUTER ASSISTED INTERVIEWING	E-BOOK	AGE/SEX REGISTERS	FEATURE CARDS	EDGE-NOTCHED CARDS	MISCELLANEOUS LEDGERS	COMPUTER SYSTEMS (ON-LINE, REAL-TIME)	COMPUTER SYSTEMS (BATCH)	COMPUTER SYSTEMS (MICRO)	GRAPHICS	CODASYL/DATA BASE	ENCOUNTER FORMS	SPECIAL INPUT DEVICES	KEY ENTRY SYSTEMS	TURN-AROUND FORMS	NOMENCLATURE	AUTOMATIC CODING	NATURAL LANGUAGE RETRIEVAL		
SECTION G - **AUTOMATIC PATIENT INTERVIEWING**																																									
G1.1 Automatic Patient Interviewing Southern General Hospital, Glasgow										X												X																			
G1.2 Computer Assisted Patient Interviewing in General Practice - North End Medical Centre, London.																						X								X											
G1.3 'Mickie' Computer Based Interviewing System - D.H.S.S. London.																						X																			
G1.4 Computer Assisted Interviewing in Gynaecology, University of Leeds Medical School																					X	X								X											


Project Reference Number and Description
SECTION H - COMPUTER AIDED DECISION MAKING
H1.1 Experimental Computer Assisted Decision Making - MRC Applied Psychology Unit, University of Sheffield
H1.2 Computer Aided Decision Making in the Acute Abdomen, Dyspepsia and other G.I. Disease Bayes Algorithm - St. James's Infirmary, Leeds.
H1.3 Head Injury Data Bank for Prognosis and Audit - Dept. of Neurosurgery, Southern General Hospital, Glasgow
G.P./HOSPITAL COMMUNICATION
RECALL AND SCREENING
FORM DESIGN
WAITING LIST MANAGEMENT
RESEARCH PATIENT INDEX
MASTER AUDIT
DRUG INFORMATION
MORBIDITY MONITORING
DECISION RECORDING
EVALUATION AIDS
FAMILY LINKAGE
FOLDERS/RECORDING
A4 POMR
COMPUTER-GENERATED RECORDS
TYPED FLOW SHEETS
PREADED PATIENT SUMMARIES
COMPUTER ASSISTED PATIENT QUESTIONNAIRES
AGE/SEX REGISTERS
EDGE-NOTCHED CARDS
MISCELLANEOUS (ON-LINE REAL-TIME)
COMPUTER SYSTEMS
COMPUTER SYSTEMS (BATCH)
CODASYL/DATA BASE
SPECIAL INPUT DEVICES
KEY ENTRY SYSTEMS
TURN AROUND FORMS
NATURAL LANGUAGE RETRIEVAL
AUTOMATIC CODING
NOMENCLATURE
X
X
X
X
X
X



KING'S FUND MEDICAL RECORDS PROJECT

REGIONAL INDEX OF PROJECTS

OXFORD

SOUTHWESTERN

KING'S FUND MEDICAL RECORDS PROJECT

SECTION A: HOSPITAL CLINICAL RECORDS

A. STANDARDISATION OF HOSPITAL RECORDS

The Tunbridge Report, HSC(IS)197, The "All Wales" and The Grampian Area Records

In 1961, the Standing Medical Advisory Committee of the Central Health Services Council set up a sub-committee to "consider the problem of standardisation of hospital medical records". It met eighteen times, set up sub-committees which met fourteen times, and published its report in 1965. They found that little had been written on the subject at that time but there were signs of awakening interest, including the assignment of one session of the BMA's Annual Scientific Meeting in 1963 to medical records. It is worth quoting a statement made in the first section (para 5) of their report:

> "We found that there was considerable awareness of the advantages of standardisation, but this was not sufficient to arouse any pressing demand among hospital doctors for standardisation. This apparently conservative attitude is based on the sound practical approach toward innovation inherent in the practice of medicine: if well tried methods work, any change which is not based on personal experience needs very solid evidence."

They found almost complete lack of standardisation in systems (many hospitals had separate record folders for each department), size (A4, quarto, foolscap), stationery, and storage procedures. At the same time, they were keenly aware not only of the administrative and clinical advantages of a standard record in which one always knew where to look for any given item of information, but of the lost opportunities for the epidemiological work that should be an integral part of a highly structured National Health Service. Even so, they note (para. 62) that "the production of data for processing away from the hospital should be a by product of the recording of information which was essential for the hospital's own administration. They considered, with regard both to history sheets and discharge summaries, the use of rigidly structured formats to cue doctors' behaviour, but concluded (para. 71) ".... but we decided that for flexibility in use the form should be kept as

simple as possible, and that other methods should be found of reminding the hospital doctor about the things he ought to bear in mind when completing the form."

Whilst recognising that progress would be slow and not uniform, because of the varying resources available to different hospitals, the sub-committee made firm proposals for the layouts of twelve standard forms, the order in which they should be inserted into the record, and the size of the paper (A4, 5 or 6). They considered microfilm (which they felt was too expensive) and the coming of the computer. Because of the expected slow progress toward standardisation, and of the demands and opportunities for epidemiological and operational research, and of the probability of important developments in information handling (and for that matter, clinical medicine) one of their most important recommendations (No. 29) was that a permanent body be set up "to act as a point of reference for changes in medical record keeping". In fact this body, called "The Advisory Committee on Hospital Medical Records", under the chairmanship of Sir Francis Avery Jones, was set up and has continued to perform this function.

HSC(IS)197

Nevertheless, progress was slow, and in 1975 the DHSS issued this circular, on the basis of work done by the Advisory Committee, which included the revision of several of the standard forms and opinion testing in the field (but not fully fledged feasibility studies or user trials). Great emphasis has been placed on G.P./hospital communication, and several of the forms have been redesigned to meet needs which have become apparent (e.g. a layout of G.P. referral letter which emphasises the need for information about drug therapy, and HMR300A, which reflects on the length of some waiting lists, by eliciting up to date patient information immediately before admission). However, they have assumed that general practice records will rapidly be converted to A4-size folders, and not designed for compatability with the smaller EC6/7-size envelopes. They also reflect changes in clinical practice (e.g. X-ray

request forms which elicit the dates of female patients' last period). In general, the new forms follow the older proposals in tending to be unstructured (HMR12, 13A, 13B) or very lightly structured (HMR5, 6).

What is surprising is that no mention is made of Problem Orientated Medical Records, and no offers are made of layouts for Problem Lists, Patient Background Information (other than HMR1) or Flow Sheets. The thorny problem of different departments keeping their own notes together, rather than in chronological order with those recording the patient's care in other departments is not explicitly dealt with. Yet the expansion of data input to the record, and the increasing frequency of cross referral in the twelve years since Tunbridge, would seem to make these important considerations if vital data are not to be overlooked.

The "All Wales" Record

Meanwhile, in Wales, which has only one hospital authority, a working party had been working towards standardisation since 1963. This working party accepted the recommendations of the Tunbridge Report with certain reservations. At that time, five out of seventeen hospital groups had implemented a standardised identification sheet, history sheet, TPR chart and nursing report. By 1968, 80% of non-psychiatric beds in Wales were served by these standard forms together with HMR2A and HMR300. Adoption of the numerous standard forms now available varies from 100% (HMR1W) and 97.8% (Operation Consent Form) to 33% (G.P. letter of referral) and 37% (Discharge Summary). (Some special purpose forms such as the Bladder Tumour Record, Responsibility for Funeral Arrangements, EEG report, etc. have even lower acceptance rates.) New forms are made available after a survey of all existing forms for the purpose in question, design of a "mock-up", which is circulated to relevant committees for comment, and final design in the light of comments received. The latest forms added to the wide range available include a special series for obstetrics and chest medicine, and consideration is being given to the standardisation of community nursing records. This working party became a sub-committee of the Board and said, making its final report in 1974 just prior to Reorganisation: "It does not appear that the full scope of Computerisation in Medical Records, Medical Information Services, and Record Linkage, has been

fully appreciated. There is much more to be done." In its conclusions (hoping to be taken up by the appropriate body after reorganisation) it suggested integration with the Avery Jones Committee; that the strengthening of Medical Records Departments is a medical responsibility; that further implementation of computerisation be considered; and that the study of problem orientated medical records should be continued and that the studies in hand should be evaluated.

The Grampian Area Records

Similarly, the Grampian Area Health Board, based on Aberdeen, has introduced a standardised record for all the hospitals in its area which has been phased in since 1975 and will be evaluated in 1977 by a review of the completeness of entry and a survey of user reactions. Whilst this is not envisaged as an "All Scotland" record, cognisance of it has been taken by other Area Medical Officers and by the Scottish Home and Health Department.

B. POMR AND HOSPITAL CLINICAL NOTES

Quite separately from these developments, several groups have been working on various aspects of the implementation of the problem orientated medical record in the context of British hospitals. Problem orientated records seek to bring a greater degree of order and accessibility to the clinical record and to make the doctors' and students' decision processes more open to inspection for teaching and audit. There are undoubtedly other ways to accomplish these same aims, and there are some workers who disagree profoundly on theoretical and philosophical grounds with the shift in perspective from 'diagnoses' to 'problems' which the implementation of P.O.M.R. implies. Nonetheless, it is the only system to gain any wide degree of acceptance in recent years, either in this country or abroad.

This being said, there remain relatively few units where the use of problem orientated records has become routine. There are a number of others who have experimented briefly with some aspects of the system, but since it is a unified system, the use of only some components has little chance of achieving the objectives of the

system as a whole. Even among those who do use it, there remain a number of controversies concerning matters such as the use of a 'temporary problem list', the detailed specification of the 'data base' and the degree to which the data base should be integrated with information concerning the present illness, and the degree to which various aspects of the record should be structured.

All those using problem orientated records extensively believe strongly in their value for patient care and, especially, for teaching. Proving that the quality of the record affects patient care remains difficult, but the work at Guy's Hospital (Ref. No. A4) has proved one methodology for studying aspects of this problem as well as the solid beginnings of an answer. This project also provided valuable information about the process of establishing P.O.M.R. Perhaps the most important of the early results in this latter category is that it takes considerably more effort for many students and clinicians to learn to use the system easily and efficiently than is often implied in the literature. It is certainly not sufficient to provide a simple handout and expect the doctors and students to proceed from there without further assistance or support. One of the reasons that P.O.M.R. has not spread more rapidly may well be that the enthusiasts have under-estimated the effort required to make the changes effective.

Note: For additional discussion of problem orientated medical records, see introduction to section F.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number A1

Project Title: Implementation of Problem Orientated Medical Records.

Location: Ninewells Hospital, Dundee.

For Further Information Contact: Professor J. Crooks, Department of Therapeutics and Pharmacology, Ninewells Hospital, Dundee.

Key Topics: Hospital clinical records; form design; G.P./ hospital communication; POMR.

Summary:

The Department has implemented a straightforward version of the problem orientated record in the inpatient notes. They have found it convenient to use a temporary problem list which is attached at the time a new patient is admitted and in which problems are indexed by letter rather than by number. The permanent list is typed by the Unit Secretary.

An experiment in which the follow-up notes for each problem were kept on separate sheets of paper proved unsatisfactory owing to the generation of pages which were subsequently little used.

The philosophy of the Unit is that while it is extremely important to identify all problems during a patient's stay, it is not necessary either to define or to deal with all problems during that time.

The discharge procedure is similar to that used by the Aberdeen Department of Therapeutics (Ref. A2). The prescription form for patients being discharged provides space for a problem list to be written in by the Houseman. A copy of this form is sent to the patient's general practitioner when the patient is discharged. An integrated, problem orientated discharge summary is dictated by the consultant or registrar separately.

A project is currently underway to compare the problem orientated notes in this unit with the source orientated notes in another similar unit in the hospital. The comparison will use the discharge letters to general practitioners and compare the numbers and types of problems mentioned.

Costs: Stationery. Some increment in the time required to write the notes, but the time saved in retrieving information probably compensates for this loss.

Transferability: Complete, although other users might want to make minimal changes in the stationery.

Comments:	The projects at both the Aberdeen and Dundee Departments of Therapeutics owe a great deal to the work of Professor Crooks who held a readership in Aberdeen before moving to Dundee.
Documents on File:	Instruction Handbook: "Notes on the Use of Problem Orientated Medical Records in Clinical Practice". Sample record folder.
Related Project:	Implementation of Problem Orientated Medical Records, Aberdeen (Ref.A2)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number A2

Project Title: Implementation of Problem Orientated Medical Records.

Location: Department of Therapeutics and Clinical Pharmacology, Aberdeen Royal Infirmary.

For Further Information Contact: Dr. J.C. Petrie, Department of Therapeutics and Clinical Pharmacology, University of Aberdeen, University Medical Buildings, Foresterhill, Aberdeen, AB9 2ZD.

Key Topics: Hospital clinical records; form design; G.P./hospital communication; POMR.

Summary: Problem orientated medical records have been used in the Department of Therapeutics since September, 1972 (and are an integral part of the computer-based record system developed in project reference number D2.).

In addition to structuring the notes in a problem orientated format, the Department have modified the discharge procedure so as to provide a much tighter control of both the record system and patient management as a whole. The drug order form has space for a brief problem list. At discharge, a copy of this form, made out by the houseman, is sent to the patient's G.P. to provide an immediate record for the G.P. to use if he sees the patient before the formal discharge summary arrives. (If the patient is not on medication, the drug section is blank, but the problem list is still filled in and the note sent).

The main discharge summary is dictated by the registrar or consultant and is structured and problem orientated. Because the doctor must review the entire case in order to produce the discharge summary, he rapidly learns of any deficiencies in the management of cases and is highly motivated to encourage his junior staff to structure the record so as to facilitate the formulation of the summary.

The system has now been implemented 'with varying degrees of success or failure' by most medicine wards and to a lesser extent in the Departments of Obstetrics and Gynaecology and Surgery. The structured discharge summaries have been taken up more widely than other aspects of the system and are now in use by many departments throughout the hospital. The approach to POMR has been pragmatic and low key rather than proselytising, and they have enjoyed a considerable degree of acceptance throughout the hospital.

The experiences of the Aberdeen group are described in detail in Petrie and McIntyre (1979). They stress the importance of a 'sensible' approach which does not stress form to the detriment of content and of the involvement and commitment of senior staff. The Aberdeen group is sceptical of simultaneous introduction across an entire hospital and stresses a step by step approach. They stress the educational and service benefits when the appropriate degree of supervision by senior staff is achieved.

Costs: Minimal. Discharge summaries take approximately the same amount of consultant time and secretarial time as they would by any other method (but see reductions in time since interactive input via VDU introduced. ref.D2)

Transferability: Complete, although other users might wish to make modifications to certain of the forms used.

Selected Publications:

PETRIE, J.C. et al. (1974) Awareness and Experience of General Practitioners of Selected Drug Interactions. Brit.Med.J., 2, 262-4.

BEVERIDGE, T. and PETRIE, J.C. (1972) Transfer of Information about Intake of Drugs by Patients Referred to Medical Units. Brit.Med.J., 2, 37-9.

PETRIE, J.C. & McINTYRE, N. Editors (1979) The Problem Orientated Medical Record - its use in hospitals, general practice and medical education. Churchill Livingstone, Edinburgh.

STARR, K.J., PETRIE, J.C. (1972) Drug interactions in patients on long-term oral anticoagulant and antihypertensive adrenergic neuron blocking drugs. Brit.Med.J., 4, 133-35.

PETRIE, J.C. HOWIE, J.G.R. & DURNO, D. (1975) Drug interactions in general practice - in Clinical Effects of Interaction between Drugs; PETRIE, J.C. & CLUFF, L.E. Editors. ASP Biological & Med. Press, Elsevier, Excerpta Medica, North Holland.

LOGIE, A.W., GALLOWAY, D.B., & PETRIE, J.C., (1976) Drug interactions in long-term antidiabetic therapy. Brit.J.of Clin.Pharm., 3, 1027-1032.

LINDSAY, D.C. MEREDITH, A.L., & PETRIE, J.C., (1977) An experimental data base for clinical and administrative use. Med.Com., Berlin, 735-739.

HOWIE, J.G.R., JEFFERS, T.A., MILLAR, H.R. & PETRIE, J.C. (1977) Prevention of drug interactions. Brit.J. of Clin. Pharm. 4, 611-614.

WILSON, L.A. PETRIE, J.C. DAWSON, A.A. & MARRON, A.C. (1978) The New Aberdeen Medical Record. Brit.Med.J., 2, 414-416

PETRIE, J.C. (1979) Systems Approach to Care in a General Medical Unit. Proceedings of Annual Scientific Meeting of the Faculty of Community Medicine, 21-22.

ERSKINE, Z.G., MOIR, D.C., JEFFERS, T.A. & PETRIE, J.C. (1978) An outpatient medication record. Brit.Med.J., 2, 1606-1607.

Related Projects:

Aberdeen Computer Network Project (Ref.D2)
Implementation of Problem Orientated Medical Records, Dundee (Ref.A1.)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number A3

Project Title: Implementation of Problem Orientated Medical Records in an Inpatient Department

Location: Royal Free Hospital

For Further Information Contact: Professor Neil McIntyre, The Royal Free Hospital, Medical Unit, Pond Street, Hampstead, London, NW3 2GQ.

Key Topics: Hospital clinical records; form design; POMR; audit, computerization of medical records.

Summary: Problem orientated records have been used throughout the Department of Medicine at the Royal Free Hospital for a number of years. They have designed their own structured form for collecting the original data base. This form is unusual in that it has provision for indicating the state of the information not only at the original admission, but also at four subsequent admissions. They have also designed their own stationery for the problem list. There has been limited success in introducing the problem orientated format on other firms in the hospital.

The unit places great emphasis on the problem orientated medical record as a tool for teaching and audit. Students' clinical progress is monitored by means of tutorials in which the adequacy of their records and care is judged against a set of criteria. The unit is also extremely interested in the possibilities for developing a computer based record which the structured nature of the problem orientated medical record allows (e.g. PROMIS being developed by L. Weed et al. at the University of Vermont, U.S.A.).

Problem orientated records are now also being used in several other departments and an integrated problem list is in use.

The problem orientated record and the 'in course assessment of clinical performance' using an audit of the students' records is an integral part of the new curriculum begun in 1976-1977.

The hospital has voted in favour of trying to implement Weeds computer based PROMIS system and funds to support this work are being sought.

Evaluation: The entire new curriculum has been the subject of an extensive evaluation by a team based at the Royal Free Hospital itself. In addition, a completely outside group from the University

of Surrey conducted a preliminary evaluation of the 'in course assessment' procedure prior to its introduction in 1976. These reports suggest a general concensus among those students and staff who actually take the time for the audit sessions that they are very useful for teaching. There are, however, serious difficulties in finding the time for the sessions within the clinical curriculum. There are also doubts about their appropriateness and validity as means of assessment, especially given the variation among firms and auditors. It is evident from the reports that POMR has still not become standard use in many areas of the hospital, especially the sub-specialities, and that the conflict between the two systems of note keeping continues to present problems.

Costs: Stationery, and some increment in the time required to write the records, but the time saved in tracing information probably compensates for this loss.

Transferability: Complete, although other users might want to make minimal changes in some of the stationery.

Comments: This unit is one of the leaders in the efforts to extend the use of the problem orientated medical record.

Documents on File: Complete set of records.

Selected Publications:

McINTYRE, N. (1973) The problem orientated medical record. Brit. Med. J., 2, (866), 598-600.

McINTYRE, N. et al. (1976) The problem orientated medical record and its educational implications. ASME Medical Education Booklet, No. 6. Suppl. to Med. Educ., 10, (2)

PETRIE, J.C. and McINTYRE, N. (Eds.) "The Problem Orientated Medical Record. Its use in hospitals, general practice and medical education." 1979.

McINTYRE, N. (1980) Educational Instruments: Medical Record Review Form. Med.Teacher., 2. No. 1. 40-43.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number A4

Project Title: Development and application of methods for measuring the quality of hospital care from data in medical records.

Location: University of London, Guy's Hospital.

For Further Information Contact: Professor I.McColl, Department of Surgery, Guy's Hospital, London Bridge, SE1 9RT.; Dr. L. Carol Fernow, Project Director; Ms. Susan Thurlow, Project Manager.

Key Topics: Hospital clinical records; form design; evaluation; POMR; audit.

Summary:

The primary work of this group is in developing methods for evaluating medical care using information routinely available from the hospital records. A second area studied has been the extent and quality of the house staff's use of problem orientated medical records.

The first study examined the question: Did the use of POMR at Guy's improve the process of hospital care? (See Fernow, 1978 on "The effect ...") Data were collected on seven different medical and surgical diseases which occur frequently. Two comparable hospitals which did not use POMR served as controls. The analysis used a regression model which attempted to control for the most important sources of inter-patient variation. While the purpose of this study was to test the POMR hypothesis, the techniques used could be readily applied to identifying other analyses of the variations between firms.

The second study analysed the length of hospital stay for patients with four diseases to determine what factors were significantly associated with stay for each disease. (See Fernow, 1978, "Firm, Patient and Process Variables ...") In addition to patient risk and firm affect, variables measuring such influences as infection and severity of operations and other invasive procedures were introduced into the regression model.

Work has begun on the third study in this series which is to develop, validate, and apply a method to measure the outcome of a stay in hospital. The objective outcome scores for each disease will be compared to independent subjective assessments of outcome by clinicians. The correlation between these assessments and the objective measurements are exceedingly high for the first disease in this series. The scores will be adjusted upward by the patient risks associated with lower outcome when outcome is the dependent variable.

Some of the information obtained in these studies is being provided to the clinicians concerned in the form of a "Clinical Information Service" which, it is hoped will stimulate policy changes.

The other area studied by this project was an evaluation of how well members of the house staff learned to use the POMR format and what effect feedback sessions had on their record keeping. (See Fernow, 1977.) It was seen that learning to use POMR was more difficult than is sometimes supposed. Records are randomly selected and scored according to a standard set of criteria for adherence to the POMR format (not for medical content). This information is presented, in strict confidence, to the doctor concerned. Guy's Hospital, recognising that support and feedback are necessary if most doctors are to learn to use the system, has appointed a full-time medical records clerk to continue this work.

Costs:

Clerical time: 3 full-time equivalents.
Professional time: 1 full-time plus support from other members of the staff.
Consulting and computing: Approximately equivalent to the yearly salary of an experienced research fellow.

Transferability:

The Project staff hope that the techniques for evaluation based on data extracted from the records will be widely applicable within the Health Service. Variations of these techniques have been successfully used elsewhere; however, it would be premature at this time to attempt to transfer the system in its entirety.

Comments:

The project is important in several respects. It has shown that new information about the process of hospital care and the factors which are associated with that care can be obtained from basic data from medical records. The most promising feature of this work is its potential application to large scale audit. The use of many patient variables to adjust scoring for factors beyond clinical control is an important innovation. Techniques of this type will be necessary if a system of large scale audit is to be widely accepted by the medical profession.

This project has also demonstrated that clerical personnel, properly trained and supervised, extract clinical data from medical records with a high degree of accuracy. Reviews of coding over a four year period have shown error rates of less than one percent.

Other projects might also benefit from the experience of using an external consulting firm for statistical help and data processing. It has given high quality advice and prompt service at a reasonable cost.

Documents on File: Protocols for studies; sample forms on which data are recorded; detailed coding instructions; specifications to SCICON; computer file layouts.

Selected Publications:

McCOLL, I. et al. (1976) Communication as a method of medical audit. Lancet, I, (7973), 1341-4.

FERNOW, L.C. et al. (1977) An analysis of problem oriented medical records (POMR) by medical and surgical house officers: factors affecting use of this format in a teaching hospital. Medical Educ. 11, (5) 341-6.

FERNOW, L.C. et al. (1978) The effect of problem-oriented medical records on clinical management controlled for patient risks. Med.Care, 16, (6) 476-87.

FERNOW, L.C. et al. (1978) Firm, patient, and process variables associated with length of stay in four diseases. Brit.Med.J., 1, 527-596.

FERNOW, L.C. et al. (1978) The state of British medicine -11 Medical audit. Journal of the Royal Society of Medicine, 71, 787-790.

FERNOW, L.C. et al. Predicting right stay for myocardial infarction, gallstones, and unilateral inguinal hernia at teaching hospitals. (Publication pending)

RENDALL, M. (1975) Problems of Implementation of the problem orientated medical record. Acta.Clin.Belg. 30. (5) 369-74.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number A5.

Project Title: Modified Problem Orientated Records in a Hospital Setting

Location: University of Newcastle on Tyne

For Further Information Contact: Professor D.N.S. Kerr, Department of Medicine, The Royal Victoria Infirmary, Newcastle upon Tyne, NE1 4LP.

Key Topics: Record format; POMR; G.P./Hospital communication.

Summary:

The Department of Medicine at Newcastle has implemented a modified form of the Problem Orientated Medical Record over the past several years. The effort has centred on providing a useful summary/problem card for use on the continuing care of the patient in the outpatient department. For this purpose the problem list created during the patient's inpatient stay is rewritten and typed on a special card. With each problem is enough detail to make it unnecessary to search the notes at every visit. Some experience is needed to judge how much information should be put in, but every effort is made to see that the list remains a crisp and readable summary which an S.H.O. can digest quickly.

Flow sheets are also used, the information being transferred from the laboratory reports to the flow sheets by the doctors themselves. For some values, graphical representations are kept, but the effort to do so on the part of the doctors has limited their use.

No attempt has been made to introduce the 'SOAP' format for the continuation notes.

A 2 spike, four section folder has been made standard throughout the hospital.

The group feels that the system has been successful and it is well liked both by junior staff and by the consultants. Although it is official policy throughout the hospital, however, it is only kept properly up to date by the originating department.

Costs: Several hours per week of consultant time is involved in going over the notes. There is probably also additional secretarial time. On the other hand, considerable time is saved during the clinic sessions themselves.

Comments: One of several compromise solutions which attempts to find a middle ground between the full POMR which meets with intense resistance in some quarters and the traditional case notes with their many shortcomings.

Documents on File:

KERR, D.N.S.,(1980) POMR and the Curate's Egg Update, (June) 1569-1576.

Selected Publications:

RENDALL, M. (1979) POMR - The case in Favour. Medical Teacher, 1, 147-150.
SIMPSON, M.A. (1979) The Problem with POMR. Medical Teacher, 1, 195-196.

KING'S FUND MEDICAL RECORDS PROJECT

HOSPITAL CLINICAL RECORDS IN BRIEF

Reference Number: A.101

Project Title: Problem Orientated Medical Records in a Department of Medicine

Location: Department of Medicine, Bristol Royal Infirmary, Marlborough Street, Bristol BS2 8HW.

For Further Information Contact: Professor Read

Some effort has been made by the Department of Medicine at the Bristol Royal Infirmary to institute basic problem orientated medical records. Problem sheets are inserted in all patients' records and the house staff have been encouraged to use the system. However, so far its application is far from universal. It has not spread beyond the Department of Medicine to other Departments in the hospital.

Reference Number: A.102

Project Title: Simple Problem Orientated Medical Records

Location: Airedale General Hospital, Steeton, Keighley, Yorks. BD20 6TD.

For Further Information Contact: Mr. J. Wood, District Medical Records Officer

Problem orientated records have been instituted at this small general hospital using a simple problem sheet. They have been enthusiastically received by many of the consultants, but no formal evaluation has been performed.

Reference Number: A.103

Project Title: Problem Orientated Medical Records

Location: Nevill Hall Hospital, Abergavenny, Mon.

For Further Information Contact: Mr. A.R. Isaac, FRCS, Consultant Surgeon

Over the course of the last ten years a Standardised Record has been established in Wales. There are over 80 standardised forms and the majority are used throughout the principality but the usage is not complete. A significant saving in cost has been demonstrated. This saving is most evident at Area level as the printing costs are born at Regional level.

Reference Number: A.104

Project Title:	'Episode Summary' System
Location:	Royal Hallamshire Hospital, Glossop Road, Sheffield, S10 2JF.
For Further Information Contact:	Mr. Stubbs, Royal Hallamshire Hospital.

This hospital has instituted a system whereby copies of the 'episode summary' are kept separately from the main record of the patient to serve as a secondary reference when the primary notes are unavailable. The summaries are intended to be the only patient records retained for those visits more than the statutory seven years in the past. The summaries are dictated by the registrar or consultant as a structured letter to the patient's general practitioner.

Reference Number: A.105

Project Title:	The Introduction of POMR in the Specialities of Geriatrics and Paediatrics.
Location:	South Glamorgan Health Authority (Teaching)
For Further Information Contact:	C. Rees, Head of Research & Intelligence, Area Management Services Divn.,South Glamorgan Health Authority (Teaching), 5-7 Museum Place, Cardiff. CF1 3PJ.

An attempt was made to introduce problem orientated medical records in the Department of Paediatrics and Geriatrics. The new stationery introduced consisted of a standard problem list, a data base, a sheet for initial problems and plans, a progress notes sheet, a flow sheet (for investigation results) and a problem orientated discharge summary. Although certain parts of the system survive, neither speciality can be said to have adopted it as originally conceived.

Reference Number: A.106

Project Title:	Design of New Record Forms
Location:	The Royal Sussex County Hospital
For Further Information Contact:	Miss F.E. Stevens, District Medical Records Officer, The Royal Sussex County Hospital, Brighton, BN2 5BE.

Following considerable work by the East Sussex A.H.A. (Brighton District) combined prescription and drug administration forms are gradually being introduced throughout the District and are proving acceptable to users.

KING'S FUND MEDICAL RECORDS PROJECT

SECTION B: HOSPITAL SPECIALITY SYSTEMS

Introduction

A number of hospital specialities present opportunities for testing and developing techniques in medical information. The range of problems can often be defined in advance. The ways in which the system must interact with other aspects of the hospital or health service can be limited, and the total numbers of both doctors and patients involved kept relatively modest.

Obstetric care, for example, is particularly amenable to a structured record, because the vast majority of cases are entirely straightforward, and the number of complications and the points in care at which they may occur are well defined. Several centres, including St. Thomas' Hospital, the John Radcliffe Hospital in Oxford, the Aberdeen Royal Infirmary and the Queen Elizabeth Hospital have completely replaced the standard case notes by a structured record booklet which is also used as the input document for an automated retrieval system.

There are two ways in which patients may benefit directly from such a system. The first is that the information is more immediately accessible to the doctor and collected more accurately than would often be the case. The second is that it may be possible to use the computer to aid with scheduling follow up, to summarise the information collected, or to provide warnings for particular conditions.

Most workers have found that the quality of the information is much higher if all those involved in collecting it are also involved in its use. If the data is only to be used in the form of statistical summaries by a small portion of the staff who actually collect it, the data tends to be of lower quality than if everyone concerned also uses the data in their day to day patient care. On the other hand, systems which are depended upon for patient care are more complex and expensive, in general, than those for research purposes alone.

If, as in the obstetric systems, the aim is only to improve the organisation and structure of the information and to gather data for administration and research, then the data may be entered at any time after the patient is seen. If, however, the aim is for the information system to contribute directly to patient care, it will usually be necessary for the data to be processed between one patient visit and the next. In most out-patient systems this means a total time for data preparation and processing of between a few days and one week, and in in-patient systems of about 24 hours. Examples of such systems are the hypertension clinic projects at Glasgow (Ref.No. B6.3) and the M.R.C. Clinical Research Unit (Ref.No. B2.1), the glaucoma project (Ref.No. B6.8) and the diabetes project under development at St. Thomas's (Ref.No. B4.1).

There is a second issue which divides these projects and which is almost parallel to the distinctions drawn above. A system may be designed selecting only those items of information which it is known in advance will be useful or required for the studies contemplated (Ref. Canniesburn Plastic Surgery B6.12), or it may collect as much information as possible in the hope of answering questions whose importance could not be predicted in advance.

In systems where the information is collected as a by-product of the preparation of the records, or in which there is a large degree of interaction of the system with the doctors delivering care, it may be argued that the best method is to collect all information using a unified procedure rather than to make a prior selection. Examples of projects based on this philosophy include the hypertension clinics at Glasgow (Ref.No. B6.3) and those connected with the M.R.C. Research Unit (Coles and Bulpitt, et al. Ref.No. B2.1). If the system requires the user to make out documents or forms in addition to those normally used in patient care, selecting the minimum information necessary is almost always to be preferred. Doctors are unlikely to complete exhaustive, additional forms accurately or completely.

Indeed, for precise clinical research it is extremely difficult to gather data routinely in a sufficiently controlled manner for adequate studies to be conducted retrospectively, regardless of

the information system used. These information systems serve primarily as aids in the preliminary testing, hypothesis generation and as convenient vehicles to facilitate the data processing for separately designed prospective studies.

Even the most limited of these data collection exercises can put a considerable strain on the resources of a Regional or especially a University computer centre. These centres are usually geared to entirely different types of work and may be poorly adapted to the needs of clinical applications. Likewise, medical data is usually very heterogeneous and the data collection is often much poorer in quality than would be the case in most commercial organisations. Consequently it is not uncommon for systems analysts and programmers accustomed to a commercial environment to underestimate the extent of the adaptations which are necessary in the medical setting. Even among the maternity systems, perhaps the simplest area in medical information handling, there have been serious problems related to these difficulties. Anyone contemplating the development or implementation of such a system should give very careful consideration to the degree of commitment and expertise which can be realistically expected to be available.

Microprocessors and on-line data collection are just now in 1980 beginning to effect these considerations. It is to be hoped that by bringing the computer closer to the user they will help overcome these difficulties. It is becoming much more feasible to collect data for patient care and secondary use simultaneously, at source, without intermediate special documents, coding forms, etc. Most of the time-consuming correction of simple errors can be eliminated by immediate vetting of the data. Multiple forms containing essentially the same information can be produced automatically or eliminated altogether. However, unless packaged programs of a much higher general utility than are now available are developed, the problem of technical support will remain extremely important.

This section of the gazetteer also contains most of the projects in which an attempt has been made either to store information in the form of free text, or to code data automatically from free text entries. Manual coding of medical diagnoses and procedures for entry into data systems is an arduous and often unrewarding task which has been known for many years to be subject to a large degree of error (Howell, 1971). Automatic encoding is potentially an extremely attractive proposition. Storing data as free text avoids the necessity of coding altogether and retains the full richness of the original phraseology. Unfortunately, this is achieved only at the cost of increasing both the total amount of storage required and the difficulty of analysing the data. The opportunity to build checks on the internal consistency of the data into the system is also very much reduced.

A number of automatic encoding systems are in routine use. Specialised systems exist in histopathology (Ref. No. B6.2) and hypertension (Ref. B6.3). The Oxford Record Linkage Study (Ref. No. E1.1) has developed the ORLCODE system (Ref. B6.17) for routine use with H.A.A. data and several of the larger projects use some form of automatic coding for at least part of their data. On-line auto-encoding as a means of intelligent data capture is used by the Royal Marsden System (Ref. B6.19) and the Nottingham General Practice Information Project (Ref. F2.25). The extent to which their importance increases in medical applications will depend on improvements in technique. However, with the increasing difficulty of recruiting hospital ancillary personnel and falling computing costs, it seems likely that automatic coding schemes will play a much more important role in future systems than they have in the past.

This is one of the sections of the Gazetteer in which it has been most difficult to decide which projects fall within the brief "Innovations in Medical Records". There are endless projects in which specialised research data in a particular area is collected with no impact on the medical record itself. We have attempted to choose those which either have some particular technical point of interest or in which there is indeed a direct effect on medical record keeping. However, in many cases the choices have, of necessity, been arbitrary. One area upon which we have not touched is anaesthetic records, as we consider that this subject has already been adequately covered by Seed and Welsh (1976). Readers with a specific interest in this field should refer to volume 31, issue 9 of "Anaesthesia". Finally, the explosion of microprocessor based applications which are entirely internally funded and maintain a relatively 'low profile' makes any claim to have produced an exhaustive catalogue unrealistic.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B1.1

Project Title:	Computerised Obstetric Records System
Location:	St. Thomas' Hospital, London,
For Further Information Contact:	Professor R.W. Taylor or Miss Janet Naldrett, Department of Obstetrics, St. Thomas' Hospital, London, SE1 7EH.
Key Topics:	Hospital speciality systems; form design; research information; record booklets; computer systems (batch).
Summary:	This project aims to provide a standard data base of well-defined, consistently collected information on each pregnancy managed in the Obstetrics Unit at St. Thomas'. The traditional case notes have been replaced by a structured record booklet. All information on the pregnancy, confinement and postpartum period is recorded along with a limited amount of information on the status of the child. No linkage between different pregnancies of the same woman is provided. The prime aim is to capture data for research, but the staff feel that the more complete data is also of help in managing the individual patient. A computer system for storing and retrieving the data was used for some time but abandoned because of the high cost relative to the return. A method of manual extraction of specialised research data has now been devised.
Costs:	Staff: 1 programmer/research assistant; 1 coding clerk; ½ nurse-midwife to help with coding and administration; occasional medical help. Computer time: very modest.
Transferability:	The data collection booklet seems to work well in practice and attempts are being made to introduce a modified version of the system throughout the South East Thames Region.
Comments:	This project has become an integral part of the standard operating procedure for the Department and is sufficiently trusted to have contributed to changes in departmental policy.
Documents on File:	Sample record booklet; sample output; Annual Report for 1973 (Annual Report for 1974/75 in course of preparation); internal documents; "The use of epidural anaesthesia", J. South, 1971; "The use of anaesthesia", J. South, 1971; "Investigation of anaemia", J. South & J. Naldrett, 1971.

Selected Publications:

SOUTH, J. & RHODES, P. (1971) Computer service for obstetric records. Brit.Med.J., 4, (778), 32-5.

SOUTH, J. (1972) A computer summary used as a discharge letter. J.Roy.Coll.G.P., 22, 28.

SOUTH, J. & NALDRETT, J. (1973) The effect of vaginal bleeding in early pregnancy on the infant born after the 28th week of pregnancy. J.Obs.Gynaeo.Brit.Com., 80, 236-41.

HAERI, A.D., SOUTH, J. & NALDRETT, J. (1974) A scoring system for identifying pregnant patients with a high risk of perinatal mortality. J.Obs.Gynaec.Brit.Com., 81, 535-8.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B1.2

Project Title: The Aberdeen Maternity Register

Location: M.R.C. Medical Sociology Unit, Aberdeen

For Further Information Contact: Michael L. Samphier, Institute of Medical Sociology, Westburn Road, Aberdeen, AB9 2ZE.

Key Topics: Hospital speciality systems; research information; linkage; record booklets; computer systems (batch); codasyl/data base; key entry systems, automatic encoding.

Summary: The Aberdeen Maternity Register has operated since the early 1950's. It was conceived as a vehicle for traditional epidemiological research on a stable, defined population. In the present version data is collected in a record booklet which provides the primary medical record for ante-natal care and confinement. From these, data is extracted to punching documents and keyed directly to magnetic tape. There are online editing and validating facilities. Originally, data processing used Cope-Chat edge punched cards.

The project has recently undergone extensive reorganisation to take into account the broader focus of recent obstetric research which includes the entire obstetric history of the woman (and perhaps her mother and daughters) rather than merely the current pregnancy. Changes are continuing to be introduced in the light of the changes in population which have accompanied the North Sea oil boom. The aim is to have a linked file of all women who have given birth in the Aberdeen Metropolitan Area since 1949. For a substantial portion, two and three generation family records will be available. Linkage with other obstetric related events in the hospital (sterilization, G.U. tumors, etc.) is also in progress. The records of the outlying hospitals are being searched and extracted in order to complete the register historically.

The computer programmes were originally designed for the University's System-4 in a traditional 'file and record' manner. With the reorganisation of the register and the arrival of a new Honeywell 66/68 machine at the University the register has been converted to a 'totally inverted file'. This structure consists of a series of lists of the patients who are positive for each attribute rather than a series of lists of attributes, positive and negative, for each

patient. Since only positives are recorded, this structure is more compact than the traditional one. Retrieval of cohorts of patients should be very rapid as it will normally be necessary to examine only the relevant cases. Correspondingly, the retrieval of the complete record for a single patient will require much more time, but this is rarely necessary as this is primarily a research application.

Coding of diagnoses and occupations is now largely automated, although the rapid development of new oil-related job descriptions in the Aberdeen area presents a problem. The coding system uses a straightforward exact match type algorithm.

An extensive set of validation routines have been developed for testing the plausibility of the data entered. The group now have sufficient confidence in these methods that manual verification of data entry has been discontinued.

The system now provides routine data for Hospital Activity Analysis use. A real time patient index has been constructed and used for record linkage.

Costs: 1 full-time programmer plus some systems analysis time (much of this is for development). 6 full-time equivalents for data preparation for 5,000 births per annum.
Computer time: moderate use in batch mode with quite extensive use of random access files. The project purchased its own disc drive as none were available through the Computing Centre. Real time work amounts to 20 hours of connect time per week.

Transferability: Record booklets: The basic record booklet is very well thought out. It is at present under test as a prototype for the Scottish maternity case records under the auspices of the Scottish Home and Health Department.

Computer techniques: Details of the reorganised file structures and the accompanying programme suite will have to await the arrival of the new computer. How dependent they will be on the special characteristics of this machine cannot be predicted at this time.

Comments: This project is of interest in several areas. The record booklet is well accepted and proven although still undergoing minor adaptations. The data covers an exceptionally long time span and a well-defined population.

If the new file structures are successful, they will provide a valuable alternative to both traditional file and record organisations and to 'data base' organisation on the Codasyl model. The good results of collaboration with the University Computing Centre should also be noted. They have received sufficient service and support for a very extensive data handling exercise. This is probably due both to the interests of the Centre at Aberdeen and the fact that the Register has been able to generate money for considerable hardware.

Documents on File: Outline paper describing the data bank; copy of current maternity case notes; copy of transcription sheet used for extracting research data; coding manual.

Selected Publications:

SAMPHIER, M.L. (1975) A Method of Translating Binary Punched Hollerith Cards to Computer Data Files. Int.J.Biomed.Comput., 6, (1), 61-3.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B1.3

Project Title:	The Oxford Obstetric Data System
Location:	The John Radcliffe Hospital, Headington, Oxford and the Oxford Medical Computer Centre, Old Road, Headington, Oxford.
For Further Information Contact:	C.W.G. Redman, Department of Obstetrics and Gynaecology, The John Radcliffe Hospital; J.Evans, Oxford Regional Health Authority, Old Road, Headington, Oxford.
Key Topics:	Hospital speciality systems; research information; record booklets; computer systems (batch)
Summary:	This project aims to capture extensive data concerning the pregnancy and delivery of all patients delivered at the John Radcliffe Hospital in Oxford. The traditional case notes are completely replaced by a special data booklet which provides a structured case note for the prenatal care, confinement, delivery and immediate postnatal checks for both the mother and child. Data is to be used for both research and administrative purposes.
Costs:	Staff: two full-time equivalent coding staff for data collection. Computer time: modest.
Transferability:	The computer package is written in Cobol, and should be reasonably adaptable to other machines. The data collection documents should not be specific to this unit.
Comments:	The entire system is being rewritten during 1980 in standard Cobol. The data base is being simplified and adapted to incorporate new developments in obstetrics. Data validation is being considerably extended. The new system will incorporate the option of developing on-line data input with validations and corrections being made in real time. Outputs will continue to include statistical tabulations and responses to ad hoc enquiries.
Related Projects:	Oxford Record Linkage Study (Ref. E1.1); Oxford Geriatrics Medical Computer Project (Ref. E.104)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B1.4

Project Title: Computerised Obstetric Records System

Location: University of London Institute of Obstetrics and Gynaecology, Hammersmith Hospital, Du Cane Road, London, W12 OHS.

For Further Information Contact: Dr. W.G. MacGregor and Dr. D.F. Hawkins, Institute of Obstetrics and Gynaecology.

Key Topics: Hospital speciality systems; research information; record booklets; computer systems (batch).

Summary: This computerised obstetric records system was originally conceived to replace the manual obstetric summary information book recommended by the Royal College of Obstetricians. It will produce monthly summaries of the department's obstetric work, building into an annual report. It was also hoped to provide a useful data bank for research.

The basic system uses a record collection sheet which forms the complete record for antenatal care and delivery. Information is keypunched onto standard 80-column cards and the programs written in Fortran, are run on the University of London CDC computer.

Costs: Personnel: 1 half-time data collection/keypunch operator.
Computer: Minimal.

Comments: Difficulties with funding have slowed progress. The routine reporting function will be implemented shortly, with the help of the Royal Postgraduate Medical School computer centre. A review to assess the research potential of the system is planned.

Documents on File: Record collection booklet.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B1.5

Project Title: The London Hospital Maternity Register

Location: The John Ellicott Centre

For Further Information Contact: Mr. A. Cundy, Management Services Division, North East Thames R.H.A., c/o. The John Ellicott Centre, The London Hospital, London, E1.

Key Topics: Hospital speciality systems; G.P./hospital communication; research information; computer systems (batch); computer-generated summaries.

Summary: This maternity and neonatal information system is aimed primarily at gathering data for research purposes, but a summary of each case is produced at the time of discharge which is sent to the general practitioner. Data is collected on a fairly simple form which is placed in the centre of the regular case notes but in no way replaces them. Regular statistical summaries of the information are produced, and facilities exist for the ad hoc retrieval of information for research purposes. Recall in facilities for RH. incompatible births are also provided.

The system is written in Cobol for the Univac 418/III and runs in batch mode alongside the London Hospital Computer Project (see Ref.No.D3)

Costs: The direct on-site costs are estimated at about £400 per annum for a few hours of data preparation and clerical work per week. No additional coding costs have been incurred. They have had estimates for having the computer processing done privately for about £3,000 per annum for 2,500 patients. If adequate service on a regional or other shared facility could be assured, the total computer use would be modest.

Transferability: The forms are reasonably general, although others might change details. The system is written in Cobol, but does make use of some of the Univac systems software. It is reported to be reasonably well documented.

Comments: The system has been used for the review of departmental practice since January 1974 and has played a part in the change of some policies.

Selected Publications: TUCK, C.S. et al (1976) The use of a computer in an Obstetric Department. Brit.J.Obst.Gynaeoc.,83, (2), 97-104.

Related Projects: The London Hospital Experimental Computer Project (Ref. No. D3)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B1.6

Project Title: Birmingham Maternity Hospital Project

Location: Queen Elizabeth Medical Centre, Birmingham

For Further Information Contact: P.M. Hills, Director of Computing; Mr. Nicholson or Dr. Insley, Maternity Hospital, Q.E.M.C., Edgbaston, Birmingham, B15 2TH.

Key Topics: Hospital Speciality systems; research information computer systems (real-time and batch); record booklet.

Summary: Since October, 1977 a new patient administration system using the Q.E.M.C. real-time mode of working has been in use, replacing a punched card system, which had been operational since 1968. Patient's registration details are recorded in the computer at first attendance and all admissions, ward transfers, deliveries, admissions to Special Care Baby Unit, and discharges are recorded as they occur. Lists of current in-patients admissions, discharges and ward bed states are produced daily. Notification of births to the Local Authority are produced by the computer. The routine hospital activity statistics are produced automatically as required.

There is a structure to the case notes which encourages medical staff to record information or events as they occur, although a final review of the case notes is made before coding begins. The items which are to be recorded in the computer are transferred from the case notes to a punching document. In the computer the medical and administration summaries are combined as the final permanent archive record.

A formal yearly report is produced annually from this information and a large number of ad hoc requests for data for research and management purposes are serviced. The retrieval service is provided in batch mode.

Costs: It is impossible to estimate the cost to the Birmingham Maternity Hospital of a real time patient administration system since this is part of the complex computing services provided at the Q.E.M.C. The recording of some 130 items for the medical summary requires some medical time but the clerical effort is about the same as for other Obstetric Hospital Activity Analysis systems, since the patient details are already recorded.

Transferability: The concepts and design techniques are obviously transferable. The programmes are written in Univac 418 and are specific to this environment.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B1.7

Project Title:	Scottish Unified Neonatal Record System (SMR11)
Location:	Scottish Home & Health Department
For Further Information Contact:	Dr. John Clarke, Common Services Agency, Trinity Park House, Trinity Road, Edinburgh
Key Topics:	Record Linkage; Computer Systems (batch)
Summary:	The Scottish SMR11 is a combined case sheet and computer entry document which has now been adopted by the Scottish Home and Health Department for use throughout the country. Two forms of the document are in use - one quite basic, the other much more detailed. There are two forms of the document. The first is a combined computer input and case record folder which provides for detailed information to be recorded routines, beginning either in the delivery ward or the antenatal clinic. The second is a much more basic document designed to be used as a take-off document on which a clerk can enter the data following baby's discharge from the maternity unit. The system provides for both long term research data and immediate data similar to that from H.A.A. and maternity H.A.A. for use in planning and development. It is reported to be well received and in use for 80% of all births in Scotland in 1979.
Costs:	The document does require some added secretarial time to complete. Computer processing costs are modest, but difficult to quantify.
Documents on File:	The Woodside System: Pre-School Developmental Screening - Description of Tests; Greater Glasgow Health Board: Child Health Record; Shetland Health Board - Woodside System Child Health Record.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B2.1

Project Title: D.H.S.S. Hypertension Care Computing Project

Locations: Oxford, Harrow, Hammersmith, Dulwich, Birmingham, Aberdeen.

For Further Information Contact: Dr. E.C. Coles, Northwick Park Hospital, Harrow, Middlesex; C.J. Bulpitt, Hammersmith Hospital; Professor C.T. Dollery, Hammersmith Hospital; Dr. A.D. Munro-Faure, King's College Hospital.

Key Topics: Hospital speciality systems; form design; recall and screening; G.P./hospital communication; research information; computer-generated summaries; patient questionnaires; computer systems (batch); automatic coding; turn-around forms.

Summary:

This computer-based medical record system aims to improve the care of individual patients with hypertension and to aid research into their long term management.

Patient information is collected by a self-administered patient questionnaire and on an extensive pre-structured form at the initial interview in the outpatient department. This information is entered onto the computer. Originally, a specially tailored follow-up form was produced by the computer for the following visit. However, this was found to be cumbersome and has been discontinued. A standard follow-up visit form is now used. A case summary is produced by the computer which forms the primary document in the medical record. For several of the sites at which the system is used, a letter to the general practitioner is produced.

Although the original data booklet was very extensive, it has now been markedly reduced in scope and complexity. Many of the items from it have been transferred to a questionnaire which is completed by the patient prior to arrival in the clinic.

All diagnoses, symptoms, drug names and names of investigations entered, are coded automatically by the system on the basis of an exact character by character match with the dictionary of phrases used previously. Potential new diagnostic and other phrases are considered by a medical committee, and a decision is made as to whether or not they should be included in the system. Some standardisa- of terminology is required to limit the number of synonyms produced, but the clinicians involved do not find this particularly onerous.

The system is also being used by a number of general practitioners.

Costs: A number of papers have been published concerning effort and resources required to operate the system. Because it has recently been revised, accurate estimates of the current system are unavailable. The bulk of the original document for the initial visit made it expensive both to print and to process.

Transferability: The current computer programs are written almost entirely in Assembly language for the ICL 1900 series computers, and it would require considerable effort to transfer them to another machine. However, the group is applying for funds to rewrite the system in a high level language.

The system uses an elaborate but well reasoned file structure for holding the records which should be of interest to anyone attempting any processing of medical information.

The automatic coding system is relatively straightforward and should provide valuable experience for others in this area.

Documents on File: All protocols and questionnaires; initial input forms; follow-up forms.

Selected Publications:

BEILIN, L.J. et al. (1973) Computer-based hypertension clinic records: a collaboration study. Proc.Roy.Soc.Med., 66, (10),1011-2.

BEILIN, L.J. et al. (1974) Computer-based hypertension clinic records: a co-operative study. Brit.Med.J., 2, 212-6.

BEILIN, L.J. et al. (1980) Long-term antihypertensive drug treatment and blood pressure control in three hospital hypertension clinics. Brit.Heart J., 43, 74-79.

BULPITT, C.J. et al. (1974) A symptom questionnaire for hypertensive patients. J.Chron.Dis., 27, (6) 309-23.

BULPITT, C.J. et al. (1976) Randomised controlled trial of computer-held records in hypertensive patients. Brit.Med.J., 1, 677-9.

BULPITT, C.J. et al. (1979) Risk factors for death in treated hypertensive patients: report from the D.H.S.S. hypertension care computing project. Lancet, 2, 134-137.

COLES, E.C. et al. (1973) Computer-based records in the clinic (a) Proc.Roy.Soc.Lond.(Biol.), 184. (77) 387-97.

COLES, E.C. et al (1976) An approach to computer processing of clinical data. Computer J., 19, (2) 104-109.

DOLLERY, C.T. et al. (1977) Initial care of hypertensive patients. Influence of different types of clinical records. Brit.Heart J., 39, (2) 181-5.

MUNRO-FAURE, A.D. et al. (1979) Comparison of black and white patients attending hypertension clinics in England. Brit.Med.J., 1, 1044-1047.

Related Projects: KODIAC Automatic Coding System (Ref. B6.1): Automatic Coding for Histopathology (Ref. B6.2).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B2.2

Project Title: Problem Orientated Management of Patients

Location: Health Services Research Centre, University of Birmingham Medical School, Birmingham. B15 2TJ.

For Further Information Contact: Dr. C. Rhys Hearn, Health Services Research Centre.

Key Topics: Hospital speciality systems; recall and screening; G.P./hospital communication; research information; decision aids; POMR; computer systems (on-line)

Summary:

This project aims to provide a format within which clinicians can specify in detail their protocols for managing various conditions. Hypertension was chosen for the initial trial because it is relatively well-defined and common.

Data on each patient is entered in response to questions presented by the system at a computer terminal. The person developing the protocol specifies the questions to be asked and the response which the system is to make to each possible answer. The result is a set of "branching logic algorithms" for the care of patients with the given condition. Once the system is developed for a particular problem, the computer will guide the clinician through it for each new patient. The treatments and disposition of the patient is expected to be fully defined by the system.

The implementers see the system being used for two purposes: 1) to standardise the care of patients in a particular unit, both to improve medical care and to provide a framework for research and 2) as a 'consulting service' whereby the expertise of one group of specialists might be made available to clinicians at outlying hospitals or to General Practitioners. The system will be implemented in MUMPS.

The system has been implemented and used for 2 years in an outpatient clinic for patients with hypertension. A one-year evaluation has been completed.

Costs:

Medical: No additional time required over previous management clinic.
Clerical: ½ day per week.
Computer: The system runs on a PDP-11 computer under MUMPS. This facility is shared among a number of users.
Developmental: 2 man years +

Transferability: The system will be implemented in MUMPS II, but is soon to be rewritten in standard MUMPS.

Because all of the algorithms themselves will be implemented using a common 'table driven' set of routines, it would only be necessary to convert these routines once if the system were to be made to run on another machine, regardless of the number of clinical algorithms implemented.

Comments: The speed of the terminal displays at which data are entered is crucial to its acceptance. The current response time is 1-2 seconds - heavily dependent on 'other users' (non POMP). It is hoped to have a dedicated machine in the near future. The degree of generality of the system should make it a useful tool for investigating the applicability of such systems provided it does not become in itself so complicated as to defeat the original aim - to provide a vehicle within which interested clinicians could, with assistance, implement their own protocols.

Selected Publications:

RHYS HEARN, C. & YOUNG, D.W. (1975) A problem orientated patient management scheme. Meth.Inf.Med., 14, (1) 13-9.

RHYS HEARN, C., CUNNINGTON, A.R., RAHEEM, A. (1979) "Computer-assisted Management for Patients after Renal Transplantation", Proceedings 2nd AWAMI Meeting, Versailles, March, pp. 291-303.

CUNNINGTON, A.R., RHYS HEARN, C., RAHEEM, A. (1979) "Evaluation of a small computer system aiding clinical decision-making". Proceedings of the 2nd AWAMI meeting, Versailles, March.

RAHEEM, A., CUNNINGTON, A.R., RHYS HEARN, C. (1979) "An interactive computer system for multiple outpatient clinics." Proceedings of the 2nd AWAMI meeting, Versailles, March.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B3.1

Project Title: Methods of evaluating health care.

Location: South Lothian District, Lothian Health Board.

For Further Information Contact: Dr. R. Gruer, Community Medicine Specialist, South Lothian District Health Authority, St. Roque, Astley Ainslie Hospital, Grange Loan, Edinburgh, EH9 2HL.

Key Topics: Hospital Speciality Systems; Form Design; Audit; Research information; evaluation; Feature cards.

Summary: The project's main aim is to provide clinicians with a simple data collection system, currently based on feature cards, which can be used by them to examine and evaluate patient care. Following an initial 6 months trial involving extensive data on elective cholecystectomy admissions, methods of data capture were revised, the amount of data to be collected was considerably reduced and the area of work expanded to include the audit of all general surgical operations and deaths in surgical units in the Lothian area. Specific studies are being mounted into hospital and general practice management of acute abdominal pain and into peripheral vascular disease. Additional studies are envisaged.

Data on operations and surgical deaths are recorded on standard forms with an extra copy for audit purposes. Transfer of information from forms to feature cards for later analysis is carried out by South Lothian District.

An important advantage of the feature card system is that analysis can be carried out at any time during data collection and information is thus rapidly available. However, difficulties exist in obtaining suitable electronic equipment for feature card analysis. Whilst this is not a serious problem with small studies collecting limited data, manual processing is tedious and time consuming for large quantities of data. Consideration is therefore being given to the possibilities for audit and evaluation offered by computerisation.

Costs: Equipment, stationery and staff totalled £885, excluding development, for 200 patients. The major costs were clerical and resulted from the very large amount of data which the clinicians had decided to collect on the pilot study. In the final study, the amount of information was drastically reduced, but no accurate cost figures

are available. The processing costs of the feature cards are very low for modest samples and straightforward analyses.

Transferability: The project has been extended from the general surgical unit in one hospital to general surgical units in all hospitals in the Area. The feature card system itself is highly flexible and easily adaptable to other projects, although the limitations imposed on project size by problems in the manufacturing and marketing of automatic sorting equipment must be borne in mind.

Comments: The problems of the pilot study of this project demonstrate again the need for careful consideration of the quantity of data to be collected. Collecting excessive or unusable data can inflate the costs of otherwise modest projects as well as making them much more difficult to execute and maintain.

Feature cards have proved to be a very useful and effective method of data handling in a completely different area of medical information from general practice, where they have received most publicity see Ref. F2.4). The project's interest in microcomputers and word processors may lead to radical changes in the future.

Documents on File: Data collection forms.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B4.1

Project Title: St. Thomas' Hospital Diabetic Clinic Project

Location: St. Thomas' Hospital Diabetic Clinic

For Further Information Contact: Dr. P. Sönksen, Diabetic Clinic, St. Thomas' Hospital, London, SE1.7H.

Key Topics: Hospital speciality systems; form design; recall and screening; G.P./hospital communication; computer-generated summaries; computer systems (batch); nomenclature.

Summary:

The primary objective of this project is to support the management and follow-up of diabetics in St. Thomas' Hospital outpatient clinic. Information is gathered by means of a detailed pro forma completed by the clinic secretary and the examining doctor on the patient's first visit to the clinic (an alternative form is available for patients who are already being followed by the clinic). The data is checked and coded by a data controller, either a medical student or a specially trained medical secretary. Diagnoses are coded using ICD8. They have developed their own system for the coding of initial problems.

The data is processed in batch mode from punch cards on the hospital computer. A summary of the data collected is produced and returned to the notes to form the primary record. The original document is not retained in the notes even temporarily. They aim to have the summary in the notes within 24 hours of the initial clinic contact.

At the present time the only portions of the system which have been implemented deal with the registration and basic history of new patients. It is hoped in the future to implement follow-up systems. The details of these systems have yet to be fully determined, but it is planned to involve extensive co-operation between the general practitioners and the hospital clinic.

The system is being designed in the hope that it will provide a useful prototype that might be implemented elsewhere. However, it must also interface, in several important respects, with the St. Thomas' Hospital Experimental Computer Project.

Costs: Data control: 1-2 hours per week data control (Covering approximately 10 patients per week.) Data preparation and computer time: low, but at present impossible to separate from the overall costs of the Experimental Computer Project. Rough estimates suggest that a large hospital might require half a day per week or more for data entry.

Transferability: The system is written in ANS74 COBOL. Transfer to ICL equipment has proved difficult because not all features used by the program are supported by older COBOL Standard ANS68 used by ICL. The system requires access to Master Index facilities (although it includes provision for creating its own patient name index), date and age routines, and an operations code dictionary (the equivalent of which one would expect to find in other hospital computer systems).

Related Project: King's College Hospital Diabetic Clinic Project (Ref. No. B4.2)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B4.2

Project Title:	King's College Hospital Diabetic Clinic Project
Location:	King's College Hospital Diabetic Clinic
For Further Information Contact:	P.J. and G. Watkins, King's College Hospital Diabetic Clinic, Denmark Hill, London, SE5 9RS.
Key Topics:	Hospital speciality sytems; recall and screening; research information; computer systems (batch); codasyl/data base.
Summary:	This project was conceived as a co-operative effort with the St. Thomas' Diabetic Clinic Project (Ref. No. B4.1), but except for agreement on a common core of data, the two have developed separately. This project is much simpler in concept than the St. Thomas' project, and orientated almost entirely towards research. Data is collected on forms which remain in the patient folders and become part of the permanent record. The computer produces a brief summary which is filed in the notes. Various statistical analyses of the data have been made, together with listings of patients in particular categories, for use administratively and for research purposes. Current plans include the routine production of a larger number of 5-year re-evaluations on patients. The usefulness of the system for research is somewhat limited by the very high mobility of the population in inner London.
Costs:	The primary cost is 1-2 hours per week secretarial time for control and data preparation.
Transferability:	The running programming is in ICL Cobol. Programmes to analyse the stored data are written in Filetab. A feasibility study is in process by another area interested in taking over this system.
Documents on File:	Report: South East Thames Regional Health Authority, King's College Hospital Computer Centre - King's College Hospital Computerisation of Diabetic Clinic Records, April, 1976.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B4.3

Project Title:	Poole General Hospital Diabetic Clinic
Location:	Poole General Hospital, Longfleet Road, Poole, Dorset, BH15 2JB.
For Further Information Contact:	Dr. R.D. Hill, Poole General Hospital.
Key Topics:	Recall and screening; G.P./Hospital communication; research information; computer generated summaries; computer systems (batch)
Summary:	This project involves an extensive basic data recording system and periodic reviews. Its aims are to produce a register of diabetics in the district; monitor control; aid recall and follow-up; to provide data for general practitioners; and to provide research data. Data are entered into a special record form which also serves as the clinical notes. They are then entered into the computer system. Summaries for the general practitioners are produced by the system. In the current version, considerable extra time is required in the diabetic clinic in order to complete the extensive pro formas used. However, the system has been constructed so as to be modular, and a more limited data collection exercise could use the same software and approach.
Costs:	The system is new and costs for operational use are not yet available. Basic expenses included printing of new diabetic clinic notes and computer programming. Data entry costs are modest as is overall computer usage.
Transferability:	The computer system is written in ICL standard Cobol for the regional ICL 1900, and should therefore be relatively compatible with other locations. The forms are extensive and probably only suitable for a clinic with special interests in Diabetes.
Documents on File:	Update sheet for entry to Diabetic Register

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B4.4

Project Title: Nottingham Diabetic Information Project

Location: University of Nottingham Medical School, Clifton Boulevard, Nottingham, NG7 2UH.

For Further Information Contact: Dr. A.J. Hedley, Department of Community Health, University of Nottingham Medical School; Dr. S. Allison, University Hospital, Nottingham.

Key Topics: Follow-up systems; G.P./Hospital communication; computer systems (batch); computer generated summaries; patient-held records.

Summary: The Nottingham Diabetic Project has three main parts: a hospital outpatient data system, a patient-held record, and a general practitioner referral letter and recording system. It seeks to establish the optimum balance among these three functions. Information on patients seen in the diabetic clinic is entered onto a record booklet from which it is transcribed into the computer. The computer prints a clinical summary/problem list, a detailed history, and medication summary. Duplicate copies of the information are sent to the general practitioner, and a copy of the problem list and medication summary forms, and a patient-held co-operation card. This card has a carbon backing which is designed to be placed over the corresponding sections of the hospital and general practice notes to minimise duplicate recording. A special backing sheet is provided for problems which the clinician does not want to appear on the patient-held notes.

It is intended that follow-up information be entered at regular follow-up visits, either at the general practice or at the clinic. Information is not entered on the computer system during any intervening visits to the outpatient clinic or general practitioner. In addition to the regular participation of general practitioners in using the co-operation cards, experiments are underway with general practitioners filling in a modified form of the basic patient entry document.

Costs: Clerical: 1 wte.
Computing: modest
Development: two man years programmer/analyst.

Transferability: The project has been developed in consultation with several other centres including St. Thomas (see Ref. No. B4.1), Addenbrookes (see Ref. No. D8). Although standardisation has not been possible, the computer programs are written in ICL Cobol and should run relatively easily on most health service systems.

Comments: The problem of interfacing patient-held records with other information systems without undue duplication of effort is a recurring one. The use of carbon backed on self-copying paper to facilitate recording is highly attractive, but it remains to be seen whether it will work in practice. Getting the two documents properly

placed precisely one above the other may prove slightly awkward. If successful it is an exciting contribution to establishing a balance between hospital, general practice and patient-held information.

The results of the related study which was part of an effort to locate all diabetics in the Nottingham metropolitan area are interesting. Diabetics were identified from general practice disease registers, the diabetic clinic register over a nine-month period and prescriptions for insulin and hypoglycemic agents supplied by the Prescription Pricing Authority. No one source was adequate to locate all diabetics. G.P. lists and P.P.A. lists together were the only combination of two sources found to be complete. Roughly one quarter were known only to the P.P.A. and one quarter only to their general practitioners. Slightly less than half were known to all three.

Documents on file:

NOTTINGHAM DIABETES RESEARCH GROUP (1980) Identification of Insulin treated diabetics in a defined population. (Statement of project & preliminary results).

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B5.1

Project Title: Accident and Emergency System, Belfast

Location: Royal Victoria Hospital, Belfast

For Further Information Contact: W.H. Rutherford, O.B.E., F.R.C.S., Accident & Emergency Dept., Royal Victoria Hospital, Belfast BT12 6BA.

Key Topics: Research information systems; computer systems (batch)

Summary:

Developing out of a pilot study covering one month, a system has been established using the regional health authority computer for recording basic data on the use of the accident and emergency department. It is conceived essentially as a research tool with a special emphasis on the epidemiology of accidents.

Financial restrictions have delayed the implementation of this program. The possibility of using a small computer in the A. & E. department with visual display is now being considered.

Costs: Clerical: one whole time equivalent
Computer: modest

Transferability: The system is believed to be transferable and runs on standard health service ICL equipment.

Selected Publications:

MAYNARD, J.S.E. (1975) An information recovery system for the accident and emergency department. Pub. by the Eastern Health and Social Services Board. Available at the Royal Victoria Hospital, Belfast.

RUTHERFORD, W.H., MAYNARD, J.S.E. (1976) Patients referred from work to a casualty department. Injury., (7) 225-232.

RUTHERFORD, W.H., BOLT, J.S.E. (1976) Comparison of patient populations referred to Accident and Emergency outside working hours by General Practitioners and their deputising services. Resuscitation. 4, 271-278.

RUTHERFORD, W.H., NELSON, P.G., WESTON, P.A.M., WILSON, D.H. (1980) Communication and records. (In) Accident & Emergency Medicine, Pitman Medical Pub. Co., Tunbridge Wells. pp.19-26.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B5.2

Project Title:	Accident & Emergency System, South Western R.H.A.
Location:	South Western Regional Health Authority, Canynge Hall, Whiteladies Road, Bristol, BS8 2PR.
For Further Information Contact:	Mr. A.R.D. Kilburn
Key Topics:	Research information systems; computer systems (batch)
Summary:	Developing out of a pilot study done at hospitals in Bristol (Frenchay) and Taunton, the Regional Health Authority is offering to all districts a system for recording all new attenders at the Accident and Emergency Departments. This has definitely been accepted by one additional district (Plymouth) and a number of others are showing interest. Information is collected on traditional data collection forms and entered into a batch system by the computer staff.
Costs:	Clerical: no extra cost over traditional system. Computer: modest
Transferability:	The system uses a standard N.H.S. ICL configuration.
Documents on File:	South Western R.H.A. Computer Centre: Accident Statistics System User Manual (issue 2)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B5.3

Project Title: Accident & Emergency System, Royal Lancaster Infirmary

Location: Royal Lancaster Infirmary

For Further Information Contact: Dr. J.A. Farrer, Casualty Department

Summary: This project provides a continuous monitoring of a sample of patients passing through the Casualty Department. A large amount of data has been collected and a variety of reports and publications produced over the past several years. Much of the work involves the linking of casualty data to census enumeration districts in order to better study the pattern of care provided.

Costs: Personnel: Less than half w.t.e.
Data Processing: Modest

Transferability: The sytem is run on a standard health service ICL 1900 system.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B5.4

Project Title:	Nottingham Accident & Emergency System
Location:	Queen's Medical Centre Accident & Emergency Department, Nottingham.
For Further Information Contact:	Mr. P. Weston, FRCS.
Key Topics:	Research information systems; computer systems (batch).
Summary:	A one in ten sample of all patients passing through the casualty department is collected for computer analysis. A multi-part NCR form is used as the standard Accident and Emergency record. Although there are some problems with the legibility of the bottom copies, this has proved reasonably successful. The system is now an established part of the hospital procedure.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B5.5

Project Title:	Leeds Accident and Emergency Information System
Location:	Leeds General Infirmary, Great George St., Leeds.
For Further Information Contact:	Mr. D.H. Wilson, FRCS.
Key Topics:	Research information systems; computer systems
Summary:	An information system which maintains information on all first contacts with the Accident and Emergency Department has been developed, and used to produce a detailed set of statistics on the day to day workings of the department. Information is collected on a simple coding card, which is sent to the computer centre and entered into the computer system. The diagnostic coding scheme has been carefully adapted for use in this department, and the number of separate codes reduced to a minimum. The system has been used to produce an extensive range of statistics on the working and operation of the Casualty Department, and is now a routine part of the hospital operation.
Costs:	Computer: V.D.U. Terminal connected to the hospital computer. Clerical: One full-time Whitley Council A. & C. Clerical Assistant. Computing: Modest
Transferability:	The system might well be adapted to other sites. The computer system is written in Extended Basic and should be adaptable to other N.H.S. installations.
Documents on File:	Leeds (Western) Health District: Accident & Emergency Services Research Project (1977) "A year in the life of a major A. & E. Department" - Nuffield Centre for Health Services Studies, University of Leeds. (Nov.)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B6.1

Project Title: KODIAC Automatic Coding System

Location: Division of Computing and Statistics, Clinical Research Centre, Watford Road, Harrow, Middlesex. HA1 3UJ.

For Further Information Contact: Dr. R.M. Greenwood

Key Topics: Hospital speciality systems; research information; computer systems (batch); automatic coding.

Summary: KODIAC is intended to provide an automatic coding system which would cope with the vast majority of diagnoses presented to it, thus greatly reducing the work of manual coding clerks. It attempts to code all diagnoses presented to it, although some will fail to be coded.

The system accepts unedited input of phrases from the diagnostic section of such forms as the SMR1 or pathology reports. It is more flexible than the histopathology coding system (Ref. B6.2) and accepts input phrases with no prior editing whatsoever. At the present time it succeeds in coding about 85% of the phrases presented to it.

The program is written in Fortran and runs on a 1900 series ICL computer.

Costs: Machine time: approximately 1 phrase every 2.2 seconds on a 1903A, plus data preparation. (More recent versions are much faster - see B6.2)

Transferability: The program is written entirely in Fortran and should be readily convertible to most other computer systems. (There is one assembly language subroutine for packing and unpacking characters.) It does require random access disk storage.

Comments: The possibility of coding the majority of diagnostic or problem entries automatically could represent a great saving in clerical time in preparation of HAA statistics and in some areas of the preparation of research data. The Oxford Record Linkage Study's ORLSS system (Ref. E1.1) is based on this work. The possibility of using a similar system interactively with an on-line data entry system is intriguing but has not yet been explored by any project.

Selected Publications:

GREENWOOD, R.M. (1972) Kodiac, a system for disease coding by a medium-sized computer. Int.J.Biomed. Computing, 3, (2) 123-34.

GREENWOOD, R.M. (1972) Statistical distributions of diagnostic phrases of morbidity and mortality. Int.J.Biomed.Computing, 3, (1).

HOWELL, R.W. (1971) A comparison of diagnostic coding by manual and computerised methods. Brit.J.Prev.Soc.Med., 25, (4) 225-30.

Related Projects: Automatic Coding for Histopathology (Ref. B6.2); Automated Record System for Hypertension Outpatient Clinic (Ref. B2.1); Oxford Record Linkage Study (Ref. E1.1).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.2

Project Title: Automatic Coding for Histopathology

Location: Northwick Park Hospital, Harrow, Middlesex.

For Further Information Contact: Dr. E.C. Coles, Clinical Research Centre, Watford Road, Harrow, Middlesex, HA1 3UJ.

Key Topics: Hospital speciality systems; research information; computer systems (batch); nomenclature (SNOP); automatic coding.

Summary: The system has been in continuous use since May 1975. It codes surgical pathology and cytology diagnoses using the College of American Pathologists ' "Systematized Nomenclature of Pathology" (SNOP). The codes are held in a computer file which forms an index to the slides and other material and to the full reports held in the laboratory. Input is on paper tape generated during the typing of the report - a "SNOP summary diagnosis" being dictated at the end of each conventional report. For each diagnosis a topographic phrase must be given first, optionally followed by a morphology phrase, optionally followed by an aetiology phrase, optionally followed by a function phrase. 97% of the phrases submitted are correctly encoded. Those which are not gave rise to no code, not to an erroneous code.

More than one diagnosis can be given for each specimen, and all the diagnoses for all the specimens from one patient are stored together in the file. Retrieval from the file may be by patient (for clinical purposes) or by content (for clinical, teaching or research purposes). Computer-generated microfiche is produced quarterly for easy reference.

Costs: Overall, for a laboratory handling 6,000 surgical pathology specimens per year, the cost is less than that of employing a typist.

Transferability: The encoding algorithms have been used in successful implementations at the Royal Marsden Hospital(using MUMPS and the SNOMed Dictionary) and at the University Hospitals in Leicester (using extended BASIC).

Comments: Automatic coding methods have been most successfully applied in pathology and radiology which cover a relatively narrow range of diagnoses and formats. The SNOP dictionary provides a well defined target code. Many clinicians find the discipline of formulating their diagnoses in the manner required useful in clarifying their thoughts rather than irksome.

Selected Publications:

COLES, E.C. and SLAVIN, G. (1976) An Evaluation of Automatic Coding of Surgical Pathology Reports. J. Clin.Pathol., 26, 621-5.

HOWELL, R.W. (1971) A comparison of diagnostic coding by manual and computerised methods. Brit.J.Prev.Soc.Med., 25, (4), 225-30.

College of American Pathologists. (1965) Systematized Nomenclature of Pathology (SNOP).

Related Projects:

Automated Record System for Hypertension Out-Patient Clinic (Ref.B2.1); The KODIAC Automatic Coding System (Ref.B6.1).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.3

Project Title: SWITCH System

Location: Western District Medical Computing Department, Western Infirmary, Glasgow, G11 6NT.

For Further Information Contact: Dr. J.W.K. Robertson, Systems & Programming Manager

Key Topics: Hospital speciality systems; computer-generated summaries; computer systems (batch); key entry systems; nomenclature; automatic coding.

Summary:

SWITCH is a system designed to collect comprehensive data on patient interactions with particular outpatient clinics, although some in-patient episodes are also included. It is intended primarily for long term research purposes, but produces printed summaries for use within the clinics themselves.

The data collection documents become the primary medical record for the patients for whom the system is used. A new cumulative summary form has been implemented. Prior to entry into the system, the data booklets and other forms are vetted by a medically qualified 'medical editor' for plausibility.

All information is entered on the data collection forms in free text or pre-coded against a small selection list. Comment can be entered for reproduction on the printed summaries but is not otherwise stored. The system includes an extensive set of routines for coding the free text part of the data, and the coding rate routinely exceeds 95%.

The system is operated in the surgery and hypertension clinics at the Western Infirmary, Glasgow and the hypertension clinics of the Royal Infirmary, Stobhill Hospital and the Southern General Hospital, Glasgow. This system has been operational in one form or another for over fifteen years. It is currently implemented on an ICL 1903A machine.

Costs:

Personnel - Computer Department:
One-third time equivalent data preparation supervisor; two full-time equivalent punch operators; one-third time equivalent data control person; one programmer for general maintenance and servicing of ad-hoc requests; one-fourth equivalent systems designer.
Personnel - Clinics:
Four medical editors (medically qualified registrar grade or equivalent, part-time, 3-8 sessions per week); one full-time secretary; one full-time clerical officer; two part-time clerical officers.
Some additional non N.H.S. funded staff for specific funded research projects.

Part of the duties of these staff include the management of the clinics, not directly associated with the computer system.
Computer time:
The system uses considerable computer time. Accurate estimates are difficult, but a reasonable figure might be 8-10 hours per week.

Transferability: The system is completely specified and the dictionary files are probably transferable. The programming itself is in low-level language and would have to be completely rewritten for a different machine. To implement a new clinic on the same machine would probably require additional programming to the level of one or two programmer years, plus the additional one-half programmer permanently available to maintain support. The main system maintenance programs are being rewritten in high-level language.

On-Site Evaluation: The system was evaluated (see Report on SWITCH, 3rd Edition, May, 1977) and is now accepted as a routine N.H.S. patient care commitment, funded by Greater Glasgow Health Board. The SWITCH project no longer receives research or development funding from the Scottish Home & Health Department.

Comments: SWITCH is one of several systems which aims to collect as much of the information on the patient contact as is humanly possible rather than attempting to select only those items which are immediately relevant to the studies under consideration. The strategy is intrinsically expensive but may have advantages in certain situations where large amounts of data for a number of different projects are being collected or where long term population surveillance is envisaged.

The automatic coding techniques applied are somewhat analogous to those used in the Northwick Park project, Automatic Coding for Histopathology (Ref. B6.2) but quite distinct from those used in the KODIAC Automatic Coding System (Ref. B6.1)
A very desirable feature of the system is an extensive cross-reference file for the dictionary which makes it possible to change systems of nomenclature and classification without modifying the patient files themselves.

Documents on File: Set of data entry documents; systems flow chart; basic admission form; detailed description of Greater Glasgow Health Board Computer Applications Unit work; 1st Annual Report of the Western District Computer Project, October 1975; Progress Report of the Western Infirmary Computer Project, 1973; Report on SWITCH, 1971; Report on SWITCH, 3rd Edition, May, 1977.

Selected Publications:

KENNEDY, F. et al (1968) In "Computers in the Service of Medicine". (Edited by G. McLauchlin and R.A. Shegog) London.

KENNEDY, F. et al. (1968) Lancet, 2. 1230
"SWITCH" A system producing a full hospital case history on computer.
KENNEDY, F. (1970) Scot.Med.J., 15. 391.
"SWITCH" Hospital Case History on Computer.
GILLESPIE, G. et al. (1970) Gastroenterology, 58, 625.
The long term stability of the insulin test.
GILLESPIE, G. et al. (1970) Gastroenterology, 59. 180. The short term reproducibility of the insulin test in Peptic Ulcer Patients.
KENNEDY, F., GILLESPIE, I.E., KAY, A.W. (1968) Gut., 9: 734.
KENNEDY, F., GILLESPIE, I.E., KAY, A.W. (1969) Brit.J.Surg., 56, 626
KENNEDY, F., et al. (1973) Brit.Med.J., ii. 14th April, 71. Truncal Vagotomy and Drainage for Chronic Duodenal Ulcer - A Controlled trial.

References - Blood Pressure

ATKINSON, A.B., KELLETT, R.J. (1974) J.Roy.Coll. Phys.Lond. 8: 175
Value of intravenous urography in investigating hypertension
BEEVERS, D.G., HAWTHORN, V.M. (1976)
Case finding and follow-up of hypertension in the community. Abstracts. 7th European Congress of Cardiology, Amsterdam, p.667.
BROWN, J.J. (1973)
Proc.Roy.Soc.Lond, 184. 399.
Computer-based records in the B.P. Clinic.
GLASGOW BLOOD PRESSURE CLINIC (1972)
J.Roy.Coll.Phys.Lond., 7. 87.
MIALL, W.E., BRINNAN, P.J. (1975) Clin.Sci.Mol. Med., 48. 165.
A pilot trial of treatment of mild hypertension: interim report of the Medical Research Council's trial in Britain.
OCKENDEN, J.M., BODENHAM, K.E. (1970)
Oxford University Press. Focus on medical computer development. A study of the Scottish scene by Scientific Control Systems, London.
PEART, W.S. (1973)
The organisation of a multi-centre randomised control therapeutic trial for mild to moderate hypertension. Clin.Sci.Mol.Med. 45. 67.
RAMSAY, L.E. BOYLE, P., and RAMSAY, M.H. (1977)
Quart.Jour.Med.,46, 400-410
Factors influencing Serum K in treated hypertension.
RAMSAY, M.H.
Study of slow release oxprenolol in comparison with standard oxprenolol. Paper presented at Ciba symposium 1976.

WINCHESTER, J.F., et al. 1976.
Effect of cessation of potassium supplements on potassium status in hypertensive patients treated with oxprenolol and cyclopenthiazide. Ciba Symposium, Basle.

AITCHISON, J., MOORE, B., TRUST, P.M.
Decision making in anti-hypertensive therapy. In preparation.

DEVINE, B., FIFE, R., TRUST, P.M. (1976)
Minoxidil in the management of severe refractory hypertension.
In preparation.

JONES, J.V., DUNN, F.G., FIFE, R., et al.
Benzothiadiazine therapy in hypertensive patients and deaths from myocardial infarction.
In preparation.

RAMSAY, L.E.
Liver dysfunction in hypertension
In preparation.

RAMSAY, L.E.
Methyldopa and renal stones; a retrospective study.
In preparation.

RAMSAY, L.E., et al.
Standardised data collection in hypertension.
In preparation.

RAMSAY, L.E., BOYLE, P. & RAMSAY, M.H. (1977)
Factors influencing serum potassium in treated hypertension. Q.J. Med., 46, 400-410.

ROBERTSON, J.W.K., SHIMMINS, J.G., THOMAS, A., & SIMPSON, D.L. (1977) Medical Information Systems Incorporating Automatic Coding of Text.In: Medinfo. 77., D.B.Shires & H. Wolf, eds. North-Holland Pub. Co. pp.271-275.

ROBERTSON, J.W.K. (1978). The Western District Computer Project and the SWITCH System. In: Proc. Computerised Medical Coding Conference, Dec.8-10, 1976. Orlando, Florida. U.S. Dept. of Health Education & Welfare, Public Health Service, National Centre for Health Statistics, Hyattsville, Md. (May)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.4

Project Title: Free Text Data Handling for Pathology

Location: Medical Computing Unit, University of Manchester, Coupland Building No. 1, Manchester M13 9PL.

For Further Information Contact: D.E. Clark, Medical Computing Unit

Key Topics: Hospital speciality systems; research information; computer systems (on-line, real time); computer systems (batch); natural language retrieval.

Summary: The heart of the system is a general purpose set of programs for processing free text data. It is currently being used to process surgical pathology and post mortem results from the University Hospitals. The system indexes the reports automatically in such a way that they may be retrieved on the basis of either combinations of words or numerical quantities in particular ranges occurring in them. Recently, extensive additions to the programs have been made to allow on-line interrogation of the data, with a reasonable response time. At the present time data capture is either off-line via paper tape or on-line via a VDU. Minimal modification of the routine pathology reporting procedures is necessary. Because of the extremely free format of the input data, only the demographic part of the report is checked, off-line. The text is not vetted.

The batch system has been in operation in the eye hospital since 1970, but only came into routine use in the remainder of the pathology department during 1976. Since February, 1979, the on-line facilities have been routinely used by the Eye Hospital via a private telephone line.

A further recent development is the addition of SNOP codes to neurobiopsy reports. The programs are written in Fortran, and depend entirely on magnetic tape for mass storage. They are unusual in that they can be run on somewhat smaller machines than is usually the case for large concordance handling packages. Currently they use an IBM 7090, front-ended by a PDP-8 to allow single user interactive working.

Costs: Data preparation: Difficult to estimate in view of the several different data entry mechanisms used, but the system probably adds a significant amount to the secretarial time required to type reports.

Computer use is modest, although the total number of magnetic tapes used and extent of magnetic tape manipulations are extensive.

A study on costs is in progress.

Transferability: The central module is written in standard Fortran, runs with only a modest use of central storage, and is fairly well documented. However, the interactive parts of the system are largely dependent on the PDP-8 communications package, and the very heavy use of magnetic tapes might be awkward under some modern disc based operating systems. The various input systems are probably specific to the unusual facilities of the Manchester Medical Computing Unit.

Comments: Use of the off-line system (designed for research and education) has been sporadic over the last few years. It has become clear that the system will not be fully utilised until it fulfils part of the day-to-day needs of the pathology department and can be operated on-line by the pathologist. Current development is towards these ends.

Selected Publications:

SHARPE, T.C. and CLARK, D.E. (1975) General purpose Information Handling Techniques for Pathological Data. Comput.Biol.Med., 5, 221-33.

Related Projects: Automatic Coding for Histopathology (B6.2)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B6.5

Project Title: The MIRPO System

Location: The Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry.

For Further Information Contact: Mrs. S. Prescott, West Midlands Regional Health Authority, Management Services, 326 High Street, Harborne, Birmingham, B17 9PX; Mr. J. Rowland Hughes, Institute of Orthopaedics, The Robert Jones and Agnes Hunt Orthopaedic Hospital, Oswestry, Shropshire, SY10 7AG.

Key Topics: Hospital speciality systems; research information; computer systems (batch); natural language retrieval.

Summary:

The MIRPO system captures data as a by-product of typing hospital documents. The data is recorded in free text without coding or, for quantitative data (e.g. blood pressure) as numerical values. The information must be dictated according to standard 'formats' - i.e. in a particular order - and the language must be kept simple in structure so that there is only one fact per sentence. However, this does not appear to be particularly onerous, and a number of junior members of staff have used the system successfully. The system is highly flexible. New formats for new documents can be implemented easily.

The bulk of the data is stored in a totally inverted file based on the occurrence of key words used. Extensive facilities to monitor the occurrence of new words and the range of numeric items are provided. Data is captured using a typewriter terminal attached to a single drive cassette recorder. The typed copy becomes the body of the note. The data on the cassette is taken to the regional computing centre weekly for conversion to industry compatible magnetic tape using a PDP11/05, and then processed on the RHA 1900 series machine.

The typewriter cassette recorder system currently used is now becoming obsolete and is, in some respects, unsatisfactory. An alternative is being sought.

Evaluation: The evaluation to date has centred on the feasibility of data retrieval using the system. It has been found convenient and practicable to retrieve information from the various special fields provided that generally accepted terms are used to describe the findings. Experience with the system has resulted in updated instructions to the systems users.

The system is currently being used in a major study of the early indications of hip disease in the infant and appears to be providing useful results.

Costs: Secretarial: Preparing a case note requires approximately one hour which is considerably more than would be the case for simply typing from dictation on a typewriter. Correcting errors also requires considerable time. It is felt that this could be improved with better hardware.
Computer time: The system runs on the Region's 1904S. Natural language processing is comparatively more expensive than dealing with coded data. An extensive system for an entire hospital would require very considerable computer resources.

Transferability: The programs are largely written in Cobol. Transferring them from the System 4 to the 1900 series machine required approximately one programmer year.

Comments: The basic concept of the project is extremely attractive, especially for specialties in which most records are typed already. The advent of relatively inexpensive word processing systems should make the preparation of the material very much easier than at present. The project has shown that it is possible to retrieve data from completely unstructured files of this type (see also Ref.No. F2.6 and B6.4)
However, the problem of standard nomenclature remains even within a relatively restricted field. A more extensive comparison of these techniques with more traditional methods for overall cost and efficiency would be extremely interesting.

Documents on File: "Introduction to MIRPO"; MIRPO System Manual - Chapter 2, System Outline (1974); formats.

Related Project: The CONCORD System (Ref. B6.4)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B6.6

Project Title: West Midlands R.H.A. MUMPS Project

Location: Manor Hospital, Walsall, Staffs.

For Further Information Contact: David Perfect, MUMPS Computer Project, Manor Hospital, Walsall, Staffs.

Key Topics: Hospital speciality systems; computer systems (on-line, real-time).

Summary:

The MUMPS Project originally aimed to determine whether or not users with little previous computer experience could develop their own systems with professional support using a very high level, interactive language. Projects have included the on-line calculation of clinical results from raw data in a pulmonary function laboratory; a perinatal mortality project collecting extensive information on all births in the Walsall area; a study of diabetic retinopathy; thyroid diagnosis; cross infection analysis and the House Officer Information System (ref. B6.7) and Problem Orientated Patient Management (Ref. B2.2) reported separately.

The project has now run through its initial three year period, and its basis is being carefully reconsidered. A number of highly successful systems have been developed, for which continued support is desired. Transfer to 'Standard Mumps' is almost certain. However, it is likely that new projects will place less emphasis on users developing their own projects.

The project has shown that it is possible to get certain members of staff to develop programs tailored to their needs using the Mumps system, but has also indicated that more users will need considerable additional support.

The Mumps (Massachusetts General Hospital Utility Multi-Programming System)language is a real-time, interactive data manipulation system which has had considerable success both in the U.K. and abroad in the past few years as a tool for the rapid development of interactive programs (see introduction to section B and D.).

Costs: One full-time systems analyst and two programmer/analysts. (Estimated cost at current prices of total configurations: £60,000).

Transferability: An ANSII standard exists for Mumps, and numerous implementations now exist on a variety of equipment. This site was begun using one of the earlier dialects of the language. Automatic translation systems do exist, but the conversion still is a considerable effort. The availability of Mumps, especially on micro-computers has remained more limited than would have been hoped at the outset of the project.

Comments:

This project is of interest for a variety of reasons. It represents one of the few situations in which the time required for users to develop their own software in a suitable environment can be evaluated. This is likely to become increasingly common as micro-computers become widely available. There are obvious advantages in developing systems which are well tailored to the users' needs. However, there is also a serious danger of staff spending inordinate time working as unskilled programmers. The project provides a practical demonstration of the value of readily available on-line computing in a variety of applications. It also provides a demonstration of the advantages of using Mumps as a means of rapid development of systems which would otherwise be too costly in development effort to mount.

A number of the projects developed might well have been begun using micro-computer systems had the facilities been available at the time. It is an interesting issue as to whether the advantages of the central facility providing support and housekeeping functions outweigh the advantages of having complete control over one's own system. At least one of the applications is being transferred to a micro-computer system.

Selected Publications:

PERFECT, D., FORBES, M.V., MARTIN, L. (1979) West Midland R.H.A. Mumps Project at Walsall - Evaluation Document for the D.H.S.S.; W.M.R.H.A. M.S.D., Birmingham, January.

PERFECT, D., FORBES, M.V., MARTIN, L. (1979) West Midland R.H.A. Mumps Project at Walsall - Final Report; W.M.R.H.A. M.S.D., Birmingham, March.

Related Projects:

The HOISS System (Ref. B6.7); Problem Orientated Management of Patients (Ref. B2.2)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.7

Project Title:	The HOIS System (House Officer Information System)
Location:	St. Chad's Hospital, Hagley Road, Edgbaston, Birmingham, B16 9RQ.
For Further Information Contact:	D.W. Young, M.B., M.R.C.P., Consultant Physician.
Key Topics:	Hospital speciality systems; decision aids; computer-generated summaries; computer systems (on-line)
Summary:	The HOIS System aims to provide readily available information about the initial management of 79 common acute medical problems, e.g. chest pain, strokes, acute bronchopneumonia, diabetes, etc. It specifies the investigations and treatments for each of these problems. The principal output of the system is a series of printed sheets, each of which details information which can be helpful in the definition and management for specific medical problems. Printed sheets of treatments are also produced. It is hoped that these sheets will direct the Junior Medical Staff towards informed history taking, physical examination, investigation and treatment of patients.
Costs:	The system has been operational since early 1977. A costing exercise performed by the West Midlands R.H.A. evaluation team found that the average weekly cost of HOIS is approximately £85.
Transferability:	The support data and algorithms should be of great interest to those wishing to implement systems to aid the doctor. The system itself will be implemented in MUMPS. Microprocessor implementations are under consideration.
On-Site Evaluation:	A detailed formal evaluation was carried out by West Midlands Regional Health Authority and the report is available. The results have shown that investigation of patients managed using HOIS is more consistant and that fewer unnecessary investigations are performed.
Comments:	This relatively simple project would seem to have great promise in effecting the quality of patient care. The results of further evaluations of the expanded range of functions will be watched with interest.

Related Project: West Midlands R.H.A. MUMPS Project (Ref.B6.6)

Selected Publications:

YOUNG, D.W. (1978) A problem orientated information system. Med.Inform., 3 (2) 105-11.

YOUNG, D.W. (1980) Clinical Information System for Junior Doctors. Int.J.Biomed Comp., 11, 241-246.

West Midlands R.H.A. (1979) Evaluation Report on HOIS.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.8

Project Title: Chronic Glaucoma Control and Records System

Location: Opthalmic Department, King's College Hospital, Denmark Hill, London, SE5 9RS.

For Further Information Contact: Dr. R. Pitts Crick, Consultant Opthalmic Surgeon

Key Topics: Hospital speciality systems; recall and screening; research information; morbidity recording; evaluation; POMR; computer systems (batch); computer-generated summaries; graphics; nomenclature.

Summary: A problem orientated, computer-assisted record system is one of the important facilities of the efforts of the King's College Hospital glaucoma clinic to improve the follow-up and treatment of patients with known glaucoma. The record system is based on a structured recording form which has completely replaced the standard case notes for these patients. The form is used directly as the punching document for input to the computer system. Summaries of each patient seen are produced routinely. Periodically the system produces lists of those patients who are long overdue for appointments and of those patients whose condition is deteriorating based on the visual field measurements. The system has been in operation for several years and contains records on over 1,200 patients.

The computer processing uses the Region's ICL 1900 series computer, and the programming is in assembly language. Various enhancements have been contemplated but prevented by lack of funds.

The first seven year's findings of the project have been analysed at Harvard University Department of Epidemiology and some useful preliminary results are being published. Further analysis is proceeding both at Harvard and the Department of Epidemiology of the London School of Hygiene and Tropical Medicine.

Costs: Data entry: 1 hour per week.
Other secretarial: one part-time secretary who also performs many other functions within the clinic.
3 part-time glaucoma technicians.

Transferability: Arrangements are in hand for the extension of the system to Southampton University and Eye Hospital, and it is also being considered by other centres. The system is sufficiently flexible to deal with minor changes in the data to be collected. Collaboration with Mount Zion Hospital, New York, is being actively pursued.

Comments: This project is of particular interest because there is reason to suspect that patients are losing their sight more rapidly than would be necessary because of the failure of the traditional system to follow them up adequately after diagnosis. The computer analysis of the results of succeeding examination is particularly helpful in this disease because several measurements may be required before a trend is apparent. This would appear to be one of the most fruitful areas for applying relatively simple automated follow-up systems.

Documents on File: Initial and follow-up record sheets; visual field chart.

Selected Publications:

CRICK, R.P. (1974) Chronic glaucoma; a preventable form of blindness. Lancet, 1, (850), 205-7.

CRICK, R.P. (1975) Prevention of blindness from glaucoma using the King's College Hospital computerized problem orientated medical record. Brit.J.Ophthalmol., 59, (4), 236-50.

CRICK, R.P. (1979) Computerised monitoring of glaucoma. In: Glaucoma - Contemporary International Concepts (Ed. J.G. Bellows) Masson Pub. U.S.A. Inc. pp.185-196.

CRICK, R.P. (1980) Computerised clinical data base for glaucoma - ten years' experience. In: Glaucoma Concepts. International Glaucoma Association Symposium, London (Ed. R.P. Crick) M.C.S. Consultants, Tunbridge Wells, Kent. pp. 29-39.

DAUBS, J.G. & CRICK, R.P. (1980) Epidemiological analysis of the King's College Hospital glaucoma data. In: Glaucoma Concepts. International Glaucoma Association Symposium, London, (Ed. R.P. Crick) M.C.S. Consultants, Tunbridge Wells, Kent. pp.41-59.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.9

Project Title: Health Education Council Card System for Contact Tracing (developed at STD Clinic, St. Thomas' Hospital)

Location: The Health Education Council, 78, New Oxford Street, London, WC1.

For Further Information Contact: Mrs. Isobel Hunter, The Praed Street Clinic, St. Mary's Hospital, London, W2.

Key Topics: Hospital speciality systems; linkage; form design; recall and screening; research information; computer systems (batch)

Summary: An efficient system for recording and managing information on the contacts of patients with Sexually Transmitted Diseases has been developed. It is based on work originally done by the former Medical Research Division of the H.E.C., located in Bristol, and has been adopted at a number of centres as shown below. The system was designed both to improve the quality of contact tracing and to facilitate epidemiological research. Although an extensive suite of programmes for analysing the data were developed in Bristol, funds have not permitted their being transferred to London. As currently used, the system is entirely manual.

A patient record card is made out for each patient and a contact card for each contact named. The cards are arranged to facilitate easy transfer to 80 column punch cards for computer input.

The system has been part of a general move to clarify the role of the contact tracer and to improve the quality of S.T.D. control. During the final stages of development emphasis was placed on training, and a handbook for contact tracers has been prepared. A HANDBOOK ON CONTACT TRACING IN SEXUALLY TRANSMITTED DISEASES, published by the H.E.C. in co-operation with the D.H.S.S., is available from the H.E.C. as of July, 1980.

Costs: It is felt that this system, by giving a structure, improves efficiency and lowers effort required to retrieve information. Cards are now supplied free of charge by the D.H.S.S., Enquiries to:

Room C204, Alexander Heming House, London, SE1 6BY.

Instructions for using the system are explained in the handbook.

Transferability: The system has already been adopted by the following centres:-
St. Thomas' Hospital, London; James Pringle House (Middlesex Hospital), London; St. Giles Hospital, London; The Radcliffe Infirmary, Oxford.

Queen Mary's Hospital, Stratford; Praed St. Clinic (St. Mary's Hospital); St. Lukes Hospital, Bradford; O.P. Dept., New West Suffolk District Hospital, Bury St. Edmunds; Derbyshire Royal Infirmary; Addenbrookes Hospital, Cambridge; Special Treatment Centre, Bullar St., Southampton; The Royal Hospital, Chesterfield; St. Bartholomews Hospital, London; Special Treatment Centre, Stoke-on-Trent; Cardiff Royal Infirmary; Royal Free Hospital, London; Peterborough District Hospital; Burton-on-Trent District Hospital; Manchester Royal Infirmary; Lincoln County Hospital; Nottingham General Hospital; West London Hospital; Wolverhampton Royal Hospital; Moorgate General Hospital; Royal Gwent Hospital.

Acceptance of the system by an increasing number of clinics appears to relate directly to newly-appointed staff with previous experience of it's use at another location.

Comments: This is a highly specialised area of care, but this relatively straightforward but carefully planned system seems to have made a major impact. The system has had an increasingly favourable reception among the contact tracers themselves. Some feel it has greatly improved their prestige and morale; others that it makes work. Certainly, the information system has been instrumental in helping to define the role of the contact tracer.

Documents on File: "The Development and Application of an Information System for Contact Tracing", May, 1974.

Selected Publications:

THE HEALTH EDUCATION COUNCIL (1976) Report on the Project Investigating the Job Requirements and Training of Health Workers in Special Clinics, 1st April, 1974-31st March, 1976.

SATIN, ANN (1977) A Record System for Contact Tracing. Brit.J.Vener.Dis., 53, (2)

SATIN, ANN & MILLS, ANGELA (1978). Measuring the outcome of contact tracing: 1) A description of the contact and patient populations studied; 2) The responsibilities of the health worker and the outcome of contact investigations. Brit.J.Vener.Dis., 54, (3)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.12

Project Title:	Clinical Records Project for Plastic Surgery
Location:	Canniesburn Hospital, Bearsden, Glasgow
For Further Information Contact:	Mr. D. Soutter, of Glasgow and West of Scotland Plastic and Oral Surgery Unit, Canniesburn Hospital, Bearsden, Glasgow, G61 1QL.
Key Topics:	Hospital speciality systems; research information; waiting list management; computer systems (batch); morbidity recording; nomenclature.
Summary:	The project collects and analyses administrative and clinical data in order to monitor the work of the unit, manage waiting lists and facilitate research. A clinically chosen sub-set of the large amount of administrative and clinical information being routinely collected is coded (entirely by clinical staff) and subsequently transferred onto punch cards by clerical staff. Normally four cards are sufficient but for groups of patients of particular research interest subsequent cards may be added. A part-time medical editor checks that data is completed satisfactorily. (75% of the clinical records require some correction at this stage.) Colour coding of the cards indicates the source and type of information and facilitates updating and correction. The information on the punch cards is transferred weekly in batch mode to an ICL computer. Standard ICL programs are used to validate, sort and update and analyse the data. Validity checks, some of them designed by the clinicians, ensure that the data to be analysed is as reliable as it can be. Rejected records are listed for correction. The up-to-date cumulative file has been interrogated in a batch mode in order to identify patients with specific conditions for clinical follow-up or for research purposes as well as to provide a description of the work of the unit.
Costs:	Staff costs include a part-time medical editor and a punch card operator. Computer programming and time was available from the Greater Glasgow Health Board. Costing is to be reviewed this year.
Transferability:	This would seem to be an important feature of the project in that a range of standard ICL computer programs have been used.

On-Site Evaluation:	An evaluation study is at present underway. It is anticipated that results will be published at the end of 1979.
Selected Publications:	LISTER, G.D. (1974) The development of clinical records for plastic surgery and their computer storage. Brit.J.Plast.Surg., 27 (1), 47-58.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.13

Project Title: Cardiology Records System

Location: St. Thomas' Hospital, London, SE1.

For Further Information Contact: Dr. M.M. Webb-Peploe, Consultant Physician, St. Thomas' Hospital.

Key Topics: Hospital speciality systems; G.P./hospital communication; computer-generated summaries; computer systems (on-line, batch); special input devices.

Summary: This system is now in use for all catheter and cardiac clinics. Data is collected for the system using a combination of mark sense forms for coded data and additional forms on which the doctor can enter a limited amount of free text relating to the past medical history, family history and previous treatment. The mark sense forms are read into the computer and the secretary then adds the free text directly on-line, using a VDU terminal. The system produces summaries which are included in the patient notes and replace the clinical notes and letters to the general practitioner.

The system operates using the St. Thomas' Hospital Computer Project equipment (see Ref. D7.)

Costs: Secretarial time: there is expected to be considerable secretarial time saved as a result of the computer-generated reports.
Medical: Although the forms are being vetted by medically qualified personnel during the implementation period, this is not expected to continue once the system is extended to the outpatients. The doctor will receive the letter to the general practitioner for checking and signature as he now receives the standard report.

Transferability: Many aspects of this system depend upon particular facilities available through the St. Thomas' Hospital Computer Project. To what extent other portions of the system might be transferable is not known at the present time.

Comments: The system is still in its early stages and further evaluation will have to wait for more complete implementation. The time savings quoted for the use of the mark sense forms and computer-generated

summaries over traditional reports are impressive. There are apparently some minor problems and administrative difficulties in the design of the forms, but these can be expected to be corrected as the system develops.

Related Project: Experimental Computer System, St. Thomas' Hospital (Ref. D7.).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.14

Project Title: MIST - Medical Information Storage System

Location: M.R.C. Clinical Research Unit, Northwick Park Hospital

For Further Information Contact: R. Greenwood, Computing Unit, M.R.C. Clinical Research Unit, Northwick Park Hospital, Watford Road, Harrow, Middlesex, HA1 3UJ.

Key Topics: Hospital systems; computer systems (batch); research information.

Summary: MIST - A Medical Information Storage System is a suite of Fortran subroutines designed to allow the easy definition and manipulation of clinical data. There are facilities for defining 'forms', manipulating data, dealing with multiple occurrences of the same record for time-orientated data, and a variety of other useful features. The system attempts to provide a readily accessible system which is less complex and more easily implemented than a full scale 'data-base' but provides the services specifically needed for handling clinical data. Users have found that although it takes considerable effort to set up the files initially, subsequent update and retrieval are very much easier than with specially written, 'one-off' programs.

The system is written in standard Fortran and should be relatively easy to implement in a variety of environments. To date it has been implemented on the DEC PDP/11 under RT-11, the ICL 1900 series machines and the XDS 9300. It is reported that little difficulty has been encountered with the code itself, although there are inevitably problems with the variation in file handling facilities under different operating systems.

Costs: The system should be capable of being adapted to most mini-computer environments.

Comments: MIST represents an interesting compromise between specially written programs and a full scale data base system. Because it is written in Fortran, it should be relatively accessible and of considerable interest to a wide range of users.

Selected References:

GREENWOOD, R.M., (1978) MIST: A Medical Information Storage System. Int.J.Bio.Med.Com., 9, 247-257

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.15

Project Title: CODIL based information management system

Location: Department of Computer Science, Brunel University, Uxbridge, Middlesex; Hillingdon Hospital, Hillingdon, Middlesex.

For Further Information Contact: Dr. C.F. Reynolds, Brunel University.
Dr. G. Sutton, Department of Cardiology, Hillingdon Hospital.

Key Topics: Research Information; Computer Systems (Batch and on-line) Data Base.

Summary: This system uses a novel software system, CODIL (Context Dependant Information Language). It aims to provide a very flexible data handling system which is easily used by non-computer specialists. The software is based on a simple psychological model of decision making. One of the main field tests of this system has been in a cardiology information system at Hillingdon Hospital. Since 1977 the system has been used in a batch mode to store research clinical information on cardiac patients. A terminal has now been installed for on-line use and the files transferred to the regional computer for on-line use.

The clinician using the system has found data entry extremely easy and flexible - much easier than the usual coding sheets. However, it was noted that there might be a danger in the extremely flexible data entry facilities if more than one person was abstracting the data since they do not impose the same level of discipline as traditional coding documents. The data retrieval facilities have not had a really satisfactory trial owing to problems with access to the computer. The data retrieval tasks have so far been performed by personnel from the computer science unit at Brunel. The use of medical rather than computer staff is not yet tested.

Transferability: The basic interpreter is written in standard Cobol and has been successfully implemented on both ICL, CDC, Honewell & DEC machines. An interactive version is available running under the George III operating system on the ICL 1900.

Comments: User orientated information systems are badly needed if the potential of information processing for radically altering the way in which tasks are approached is to be realised. Whether CODIL represents a really successful venture in this direction, it is probably too early to tell. It is regrettable that problems of access and general service have so far prevented an adequate trial. Certainly it contains a variety of extremely attractive features which should commend it. The fact that part of the development was originally based on work in the research liaison office of a pharmaceutical company and that a portion of the subsequent work has been conducted in medical problems is hopeful. The fact that the basic routines are written in ICL Cobol should certainly be helpful to the potential Health Service users.

Documents on File:

REYNOLDS, C.F., SHACKELL M., SUTTON, G. "Using CODIL to handle poorly structured clinical information"

Selected Publications:

REYNOLDS, C.F. (1971) CODIL, PART 1, The importance of flexibility. Computer Journal, Vol.14, p217-220.
REYNOLDS, C.F. (1971) CODIL, PART 2. The CODIL language and its interpreter, Comp.Jour.,14, p327-332.
REYNOLDS, C.F. (1974) Designing an interactive language for the pragmatic user. Proc.Euro.Comp.Conf.,p991-1006.
REYNOLDS, C.F. (1977) Matching the computer language to the user. Report CSTR/14, Brunel University.
REYNOLDS, C.F. (1978) A new look at the problem of open-ended applications, Pragmatic Programming and Sensible Software, 239-251.
REYNOLDS, C.F. (1978) A psychological approach to language design, Workshop on Computing Skills and Adaptive Systems.
REYNOLDS, C.F. (1978) The design and use of a computer language based on production system principles. Report CSTR/15, Brunel University.
REYNOLDS, C.F. (1975) TANTALIZE, a conversational problem solver written in CODIL. Second one day conference on Recent Topics in Cybernetics.
REYNOLDS, C.F. (1971) Handling cave fauna data on a computer. Trans.Cave Research Group of Great Britain, Vol. 13. p160-165.
REYNOLDS, C.F. (1976) A data base system for the individual research worker, Selective Dissemination of Information, IEEE, p1-7.
REYNOLDS, C.F. & OMRANI, D. (1978) Formalism & flexibility? Int.Conf. on Management of Data., Milan. pp.127-138.
NEAL, L.R. (1977) The computer handling of medical information for research purposes. Medinfo 77, p651-655.
PALMER, R.J. (1974) A computer based data retrieval system to aid research into myocardial infarction, B.Tech. dissertation. Brunel University.
MARMION, K. (1976) The study and use of the CODIL language in a patient recording system in Hillingdon Hospital. B.Tech. dissertation, Brunel University.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.16

Project Title: Computer Based Radio Therapy Clinical Records System

Location: Addenbrooke's Hospital, Cambridge.

For Further Information Contact: Terence Wheeler, FRCR.

Key Topics: Computer systems; batch mark sense forms; computer printed summaries.

Summary: The system provides a computerised disease index and basic computer printed summaries for the radiotherapy unit at Addenbrooke's Hospital. It also serves for basic records for clinical trials and for departmental statistics. Data for the systems is collected using mark sense forms which are filled in by the clinicians at the time of the patients visit. These are then transferred to the computer and the information entered on the permanent files and a summary printed, to be checked by the doctor. This system has been in use for a number of years.

There was reluctance on the part of some clinicians to complete the mark sense forms, and the system has now changed to a simple plain paper multiple choice questionnaire which is completed by the referring clinician, and where data is absent the records are searched by a clerk and the deficiency made good.

Costs: Clerical: one half/whole time equivalent
Computing: very modest
Development - approximately three man months

Comments: The use of mark sense forms has been one of the more appealing approaches to data collection for some time. However, numerous workers have found considerable reluctance on the part of clinicians and other clerical workers to fill them in adequately. It seems likely that as direct data entry techniques become more easily available, that the mark sense type applications will probably become less common.

Selected Publications:
WHEELER, T.K., HAYBITTLE, J.L. (1976) A computer-based radio-therapy clinical record system using mark-sense forms. Brit.J.Radiology, 49, 863-867.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B6.17

Project Title:	ORLCODE Automatic Coding System
Location:	Oxford Regional Health Authority, Old Road, Headington, Oxford.
For Further Information Contact:	Mr. L. Gill, Oxford University Unit of Clinical Epidemiology, Oxford Regional Health Authority.
Key Topics:	Hospital speciality systems; research information; computer systems (batch); automatic coding.
Summary:	The original work done on the KODIAC Automatic Coding System has been extended by the Oxford Record Linkage Study and the Oxford University Unit of Clinical Epidemiology to produce the ORLCODE System. They have greatly increased the speed and extended the range of the techniques of the system. The system now runs on a standard ICL 1900 series configuration and is being routinely used for coding the data for Hospital Activity Analysis from the Oxford R.H.A. This data is actually the original data from the Oxford medical records development without pre-editing of any sort. The system currently achieves a success rate of approximately 80/85% with this completely unedited data. The rate of mis-coding is very small.
Costs:	The system currently codes approximately 25 diagnoses per second on an ICL 1906A. The savings in clerical time for routine coding, as well as the increase in accuracy of the coding are considerable.
Comments:	Although it seems clear that automatic coding procedures will not enable 100% of the diagnoses which doctors choose to write on discharge summaries, it is extremely encouraging to see that a relatively straightforward system is able to eliminate a very large portion of the most tedious and repetitive coding. It is to be hoped that this success can be repeated.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number B6.18

Project Title:	Drug Monitoring Study
Location:	Southampton General Hospital
For Further Information Contact:	J.C. Davies, Clinical Information Officer, Hampshire A.H.A. (Teaching), 18/20, Cumberland Place, Southampton, SO1 2PD. Professor C.F. George, Department of Therapeutics, Southampton General Hospital, Southampton, SO9 4XY.
Key Topics:	Research information; drug monitoring; computer systems (batch); nomenclature.
Summary:	The project is concerned with the use of drugs in the various Cogwheel Divisions of the Southampton hospitals. The drug prescription sheet introduced several years ago forms an integral part of the notes, From this sheet are extracted identification data, coded drug names and where required, diagnoses. Drugs are recorded giving dose, route, frequency and start/finish date. The information is punched on standard 80 column cards and processed at the Regional Health Authority using their 1900 series computer. Output includes the use of drugs by various doctors, total numbers of drugs used, prescribing patterns, the different services. The initial purpose of the study was primarily to investigate the use of drugs within the N.H.S. from the point of view of cost-effectiveness of treatment, expense of new drugs, etc. By regular review it is possible to ascertain whether there has been any impact of propaganda. The information is also of value in medical education.
Costs:	1 full-time data preparation clerk; back-up time from a member of clinical staff in coding diagnoses. Programming has been done by the Regional Computer Staff. Computer time is relatively low.
Transferability:	The program suite should run on any standard H.A.A. configuration.
Comments:	The system seems likely to provide useful information at reasonable cost, but is too new to evaluate.
Related Projects:	Oxford Drug Monitoring Study (Ref. No. E103) Intensive Drug Monitoring Study, Belfast. (Ref.No. E201)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.19

Project Title: Institute of Cancer Research/Royal Marsden Hospital MUMPS System

Location: Royal Marsden Hospital, Sutton, Surrey.

For Further Information Contact: Dr. J. Milan, Royal Marsden Hospital.

Key Topics: Research Information; Computer Systems (on-line); Automatic coding; Natural language retrieval.

Summary: The purpose of this system, which was installed in 1977, is to aid Cancer Research by providing improved methods of collecting and analysing clinical data.

Self-contained systems are being developed for individual tumour study groups. These systems use branching on-line questionnaires for input, use common analysis routines and have a formalised standard data structure. All the clinical data considered to be of interest for selected groups of patients are recorded using these systems and, to date, they have been implemented for breast, leukaemia and testicular cancer. Data for these groups are abstracted from case notes and input by medically informed staff employed for this purpose.

A basic data set (disease, treatment and survival) is being recorded on all patients attending the Royal Marsden Hospital. This data is captured using a computerised system which combines the activities of (a) Cancer registration (b) Patient follow-up, including the production of routine letters and (c) the production of administrative statistics (H.A.A.) Automatic encoding techniques are used to encode diagnoses; SNOMED is used for neoplastic disease and ICD 9 is used for other cases. Eventually it is intended that similar techniques will be developed for treatment and survival information. This system is expected to be complete from an administrative viewpoint in June, 1980.

Systems are being developed for hospital laboratories and diagnostic departments so that the data from these departments can be captured directly and become automatically available without the labour of transcribing the data from case notes. To date, systems have been developed for Nuclear Medicine, Mammography, EMI-scan summaries and Histopathology. The Nuclear Medicine and Mammography systems generate reports from branching questionnaire input. The EMI-scan and Histopathology systems use automatic encoding techniques to encode summaries. The histopathology uses SNOMED to encode histological diagnoses in terms of topography, morphology, aetiology and function and is used by the histopathology department and an indexing system. The EMI-scan system is intended to encode more factors from relatively free format input and is at an early stage of development. A patient registration/Master Index System has been developed to provide the basic file linkage.

On-Site Evaluation: A PDP 11/70 computer is situated at the Royal Marsden Hospital, Sutton. This currently has 25 terminals, 15 of which are situated in Sutton and 10 are situated at the Royal Marsden Hospital, Fulham Road and connected to the computer via G.P.O. lines.

Costs: The total hardware cost to date is about £150,000. There are four full-time computing staff and the equivalent of two full-time staff are employed for data input.

Transferability: Most of the applications are transportable to other (Digital) Standard Mumps installations but are likely to require more or less tailoring to suit individual installations.

Comments: The success of the automatic encoding procedures which have been transferred into Mumps from the system developed at Northwick Park (Ref. B6.2) is of particular interest. They appear to be able to cope with the vast majority of the standard material presented to them and work with entirely acceptable speed on-line. The project demonstrates once again the ease of development of novel systems using Mumps.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number B6.20

Project Title:	Hospital Medical Record in King's College Department of Medicine
Location:	Department of Medicine, King's College Hospital, London.
For Further Information Contact:	Professor John Anderson, King's College Hospital Drs. F. Poole and R. McMillan, Sheffield Polytechnic.
Key Topics:	Form design; Audit; Research Information; Data Base Systems
Summary:	The objective of the project is a system analysis and design specification for a system of integrated medical records for the medical ward and outpatient clinics which might form the basis of a hospital record system. The record is being implemented using a distributed relational data base system providing a friendly user interface. The system requires that a paper record be left in the routine medical record folder. Changes in the format of the record system and different models of medical records are being explored. Of particular interest is a 'decision directed' form of the record designed so that different medical and nursing decisions can be investigated in relation to the quality of care. The medical staff in the Department of Medicine have been involved in the systems analysis and design and meet regularly to report progress and changes. Preliminary experiments have already suggested that an abbreviated record would give the clinician much more information about clinical control than is presently available.
Cost:	The project is developmental, and no running costs are available. So far the system has required about two man years each in the system design and medical information systems.
Documents on File:	"Hospital Medical Record in Departments of Medicine, Wards and Clinics" - Summary of one project at King's College Hospital "Medical Records in a General Practice Health Centre" - Summary of second project at King's College Hospital.

KING'S FUND MEDICAL RECORDS PROJECT

HOSPITAL SPECIALITY SYSTEMS IN BRIEF

Reference Number: B.101

Project Title:	Paediatric Information System
Location:	Royal Sussex County Hospital
For Further Information Contact:	Miss F.E. Stevens, District Medical Records Officer, The Royal Sussex County Hospital, Brighton, BN2 5BE.

A neonatal records system was developed at the Royal Sussex County Hospital, data for both the birth and post natal period of each child being collected on special forms. Coding sheets for entry of the data into the computer were designed but it was not possible to proceed with the project because of lack of computer time.

Reference Number: B.102

Project Title:	Computer-assisted Decision Making in an Antenatal Clinic.
Location:	Glasgow Royal Maternity Hospital
For Further Information Contact:	D. Davidson, Associate Director, Health Services Operational Unit, Balmano House, Rottenrow, Glasgow.

This project is described extensively in Methods of Information in Medicine, vol. 15, No. 4, p.224-9 (1976). It concerns itself with record keeping and decision making in an obstetric clinic and was developed and piloted successfully, but has not been continued.

Reference Number: B.103

Project Title:	St. Bartholomew's Hospital Urology Project
Location:	St. Bartholomew's Hospital, London, EC1.
For Further Information Contact:	Mr. J.E.A. Wickham, Department of Urology, St. Bartholomew's Hospital.

A fairly extensive computerised system for the departmental records and research instituted in the Department of Urology which has proved useful for both patient care and research. Development is currently suspended pending the possible introduction of a new computer system for the hospital.

Reference Number: B.104

Project Title:	Experimental Outpatient Hospital Activity Analysis
Location:	Chesterfield Royal Hospital, Chesterfield
For Further Information Contact:	Mr. K. Trout, Regional Statistics & Medical Records Officer, Trent Regional Health Authority, Fulwood House, Old Fulwood Road, Sheffield, S10 3TH.

This was originally an experimental project to assess the feasibility of obtaining, on a regular basis, information on outpatients and to assess the value of this information for administration and planning. It ceased to be a routine practice in 1978 when the Health District was asked to fund the project. The information was collected on forms filled in partially by the clinic staff and partially by the doctors. There was considerable difficulty in getting the doctors to fill in the diagnostic information requested. The forms used passed through several revisions in order to make them easier to use, but a considerable amount of clerical time was still used in searching the notes for the diagnoses. Some secondary and concommitant diagnoses were believed to be omitted from the coding.

Data from the forms were transferred to the computer by a key-to-disk system and processing was on the Regional Health Authority's ICL 1900 series machine. The programs were written in Cobol.

Reference Number: B.105

Project Title:	Breast Clinic Information System
Location:	Royal Infirmary, Edinburgh
For Further Information Contact:	Dr. M. Roberts, Edinburgh Breast Screening Clinic, Springwell House, 26, Ardmillan Terrace, Edinburgh, EH11.

This system aimed to improve the administration of the breast clinic by reducing the possibility of delay in the preparation and availability of reports. A longer term aim was to improve, by research, the diagnostic ability of the clinic. Clinicians entered information of an administrative and clinical nature onto specially designed forms and a part-time clerical assistant completed the form and entered the data in a computer terminal linked to the R.H.A. computer. Weekly printouts in a batch mode were provided from the main computer concerning the patients seen during the previous week. These were inserted into the case notes and enabled, for example, any patient with missing test results or a long wait for an operation, to be checked. A cumulated summary document was provided regularly which described the activity of the clinic, allowed routine statistics to be extracted and facilitated research.

This project recently came to an end but in the two years that it was alive, a file of 3,500 patients was accumulated.

KING'S FUND MEDICAL RECORDS PROJECT

SECTION C: HIGH DEPENDENCY MEDICINE

Introduction

With the increasing complexity of certain highly technological branches of medicine, the total amount of data collected on each individual patient becomes difficult to manage. In the projects in the other sections of this report, the emphasis has been on organising a relatively small amount of information concerning each of a relatively large number of patients. In this section, the systems are aimed at helping the doctor to integrate the very large volume of information which is collected on relatively few patients involved in either renal dialysis or intensive care. Emphasis in this particular type of project is on the organisation and integration of the data for a single patient and its presentation in a manner easily assimilated by the clinicians, frequently by means of graphical displays. Potentially, this is an area where automated decision aids might also play a major part. For instance, the Exeter Renal Dialysis Unit Information Project (Ref. No. C1.2) attempts to provide the clinician with a means of predicting the outcome of dialysis. It tests possible settings of the dialysis parameters against a mathematical model which includes previous measurements taken on the particular patient. The Charing Cross Renal Dialysis System (Ref. No. C1.1) now being made commercially available, provides a variety of facilities for helping the clinician to recognise when patients are not responding as expected to the dialysis programme. With the rapid increase in the availability of small computer systems, many more systems of this type can be expected to develop.

These systems are closely allied with the various experiments in patient monitoring, the analysis of electrocardiographic and electroencephalographic data and data from cardiac catheterisation; all areas which lie outside the immediate brief of the current study. The integration of these various techniques with improved processing of the information which they provide could potentially be an important step toward fuller realisation of the therapeutic potential of modern physiological knowledge.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number C1.1

Project Title:	Clinical Decision Making in Renal Disease
Location:	Charing Cross Hospital (Fulham), Fulham Palace Road, London, W6 8RF.
For Further Information Contact:	Dr. Michael Gordon, Department of Medicine
Key Topics:	High-dependency medicine; decision aids; computer-generated summaries; computer systems (real-time); graphics.

Summary:

Patients on renal dialysis generate an enormous number of laboratory test results. This project aims to hold this information on computer and to facilitate its display in a graphical form easily grasped by the clinician. The system is extremely flexible and will display graphs of any three of the routinely collected results simultaneously on the VDU screen. It will present either the pre-dialysis values, the post-dialysis values, or both. It can be directed to display just those values which lie outside a specified range, or any changes greater than a specified maximum.

The system has an interface with the main hospital computer and obtains the pathology results directly from it, but also maintains its own files on those patients on dialysis. The project is just leaving developmental stages, so the clinicians have not yet had sufficient time to evaluate its usefulness.

A 'packaged' system based on this prototype has been developed and is available commercially to run on a small dedicated computer.

Costs:

Because the system obtains most of its input directly from the hospital computer system, minimal extra clerical effort should be required to operate it.
Original Hardware: PDP11/40 plus a GT11 graphics terminal.
Packaged version: Hardware and Software (DEC LSI.11 based) approx. £20,000.

Transferability:

The system requires its own dedicated mini-computer and graphics terminal and is available as a package. The interface to the hospital computer is specific to the current environment, but could probably be duplicated at another site if a central system for automated reporting of lab results were available.

The package is being used for a system for the Oncology department which is to cover more than some 100,000 patient records.

If this is successful it would be an indication that the system might have much wider applicability.

Comments:

The renal dialysis project differs from most of the medical systems investigated in that a great deal of information is held on each of a relatively few patients. The usefulness of the computer to make such a mass of information intelligible to the clinicians can hardly be doubted. The potential also exists for the computer to issue warnings as trends in test values indicate the possibility of trouble developing. It should make it relatively uncommon that obviously ominous values are missed because they are buried in the mass of data which is collected routinely.
The graphics facilities of this system are unusually comprehensive.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number C1.2

Project Title: Renal Dialysis Unit Information Project

Location: University of Exeter

For Further Information Contact: R.S. Lott, University of Exeter, Department of Mathematical Statistics and Operational Research, Streatham Court, Rennes Drive, Exeter EX4 4PU.

Key Topics: High-dependency medicine; decision aids; computer systems (on-line); graphics.

Summary: The project, supported by the SRC, aims to aid the clinician to set up the optimal parameters for each dialysis run to obtain the desired weight and serum chemistries at the end of that run. The chemical pathology data and weight of each patient on renal dialysis are stored. These are used in a physiological model to predict the response of the patient to a dialysis with given parameters. The clinician selects the desired values for the blood chemistries following the next dialysis run. The computer then plots a graph of the flow rate and transmembrane pressure against duration such that any point on the given curves will achieve the desired result. Consultants can use any combination point on the curves given or they may decide that the indication is that the target values are unrealistic and revise them, in which case new curves will be plotted.

It is hoped eventually to provide a capability of displaying a patient's chemistries and weight graphically, as is done in the renal project at Charing Cross (Ref.C1).

Costs: Personnel: some time for data entry (exact value not available); one man-year for development. Computer: the project is currently implemented using spare capacity on the Department of Mathematical Statistics and Operational Research computer. The graphical display is quite sophisticated. Storage is by means of a floppy disc device which should be relatively inexpensive.

Transferability: The system is implemented in Algol-60 on a somewhat old machine, the Elliott 4120. It is likely therefore that other users would want to adapt the programs to other languages used on a different machine. However, this should not be too difficult. The terminal is a Tektronix 4012 graphics terminal and the system uses standard Tektronix routines (supplied in Fortran but translated to Algol) to drive it. The algorithms used should certainly be applicable to other renal dialysis systems if they prove clinically useful.

Comments: This project illustrates the potential usefulness of the combination of a computer-held record and sophisticated mathematical techniques for manipulating the information in that record to provide clinicians with a type of prediction which would not ordinarily be possible. It has now been in routine use for 3 years. Transfer to more up-to-date equipment is being contemplated.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number C1.3

Project Title:	Kent and Canterbury Renal Project
Location:	Renal Unit, Kent and Canterbury Hospital, Canterbury, CT1 3NG
For Further Information Contact:	Dr. M.J. Goggin, Consultant in Renal Medicine.
Key Topics:	High-dependency medicine; miscellaneous ledgers; computer systems (batch); graphics.
Summary:	The Kent and Canterbury Renal Project provides a relatively simple, batch system for maintaining cumulative records of renal dialysis patients and presenting them in graphical form. Data is collected routinely in the course of each dialysis and punched onto cards once a week, from which it is entered into the computer at the University of Kent. Routine output includes a graphical presentation of the blood pressure and weight of the patient over the past quarter and summaries of biochemical data which are monitored less frequently than every dialysis. These are monitored by the clinician in charge for any unexpected changes and then pasted into a cumulative ledger for each patient. All data is archived on magnetic tape for statistical analysis.
Costs:	Data preparation: 1-2 hours per week. Computer time: Minimal. The system saves a great deal of tedious work by Dr. Goggin and one of his secretaries who had previously made up similar ledgers for each patient by hand.
Transferability:	The system is written largely in Cobol and should be transferable to other machines. Documentation is reported to be adequate.
Comments:	This is a simple system which serves a relatively small group of patients at the present time, although the organisers would very much like to extend it to additional functions. Nevertheless, the clinicians feel that the presentation of information in graphical form is of sufficient importance that they were preparing the data themselves by hand prior to the advent of the system. If funds were available they would very much like to extend the functions of the system.

Comments: This project illustrates the potential usefulness of the combination of a computer-held record and sophisticated mathematical techniques for manipulating the information in that record to provide clinicians with a type of prediction which would not ordinarily be possible. Whether or not it is in fact helpful to the clinicians remains to be seen as this project has not yet been used in the clinical situation.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number C1.4

Project Title: Computerised Data Base for Clinical Information on Patients with Chronic Renal Failure.

Location: Royal Victoria Infirmary and the University of Newcastle upon Tyne.

For Further Information Contact: Dr. M.K. Ward, Consultant Physician, Department of Medicine, Royal Victoria Infirmary, Newcastle upon Tyne, NE1 4LP.

Key Topics: High-dependency medicine; computer systems (on-line); data base/codasyl; research information.

Summary: This project, supported by the Scientific Research Committee of the Area Health Authority and the University of Newcastle upon Tyne was designed to store key clinical information related to medical/surgical history, complications, drug therapy, diagnosis, radiological and histological reports on patients with chronic renal failure maintained on intermittent haemodialysis or following renal transplantation. In addition the biochemistry generated from each patients at each dialysis is also recorded. The information is accessible through a data base programme and can be displayed in many formats. It has been developed so that it can be of use to medical and nursing personnel unfamiliar with computer terminals and methods. It was designed as a research tool, i.e. comparing patients morbidity and mortality, biochemistry dialysis parameters, etc. It has been found to be a useful clinical tool for patient management.

It is hoped to be able to provide graphical and histogram display of biochemical data at any time, day or night.

The data base package currently used is called "Spires". It was developed at Stanford University and modified at the University of Alberta. It is run on the University of Newcastle upon Tyne IBM370; unfortunately at the present time is not portable.

Costs: One full-time secretary to handle data in-put and output. Part-time supervision by Dr. Ward. Computer: this is currently provided by the University. The computer programme is written jointly by a part-time BSc. Graduate and one of the medical personnel.

Comments: Between 7 and 10,000 pieces of information are stored per year on patients with chronic renal failure. A considerable amount of this information needs to be accessible at any time. Vital pieces of information are often lost with current

manual record handling systems. This computer data base can give an updated time orientated medical/surgical history and biochemical data profile in a few minutes. Thumbing through medical records to obtain the same information may take many hours, and vital information may be missed.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number C2

Project Title:	Patient Record Systems for Catheterisation and Pacemaker Procedures.
Location:	Cardiology Department, Royal Victoria Hospital, Belfast, BT12 6BA.
For Further Information Contact:	J.S. Geddes, Physician, Cardiac Department.
Key Topics:	High-dependency medicine; decision aids; computer systems (on-line, real-time); special input devices.
Summary:	Within the cardiology department of the Royal Victoria Hospital two parallel systems are being developed but are not yet fully implemented. a. Catheterisation: On-line measurements of physiological variables (Mennen-Greatbatch system) will be combined with clinical data input from optical mark reader cards to produce the combined information in a standard printout. This will be used to facilitate decisions concerning cardiac surgery. Records of operative procedures and follow-up data are added as a further aid to future clinical decision making. To ensure accuracy, no coding of input is necessary and updated printout is obtained at each stage of investigation and treatment. It is hoped that the output from the system will replace the patient's traditional, written record. b. Pacemaker records: This system will be used in conjunction with on-line measurements of pacemaker rate, pulse amplitude, pulse duration, etc. as an aid to decision-making and patient follow-up.
Costs:	Not yet available.
Transferability:	The computer is a PDP11/35 using RT11 programmed in Assembly and Fortran language. Further information is not yet available.
Documents on File:	Preliminary input formats.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number C3

Project Title: Patient Data Display System, Cardio-Thoracic Department

Location: Wythenshawe Hospital, Manchester.

For Further Information Contact: Mrs. P. Caddick, Computer Project Wythenshawe Hospital, Southmoor Road, Manchester, M23 9LT.

Key Topics: High-dependency medicine; decision aids; computer systems (real-time); graphics; key entry systems.

Summary: This computerised patient data display system can effectively collect data, which is inserted manually at source, manipulate it as required, store and display the information in a clear and concise form. Six months after hardware commissioning it had replaced all bedside charts and a large proportion of the patient notes within a 12-bedded Intensive Therapy Unit and a 10-bedded Coronary Care Unit.

A complete operational system was purchased in March, 1973 and is a copy of an already existing system to be found at the Karolinska Hospital in Stockholm.

The system consists of a Censor 908 processor, disk and paper tape facilities. The terminal equipment, located throughout the Cardio-Thoracic Department (Intensive Therapy Unit, Coronary Care Unit, Cardio-Thoracic Theatres and all allied laboratories) consists of 10 "Grafoskop" visual display units, 59 push-button intercoms of which 38 can be used to input data, and a hard-copy printer.

The visual display units all operate independently of each other and are used to display all aspects of the patients' condition, in graphical, tabulated and free-text forms.

The intercoms allow for input of up to 90 different numerical parameters, such as blood pressure and electrolytes, by the use of a two digit code system.

Initially, education and training of a multi-disciplinary team of doctors, nurses, laboratory and para medical staff was accomplished by a registered nurse and a computer adviser. In January, 1974, a secretary was employed and subsequently trained for the day-to-day running of the computer system, and since October, 1977, she has carried out all training, etc., whilst continuing to deal with all aspects of the computer system.

Staff reaction has been positive, users realising the significant potential of the system, and confidence and trust in the system is well established. System reliability has been very good, the system being in operation on a 24 hour basis, 365 days per year.

Costs: Costs are available on application to cover capital costs, all hardware, software, additional building and ventilation requirements, on-going costs and three-year maintenance contracts covering 24 hours, 365 days per year.

Transferability: Transferability has been demonstrated in a very practical way, in that it is essentially the same as systems in operation in Sweden and has also been transferred to the U.S.A.

Documents on File: Sample printout; descriptive handbook 'Real Time Patient Data Information System'.

Selected Publications:

ASHCROFT, J.M. & BERRY, J.L. (1975) The Wythenshawe Hospital Patient Data Display System. Europ.J.Intensive Care Medicine, 1. 49-52.

ASHCROFT, J.M. & BERRY, J.L. (1974) The Introduction of a Real-Time Patient Data Display System into the Cardio-Thoracic Department at Wythenshawe Hospital. MEDINFO-74, North Holland Publishing Company.

BRADSHAW, E.G. & THOMPSON, G.R. (1975) User Attitudes to a Real-Time Patient Data Display System. Acta Anaesth.Belg. 26, suppl. 191-99.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number C4

Project Title: Computer Display of Data from a Neo-Natal Intensive Care Unit.

Location: Department of Paediatrics, University College, London.

For Further Information Contact: A. Todd-Pokropek, Department of Medical Physics and Bio-Engineering, University College Hospital, Shropshire House, 11-20, Capper St., London, WC1E 6JA.

Key Topics: High-dependency medicine; research information; decision aids; computer systems (on-line); graphics.

Summary: This project aims to improve the care of infant patients, the majority with respiratory disorders, by speeding access to data and reducing the considerable amount of manual tabulation and graph drawing necessary to monitor progress.

Nine parameters are currently measured, including blood gas, acid/base and amount and type of ventilatory assistance given by clinicians.

Measurements are obtained off-line, recorded in a log book, then added to the cumulated data store for the particular child, via a standard keyboard and using conventional mnemonics. It is intended to perform certain of these measurements on-line in future, thus eliminating some keyboard entry. Two television screens within the Unit display this data in a standard graphical form, with facilities to automatically stretch or contract the horizontal time axes. Additional cot-side display of data is planned.

Although currently only the records of the six most seriously ill children are maintained on-line, this will shortly be extended to 24. Facilities exist to substitute patients with a time delay of less than one minute. A carefully designed print-out of all measurements presented on the screens may be produced on demand for insertion into the clinical data.

Work is in progress to implement the project as a stand alone system using a DEC PDP 11/34. The machine currently used is a PDP 11/45, shared with other computer research projects within the Department of Medical Physics, and programmed largely in Fortran. A projected direct link from the new system to the Biochemistry Department will enable results of tests to be added rapidly to the patient computer file.

Only a limited amount of formal evaluation has been completed at this stage. A small survey comparing the time taken to process the data showed a one minute (44%) saving using the computer. It is felt that accuracy is also improved, but this has yet to be tested.

Costs: Hardware and development costs for the original system are shared between several clinical applications which form a multi-tasking computer research project within the Department of Medical Physics. This project is supported by a D.H.S.S. grant. It is difficult to estimate what proportion of project costs should be allocated to neonatal records. Only a small amount of computer maintenance and minor administrative effort is required routinely. Total costs for the new system are not yet known.

Transferability: The PDP 11/45 and 11/34 are widely available and the programming, in Fortran, readily transferable. The terms used in visual displays are accepted in British medical circles and, in any event, could be changed fairly easily. A number of other sites are considering adoption of the system.

Comments: The display of graph data in this way has proved both useful and popular with clinicians (who do all the data entry) and nurses, particularly when coming on shift. The clinicians have found the material useful for teaching and research purposes.

Selected Publications:

ALLEN, L.P. et al (1978) Computer System for Recording and Display of Data from Newborn Infants with Respiratory Illnesses. Arch.Dis. Childhood, 53. (2) 169-72.

CLIFTON, J.S. et al. Special purpose computer systems for intensive care applications (In) "Real-time Computing in Patient Management" (Eds: D.W. Hill and J.P. Payne) London: Peregrinus.

KING'S FUND MEDICAL RECORDS PROJECT

SECTION D: HOSPITAL INFORMATION SYSTEMS

Introduction

The major projects to develop hospital information systems lie on the periphery of the main interests of this report. This is not to downgrade their importance to the health service as a whole, but merely reflects that, with a few exceptions, their primary goals and achievements to date have been more involved with the administrative aspects of the hospital than with the medical record itself. Furthermore, these projects each contain an evaluation team and are being extensively reviewed and reported elsewhere. Those interested in an overview of the various projects might be referred to the Profiles of National Health Service Computing, and the Annual Reports of the Scottish Health Service Computer Working Group. More detailed documentation is available from each of the projects and from the Department of Health and Social Security.

For those projects which most clearly affect medical records, or in which the administrative systems have advanced to the point where the distinction between administrative systems and medical records has become blurred (The London and Queen Elizabeth), we have attempted to provide summaries in the same format as the other major entries in the gazetteer. However, it must be understood that, even for these projects, the summaries reflect primarily those aspects of the work of most relevance to this survey. For the others, we have provided a much briefer paragraph indicating something of the relevant aspects of the work being done, but in no sense a summary of the project as a whole.

Since the first edition of the gazetteer, a large number of smaller scale hospital administration systems have been developed, only a few of which are included here. It has been particularly gratifying during the past year to see Regional Health Authorities moving towards coherent policies which it is hoped will allow a range of compatible machines in hospitals throughout a particular region.

North East Thames with its Mumps systems, East Anglia with its new CTL based systems are both moving in this direction, and other Authorities are in the process of formulating policies. In Scotland the use of the CMC Reality system for a variety of tasks appears to be achieving similar objectives in providing systems which can be made rapidly and economically available to fit local needs.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number D1

Project Title: Major Computer Project, Queen Elizabeth Hospital

Location: Queen Elizabeth Hospital, Birmingham

For Further Information Contact: P.M. Hills, Director of Computing, The Queen Elizabeth Hospital, Queen Elizabeth Medical Centre, Edgbaston, Birmingham, B15.2TH.

Key Topics: Hospital information systems; drug monitoring; computer systems (real-time); decision aids.

Summary: This project is one of the experimental computer projects attempting to produce a complete hospital information system. The administrative functions of the hospital, including admission, discharge and bed state were implemented in 1973. There are terminals on each ward. Requests for laboratory procedures are entered via the lab. terminals and the results can be displayed on the ward terminals as soon as available. The results are also printed in cumulative reports which are produced daily.

A drug information system has now been in use for more than two years and a linked drug prescribing system is in the final stages of preparation. The information system provides information on request concerning any of the drugs commonly used in the hospital including their indications, contra-indications, side effects, etc. When the prescription system is fully operational, the doctor will prescribe via the VDU and the computer will automatically schedule delivery of the drug to the correct rounds. The ward teletype will then print the prescription. Each prescription will be checked against the known pathology results and current medications for the individual patients, and warnings will be issued of potentially dangerous therapy. These warnings can, of course, be over-ridden by the prescribing doctor. Information concerning reduced dosage schedules for patients with impaired kidney function will also be provided.

The in-patient organisation system, which is now also operational at the Maternity and Children's hospitals, incorporates an automatic check against the Master Index when registering a patient, the automatic production of documentation and labels for all registered patients, and the provision of HAA data for the whole Central District of Birmingham.

A Nursing Order application is also in operation, and enhancements are planned. Nursing Orders for each patient are input by senior nursing staff. These are printed daily in bed location order on the Nursing Care List and are carried forward automatically until cancelled or superceded.

Costs: As in all the large computer projects, the costs are difficult to allocate among the different subsystems. The marginal cost of the drug prescribing system would appear to be modest in the context of the entire system. The effort invested in developing the information itself is considerable and is occupying most of the efforts of a pharmacist and a clinical pharmacologist, and in addition requires considerable additional consultant time to approve the final proposed displays.

Transferability: The details of the administration of the system are specific to the Queen Elizabeth Hospital, but are being modified successfully to cope with other hospitals in the same group. True transferability from the present site is not possible as the programming is entirely in assembly language and is therefore specific to the particular machine, although the work is reportedly fully specified and documented. The information gathered for the drug prescribing system should be useable at other institutions and other projects, whether or not the drug system itself is capable of adaptation.

On-Site Evaluation: There is an independent evaluation group on site who are engaged in a long term effort related to all of the applications.

Comments: The drug prescribing system will be among the first developments of the experimental projects to affect the medical care of the patient directly in ways which would be impossible without the integration of information which the computer system provides. At the point where the majority of the data generated by the diagnostic services is held for each patient within the system, the line between administrative systems and medical information systems becomes blurred.

Documents on File: Brief description of the state of the project at Autumn, 1975; work plans for 1976 and beyond; record formats; sample output.

Selected Publications:

BEELEY, L. et al. A real time system for drug prescribing (in preparation)

HILLS, P.M. (1978) The Objectives and Design Philosophy of the R/T computer project at the Queen Elizabeth Medical Centre. (In) "Medical Informatics, Europe 1978" (Ed: J. Anderson) Proceedings of the Conference, Cambridge.

SARGENT, S.W. (1978) Clinical Laboratory Systems. In: Medical Informatics, Europe, 1978. Ed.J. Anderson. Cambridge: Proceedings of Conference.

Related Projects: The London Hospital Experimental Computer Project (Ref. No. D3); North Staffordshire Hospital Centre Computer Project (Ref No. D9).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number D2

Project Title: Aberdeen Computer Network Project

Location: Aberdeen Medical Computing Centre

For Further Information Contact: K. Allen, Project Director, Regional Computing Project, Medical Computing Centre, Westburn Road, Aberdeen AB9 2XW.

Key Topics: Hospital information systems; G.P./hospital communication; waiting list management; decision aids; POMR; computer-generated summaries; computer systems (batch); codasyl/data base; turn-around forms; automatic coding.

Summary: This experimental computer project is investigating the feasibility of using in the medical environment a generalised data management system based on the Codasyl standards. Two applications are of particular interest.

The patient record (Ward IV) experiment currently implemented for the Department of General Medicine, collates information from the admission data, a modified discharge summary, and carbon copies of all prescriptions to produce a 'care profile'. Letters to the patients' general practitioners are generated automatically after the visit. The 'care profile' includes a master problem list of both active and inactive problems, the details of the last outpatient or inpatient contact with the General Medicine Dept., a list of all medications on which the patient was placed at his last contact, and the reason for the patient's last admission.

The clinic staff make their notes directly on the summary form which is then entered onto the computer. Diagnoses are entered in plain text but in the order 'pathology, site, aetiology, other information' except where this is strongly at variance with standard practice (e.g. duodenal ulcer). Diagnoses or problems recognised by the system are coded automatically; those not recognised are checked manually for errors and if correct added to the diagnosis or problem dictionary. Considerable progress has been made in standardising nomenclature. The automatic coding is based on a simple, character-by-character exact match procedure, thus ensuring that clinical staff always get back what was put into the system.

The second application is a generalised program for waiting list management. On request, the system will present lists of patients on a given service in

three categories, 'urgent', 'soon', and 'routine'. It is also possible to specify 'admit before a certain date'. The novel aspect of the system is that the patients in the 'routine' category are ordered according to the ratio of time actually waited to time deemed 'appropriate' by their consultants for patients with the same diagnosis. The doctors have found this procedure to be highly satisfactory and the system provides a variety of support in the form of statistics and simulation programs to help the consultants decide what is the 'appropriate' waiting time.

The system currently operates in a rapid turn-around batch mode, but a real time version with terminals in the clinics is in the final stages of implementation.

Extensive checks to safeguard the confidentiality of the record are integral to the system.

Costs: The system has operated primarily in batch mode and with rapid turn-around. The overall cost is modest relative to many of the experimental computer projects. The costs of the new real-time system are not known but should not be expensive. Short-term design and development costs have been high, although less than if the programming had been implemented in a low level language.

Transferability: The primary aim of using a data base management system which conforms to the Codasyl standard is that it is hoped that this formulation will be widely accepted in large data base applications in the future. The basic data structures and many of the programs would therefore be much more transferable than if they were expressed in terms of a more highly specialised system.

The waiting list program is written so as to be extremely general and might well have applications in many other specialities.

The Data Base Management system itself is written in Coral-66, a high level systems programming language. Compilers are currently available for a number of machines but are not widespread. Many of the application programs are written in Fortran augmented by the Codasyl based Data Manipulation and Data Description Language. The application programs should be more transferable than those of systems written in low level languages, but will depend on the data base management system.

On-Site Evaluation: The on-site evaluation committee produced a mass of baseline studies and an extensive study of the waiting list system. Perhaps the best criteria is that a number of additional clinics within the hospital are now anxious to employ the system.

Comments: The project's prime interest is in its application of general, and therefore hopefully transferable, techniques to medical information systems. The speed with which the development group can now mount new applications is impressive. The applications themselves, seem well liked by the clinicians, but detailed evaluation must await fuller implementation. Numerous 'before and after' studies have been done on the administrative aspects of the system, but interpretation is, as always, difficult.

Documents on File: Annual Report of the Medical Computing Network Project, 1974-75, The Grampian Area Health Board; patient history sheet; sample output.

Related Projects: Implementation of Problem Orientated Medical Records (Ref. No. A2.).

Selected Publications:

PETRIE, J.C. & McINTYRE, N. (1979) The Problem Orientated Medical Record - its use in hospitals, general practice and medical education. Churchill Livingstone, Edinburgh.

BEVERIDGE, T. & PETRIE, J.C. (1972) The transfer of information about the intake of drugs by patients referred to medical units. Brit.Med.J., 2, 37-39.

STARR, K.J., PETRIE, J.C. (1972) Drug interactions in patients on long-term oral anticoagulant and antihypertensive adrenergic neuron blocking drugs. Brit.Med.J., 4, 133-135.

PETRIE, J.C. HOWIE, J.G.R. & DURNO, D. (1974) Awareness and experience of general practitioners of selected drug interactions. Brit.Med.J., 2, 262-264.

PETRIE, J.C. HOWIE, J.G.R. & DURNO, D. (1975) Drug interactions in general practice in Clinical Effects of Interaction between Drugs, Petrie, J.C & Cluff, L.E. Editors. A.S.P. Bio. & Med. Press. Elsevier, Excerpta Medica, North Holland.

LOGIE, A.W., GALLOWAY, D.B. & PETRIE, J.C. (1976) Drug interactions in long-term antidiabetic therapy. Brit.J. of Clin. Pharm.,3, 1027-1032.

LINDSAY, D.C. MEREDITH, A.L. & PETRIE, J.C. (1977) An experimental data base for clinical and administrative use. Med.Comp., Berlin, 735-739.

HOWIE, J.G.R., JEFFERS, T.A., MILLAR, H.R. & PETRIE, J.C. Prevention of drug interactions. Brit.J. of Clin.Pharm. 4, 611-614.

WILSON, L.A., PETRIE, J.C. DAWSON, A.A., & MARRON, A.C. (1978) The New Aberdeen Medical Record. Brit.Med.J., 2, 414-416.

PETRIE, J.C. (1979) Systems Approach to Care in a General Medical Unit. Proceedings of Annual Scientific Meeting of the Faculty of Community Medicine. 21-22.

ERSKINE, Z.G., MOIR, D.C., JEFFERS, T.A. & PETRIE, J.C. (1978) An outpatient medication record. Brit.Med.J., 2, 1606-1607.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number D3

Project Title: The London Hospital Experimental Computer Project

Location: The London Hospital

For Further Information Contact: Professor R. Cohen, Department of Medicine, The London Hospital, Whitechapel, London, E.1.; Mr. J. Rowson, Director of Computing, The London Hospital, John Ellicott Centre, Cavell Street, London, E.1.

Key Topics: Hospital information systems; waiting list management; drug monitoring; decision aids; evaluation; computer systems (on-line).

Summary: This project is one of the early Experimental Computer Projects sponsored by the DHSS to explore the role of on-line computing in improving patient care and hospital administration. Major systems now working include an in-patient index, bed state, waiting list and pathology systems including clinical chemistry, haematology and microbiology, nurse training and allocation.

All laboratory requests can now be made through the system with a considerable saving in time for the house officer or registrar. On-line results from clinical chemistry, haematology and microbiology are available in the wards, as is X-ray requesting and reporting.

A pharmacy information system has been partially implemented. This provides information on request concerning important clinical considerations in using drugs including interactions, side effects, etc. Aids to drug prescribing in renal failure are already available on-line.

Costs: As with all major computer projects, precise costs are difficult to establish. However, it is estimated that running costs are £0.5 million per annum, approximately half of this representing development costs and the remainder routine work.

Transferability: The system is currently in operation at The London Hospital and the Mile End Hospital. It is entirely written in Assembly language and so is designed for a particular environment. However, many of the concepts, as opposed to the specific hardware and software have been adopted at other sites within the U.K. and abroad. It is of interest that the clinical chemistry system supporting automated laboratory equipment has been borrowed from Dundee and interfaced with the London system.

On-Site Evaluation:	The experimental programme provided for an evaluation of the systems introduced and there is an in-house evaluation team. Reports reflecting the changes brought about by the introduction of the computer indicate amongst other things a considerable improvement in the speed with which the laboratory requests are handled and also an improvement in the administrative departments. There are indications that the amount of time which nurses spend off the wards has also been reduced. Further evaluation is currently being undertaken using the DHSS Performance Criteria methodology.
Comments:	Junior staff in the hospital appear to be very enthusiastic about the systems and believe that they save them time. It is a measure of the systems' success that the AHA, through Region, is to finance replacement of the hardware in 1981.
Documents on File:	"A Guide to the London Hospital Computer System" (1972) A handbook produced by the London Hospital. "The London Hospital Computer System - a case study in the installation of a major real-time systems" (1974) The London Hospital.
Selected Publications:	BARBER, B. (1974) The Approach to an Evaluation of London Hospital Computer Project. MEDINFO-74, North Holland Publishing Company, pp. 155-65.
Related Projects:	North Staffordshire Hospital Centre Computer Project (Ref. D9.); Major Computer Project; Queen Elizabeth Hospital, Birmingham (Ref. D1); The London Hospital Maternity Register (Ref. B1.5).

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number D4

Project Title:	University College Hospital Major Computer Project
Location:	University College Hospital, Gower St., London, WC1.
For Further Information Contact:	Ms. Ruth Grace.
Key Topics:	Computer systems (on-line)
Summary:	University College Hospital was originally one of the participants in the 'four hospital project' using common hardware and a Codasyl data base. Following various hardware and software problems, this system has been exchanged for a Mumps based system. The basic system was rewritten from Cobol into Mumps in a period of six months by a relatively small team of programmers and analysts. It now provides a master patient index, hospital inpatient and admission and discharge systems as well as links to laboratory systems and various other specialised subsystems. The basic hospital inpatient system is being 'packaged' and introduced to replace the system at Southend on Sea (See Ref. No. D4.) The microbiology request and reporting system has recently been transferred to Selly Oak Hospital.
Costs:	Hardware: approximately £150,000. Developmental team: ten people for six months plus a current team of three.
Transferability:	It is hoped that the system will be portable between hospital environments and some effort is going into producing a flexible package. Mumps is available on a variety of equipment, although the primary application in the U.K. is Digital Equipment Corporation.
Comments:	The greatest single interest in the system has been the speed with which developments have proved possible in Mumps. The possibility of using systems such as Mumps to produce tailored systems relatively rapidly has been one of the most hopeful developments of the past few years.
Selected Publications:	HALL, D.G. (1979) Experience of transferring an integrated hospital-administration system from a CODASYL data base to a standard MUMPS file structure. Med.Inform., 4, (2), 93-103.

KING'S FUND MEDICAL RECORDS PROJECT

HOSPITAL INFORMATION SYSTEMS IN BRIEF

Reference Number: D5

Project Title: Exeter Community Health Project

Location: Exeter

For Further Information Contact: Mr. J. Sparrow, Director, Exeter Community Health Services Computer Project, Royal Devon & Exeter Hospital (Wonford), Barrack Road, Exeter EX2 5DW.

The hospital services of the Exeter Community Health Project should not really be separated from the remainder of the project (Ref. F2.6) as the aim is an integrated system. The hospital system provides administrative and nursing services for the District General Hospital including registration and waiting list management. Microfiche are used to provide an up-to-date community index to replace the manual card index for both reference and standby purposes. The nursing systems are run by nurses using terminals on the ward. Hard copy records of the nursing orders are provided at ward level and are included with the case notes on patient discharge.

A pharmacy information system is provided and there is a wide range of other on-line facilities similar to other major hospital projects referred to elsewhere in this Gazetteer (see Ref. D1. and D3.).

Reference Numbers: D6-D9

The computer projects at Charing Cross Hospital, St. Thomas' Hospital, University College Hospital and Addenbrooke's Hospital form the co-ordinated project. However, since each has its own machine and project team, the four projects are described separately.

Reference Number: D6

Project Title: Charing Cross Hospital Computer Project

Location: Charing Cross Hospital

For Further Information Contact: Mr. C.H. Sinclair, Project Director, Dept. of Medical Computing Science, Charing Cross Hospital (Fulham) Fulham Palace Road, London, W6 8RF.

A number of applications have so far been implemented, including a master patient index using microfiche, and a patient administration system including bed state. The extension of the latter system to the other three Districts in the Area is imminent, with each District Hospital having a direct link with the Sigma 6 at Charing Cross. An obstetric system, primarily for Queen Charlotte's, is operational, as are several laboratory systems, An "Abbreviated Patient Record" for anaesthetics, for which patient data had been collected over the previous 18 months, was implemented in January, 1980. A pharmacy system is also planned, and Stage 1 should now be operational.

Much of the data input for the system is by mark sense forms, with data validation being carried out on-line.

Reference Number: D7

Project Title:	Experimental Computer System
Location:	St. Thomas' Hospital
For Further Information Contact:	Mr. V.S. Robertson, Director of Management and Computing Sciences, St. Thomas' Hospital, London SE1 7EH. Sharpey-Schafer Centre.

Systems covering registration, patient master index, admissions, discharges and transfers, theatre statistics, clinic documentation, microbiology and haematology have been implemented and are well established. The Phoenix system for chemical pathology has been transferred from Hammersmith and developed for St. Thomas' use on a Prime 300 computer to accommodate a Vickers M300 analyser on-line. A second generation of laboratory systems is now under development. It is anticipated that all patient care systems will be integrated into a summary record that will supplement, and in some cases replace the traditional case notes. The summary record can also form part of the discharge letter to the referring G.P. A summary record system has been developed for cardiology, using optical mark recording. This system is still being extended. Extensive developmental work has been done for a similar system in the Diabetic Clinic. 24,000 patients are held on age/sex registers used by 2 local Group Practices to assist in clinical management and administration. Another system has been developed to assist in the clinical management of haemophiliacs and the administration of the Coagulation Department. This has also been enhanced to provide a supra-regional service to other Haemophilia Centres. An interactive patient dialogue has been developed for the treatment of V.D. patients. A nursing personnel system is under development. Data capture for the various systems is by means of mark sense documents and keyboard. Some laboratory analysers are on-line. All data are validated on-line. A number of systems have been transferred elsewhere.

KING'S FUND MEDICAL RECORDS PROJECT

HOSPITAL INFORMATION SYSTEMS IN BRIEF

Reference Number D8

Project Title: Addenbrooke's Hospital Medical Records Service

Location: Addenbrooke's Hospital, Cambridge

For Further Information Contact: Mr. J.R. Bryant, Technical Director, Computer Unit: Miss J. McClintock, Patient Services Officer Addenbrooke's Hospital, Hills Road, Cambridge, CB2 2QQ.

The medical records service is being assisted by a computer-based system with on-line access for record staff. The data base may be accessed using a number of pre-defined transactions. The hospital's master patient index has been included and all patient registration, documentation, and outpatient appointments are incorporated. Work on the inclusion of the waiting lists and inpatient admissions is almost complete.

Reference Number D9

Project Title: North Staffordshire Hospital Centre Computer Project

Location: The North Staffordshire Hospital Centre, Stoke-on-Trent

For Further Information Contact: A.M. Nash, Director of Computing Services, Staffordshire Area Health Authority (North Staffs. District), Princes Road, Hartshill, Stoke-on-Trent.

This DHSS experimental computer project aimed to create a total, integrated system for hospital records. At the end of the experiment not all plans had been achieved. Many of the systems will now be developed as packages for Regional and National use.

Reference Number D10

Project Title: Liverpool Experimental Computer Project

Location: Royal Liverpool Hospital

For Further Information Contact: Mr. A.J. Fawke, Regional Computer Services Officer, Mersey Regional Health Authority.

This is a former DHSS experimental computer project using a combination of a dedicated small computer in real-time and access to a large computer in batch mode to handle the hospital's basic administrative workload.

Implementation to date includes 1, patient registration with a master index produced in microfiche form, 2, an on-line out-patient appointment booking system, 3, an out-patient administrative system incorporating picking and clinic lists and the provision of out-patient attendance statistics, 4, an inpatient recording system providing access to an on-line bed state enquiry facility and 5, a drug stock control reporting system.

KING'S FUND MEDICAL RECORDS PROJECT

HOSPITAL INFORMATION SYSTEMS IN BRIEF

Reference Number: D11

Project Title:	Western District Hospital Computer Project, Glasgow.
Location:	Western District Medical Computing Department
For Further Information Contact:	Dr. J.W.K. Robertson, Systems & Programming Manager, Western District Medical Computing Department, Sisters' Home Building, Western Infirmary, Glasgow, G11 6NT.

This project is providing an integrated information service for 9 of the hospitals in the district based on a network of semi-intelligent terminals. Patient registration, bed state and discharge systems are operational. Replacement of the data capture equipment is planned, which will provide on-line access to these functions. The project is of interest in the routine use of an automated coding system for the coding of all HAA data (including Diagnosis, Operations and Occupations). This latter system is based on the SWITCH system reported in Ref. B6.3. The HAA data processing and automated coding has been extended to deal with all patient discharges from general hospitals in Glasgow, some 160,000 patient discharges per year, and has been revised to use ICD9 coding.

Reference Number: D12

Project Title:	Ward Computer Project, Ninewells Hospital
Location:	Ninewells Hospital, Dundee
For Further Information Contact:	C.R. Henney, Research Officer. Prof. J. Crooks, Co-Director. Department of Therapeutics, Ninewells Hospital

This project, based on a small real-time computer, has both a service and a developmental component.

A 24-hour on-line patient administration and nursing system has been installed in six medical wards over an 18-month period, and is now fully operational. Data on patients and their nursing care are entered by the nurse-in-charge on a ward-based visual display unit, and individual patient care plans and care summaries are produced, in standard A4 format, on a serial printer also situated in the ward. Patient-orientated nursing care is greatly facilitated by the system which also allows task-orientated care to be given. The system is well liked by the nurses. Research and development are currently concentrated in two areas:-

1. extension of the system to a surgical ward;
2. links to the Biochemical Medicine computers, the projected Ninewells administration computer, and the computerised Tayside Master Patient Index, to form a co-ordinated network for information interchange.

Reference Number: D13

Project Title: Nottingham Hospital Computer Project

Location: Queen's Medical Centre, Nottingham/Hallamshire Hospital, Sheffield

For Further Information Contact: J. Ingram, Queen's Medical Centre, Nottingham

This group is responsible for hospital administrative application in the Trent Region. A master patient index and rapid turn-around batch processing outpatient system based on the work done at St. James's Hospital in Leeds has been developed and implemented at Nottingham. A basic patient admission/discharge and bedstate system has been developed as an inpatient system for the Hallamshire Hospital in Sheffield. There have been some problems with the batch system, and it is now felt that an on-line outpatient system would be both more cost effective and easier to operate. Possible conversion to an on-line outpatient system is under consideration.

Reference Number: D14

Project Title: Oxford Commputer Project

Location: Oxford Regional Health Authority

For Further Information Contact: Mr. C. Smith

The original D.H.S.S. experimental project has now been absorbed by the Regional Health Authority. The Hospital admission, discharge and patient index systems are being transferred from the original equipment to Digital Standard Mumps. Other applications are a blood bank system and a pathology system, both also written in Mumps.

Reference Number: D15

Project Title: St. James's University Hospital Out-Patient System

Location: St. James's University Hospital, Leeds, LS9 7TF.

For Further Information Contact: Mr. R. Fawcett, Patient Services Officer

A rapid turn-around batch processing system has been implemented and in use since 1974. It has appeared to work relatively smoothly, and the Medical Records staff are pleased with the results. A basic in-patient system has been developed in co-operation with the Sunderland Hospital.

Implementation of an In-Patient Waiting List system has also been developed.

Reference Number: D16

Project Title: Sunderland General Hospital In-Patient System

Location: Sunderland General Hospital

For Further Information Contact: Mr. J. Hedley

A basic inpatient administration system including bedstates, H.A.A., SH3 statistics and similar functions, as well as stores control and some administrative facilities, was implemented using an ICL 7020 system and in April 1980 was transferred to an ICL 2903 computer. The system has been adopted by the St. James's Infirmary, Leeds. (see Ref. No. D15).

Reference Number: D17

Project Title: Southend Experimental Computer Project

Location: N.E. Thames Regional Health Authority; Southend Hospital

For Further Information Contact: Mr. Peter Lock, Regional Computing Services Manager, Regional Computing Centre, Haroldwood Hospital, Haroldwood, Essex.

This project originally demonstrated the usefulness of a relatively modest administrative system developed very rapidly with the use of an interpretive language. This system has now reached the end of its expected life and is being replaced with the first transfer of the MUMPS based program developed at the University College Hospitals for the N.E. Thames region.

Reference Number: D18

Project Title: Stirling Health Board Hospital Inpatient System

Location: Stirling Royal Infirmary, Faulkner District Hospital

For Further Information Contact: Mr. R. Ferguson, Stirling Health Board

A basic inpatient system including admission and discharge, SMR1 (HAA) data bedstate, waiting list etc. has been implemented using the CMC Reality package. A diabetic register is in the final planning stages.

Reference Number: D19

Project Title: Inverclyde Royal Infirmary Inpatient System

Location: Inverclyde Hospital

For Further Information Contact: Dr. D. Davidson, Argyle and Clyde Health Board, Paisley, Scotland.

An inpatient system has been implemented using much of the work from the Stirling Health Board. Various additional facilities are being added.

Reference Number: D20

Project Title: Ayrshire and Arran Health Board Projects

Location: Ayrshire and Arran Health Board

For Further Information Contact: Mungo Scott

A master patient index using the Tayside system with slight modifications has been implemented. There is also a hospital inpatient system based on the CMC Reality package which includes bedstate, admission and discharge, SMR1 (HAA) data, etc. The group hopes shortly to be developing an out-patient system.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number D.101

Project Title: East Anglia Co-ordinated Development

Location: East Anglia R.H.A., Union Lane, Chesterton, Cambridge,CB4 1RF.

For Further Information Contact: P. Westcott, R.C.S.O., East Anglia R.H.A.

The East Anglia R.H.A. has recently tendered for the development of a standard hospital administration system which it hopes to install throughout the region. The initial systems will be installed in Kings Lynn in 1981.

KING'S FUND MEDICAL RECORDS PROJECT

SECTION E - INTERFACE

Introduction

The projects in this section fall into two groups: those dealing primarily with the integration of information from several different sources and those aimed at improving communication between the various sectors of the health and social services. The best known of the projects in the first category is the Oxford Record Linkage Study (Ref. No. E1.1), which has developed the techniques required for linking records from hospital and the registration of births and deaths to provide an important tool for research and health planning. The Northern Ireland Record Linkage Programme (Ref. No. E1.2) has produced somewhat similar work with a greater emphasis on child health and genetic disorders. Various of the psychiatric and follow-up registers employ some of the techniques derived from the record linkage programmes. Whilst they do not, strictly speaking, involve changes in the clinical record itself, they seek to extend the usefulness of the medical record and the expertise which they have developed in patient identification is relevant to a great many projects of other types. Failure to identify patients accurately has been a source of recurring problems in numerous projects.

Communication among the general practitioners, hospital consultants, health visitors and the social services all too frequently remains haphazard. In obstetrics, the simple expedient of giving the patient a summary card containing the most important information on their pregnancies is becoming widely accepted. Two groups (Ref. No. E2.1 and E2.3) has gone much further and given the patient her entire obstetric record. In general, these programmes have proved extremely successful. Few patients forget their cards or records when attending a consultation, and virtually none actually lose them (how many obstetric clinics can claim 98% availability of their own records?) A few practices, such as Dr. Crombie's in Birmingham (Ref. No. F2.10) are experimenting with other types of patients' cards containing a list of the patient's continuing medication. Although the limits on what information should be given to a patient remain controversial, in a great many conditions the most efficient way to make sure that the core of information needed is

available to each of the different clinicians who treat the patient is to have the patients carry that information themselves.

The length of time between a patient's discharge and the arrival of the consultant's discharge note at his general practitioner's surgery is a continuing problem within the health service. Attempts to get at least a minimal note containing the discharge medications and final problem list or diagnoses to the general practitioner immediately have been incorporated in a number of projects reported in other sections of the gazetteer. A number of the computer-aided clinics and specialist projects also aim to produce a summary which can be sent to the general practitioner much more rapidly than it is usually possible for the consultant to dictate his full note.

The organisation of the care of patients with chronic diseases which is shared between the hospital specialist clinic and the general practitioner is an especially fertile area for investigation and innovation. The Scottish and Welsh Automated Follow-Up Registers for patients with thyroid conditions (Ref. No.E3.1 and E3.2) have established a model in which the overall plan of care is maintained jointly by the hospital clinic and the patient's general practitioner. The actual follow-up examinations are performed by the general practitioner. A central computer-assisted register is used to control all the administration procedures and ensure that patients are not lost to follow-up. A similar approach is planned for diabetic patients in the Nottingham Diabetic Project (Ref. No. B4.4).

It is also possible, of course, to operate follow-up registers purely from the hospital without direct involvement of the general practitioner. Within thyroid disease, the systems operating at Sheffield and Birmingham involve the general practitioner only for those patients who live at a great distance from the thyroid clinic (Ref. Nos. E3.3 and E3.4). In some fields, such as glaucoma (Ref. No. B6.8), there is no choice as the general practitioner does not normally have the necessary technical equipment. The pattern of organisation of such services, and the extent to which the collaboration of the relevant general practitioner is sought, raises fundamental issues concerned with the delivery of health care within the National Health Service. With availability of

resources becoming more restricted, it seems only reasonable to look at greater integration of care as one possible means of rationalisation. Adequate information systems are one important aspect of such integration.

Two very different projects are aimed at integrating information for an entire district. The Tayside Master Patient Index (Ref. No. E4.1) aims to establish a central system for identifying all patients in a given area as a basis for the development of a variety of services. The Exeter Community Health Project (Ref. No. F2.6) actually aims at an integrated record structure for most of the services of a district, on-line and immediately available, in the context of a large, real-time computer system (see also D5). The original aim of the Exeter project to create a total Community Medical Information System has now largely been superceded, as the emphasis has been centred on systems for the general practitioner which would be practical for the individual surgery.

The Tayside system is spreading throughout Scotland (Ref. No. E4.3) and to sites in Northern Ireland and England. There is also a programme, independently, to develop a Family Practitioner System for England which would, in fact, provide many of the same facilities as the Master Patient Index systems. However, considerations of confidentiality are likely to limit the amount of clinical data which can be stored on control used systems. It is probably most useful to see the F.P.C. and Master Patient Index Systems as facilitating the linking of other systems and simplifying the task of creating new systems than as all embracing community information systems in their own right. This leads naturally to a view of integration based on co-ordinating the three holders of information - patient, hospital and general practice - with the central index providing links between them.

There are a number of types of register and follow-up systems which have now become widely accepted and whose implementation throughout the Health Service is now official DHSS policy. We have not included these because ample documentation is available elsewhere. In particular,

there is a detailed report on the Child Health Registers, and two separate reports on the different Cancer Registries are in preparation. Psychiatric and mental subnormality registers have likewise become widespread.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E1.1

Project Title: Oxford Record Linkage Study

Location: Oxford Regional Health Authority, Old Road, Headington, Oxford.

For Further Informaton Contact: Dr. J.A. Baldwin, Oxford University, Unit of Clinical Epidemiology, Oxford Regional Health Authority.

Key Topics: Interface; research information; linkage; computer systems (batch); key entry systems; automatic coding.

Summary: The Oxford Record Linkage Study creates cumulative person records from hospital, birth and death registration and other records for most of the Oxford Region. The Oxford Psychiatric Case Register is also operated under its aegis. Its central purpose is to develop the technology of linking and demonstrate the epidemiological value of linked person and family records. The project also provides a research facility for doctors in the Oxford area, and answers a number of ad hoc requests each year.

The hospital information comes from admission and discharge forms used for the collection of data for the Hospital Activity Analysis. Since it was known that significant inconsistencies exist in the coding of this data, considerable effort has gone into the design of an automatic coding package called ORLCODE, and based on the KODIAC system (Ref. B6.1). Work on this is at an advanced stage, and is detailed under Ref. B6.17.

A great deal of expertise has been accumulated by the project on techniques for record linkage which is relevant to anyone dealing with problems of patient identification.

The experience, especially with regards to changes in name and address leads to serious questions concerning the accuracy of the master patient indexes (see Ref. Nos. E4.1, 4.2, 4.3) unless similar stringent efforts are made to avoid duplication.

Tables in a form which is much more pertinent than the standard HAA tables are now provided routinely to the region's consultants.

The accumulated statistical tables from the record linkage study have just been published and are available on microfiche from the Project. They should form a unique resource for studying many aspects of NHS service.

Costs: Apportioning the costs for the various aspects of this project is particularly difficult. However, computer useage is modest, and a recent survey has indicated that the cost of record linking is less than 0.5p. per record, which is about 0.6% of the cost of collecting and processing unlinked data for e.g. HAA.

Transferability: The programmes are all written in higher level languages and should be reasonably transferable. Developing the administrative links with various agencies and maintaining an adequate quality of information is potentially much more difficult. Proposals have been put forward for transfer of record linking and automatic coding procedures to some other systems.

Comments: The bibliography gives some ideas on the scope of the research supported by the record linkage project. There can be no doubt that it has been of great value for a variety of epidemiological studies. In recent years it may have become somewhat a victim of its own success with much time devoted to outside requests and to service requirements, leaving less time available for additional research by the staff.

Documents on File: Computer hardware and software specifications.

Selected Publications: The following is not a comprehensive bibliography. It is intended only to illustrate the wide range of publications arising from this project.

ACHESON, E.D. (1967) "Medical Record Linkage". Published by the Oxford University Press for the Nuffield Provincial Hospitals Trust.

EVANS, J.G. (1967). Deliberate Self-Poisoning in the Oxford Area. Brit.J.Prev.Soc.Med., 21, 97-107.

WATTS, S.P. and ACHESON, E.D. (1967) Computer Method for Deriving Hospital Inpatient Morbidity Statistics Based on the Person as the Unit. Brit.Med.J., 4, 476-7.

HUBBARD, M.R. and FISHER, J. (1967) A Computer System for Medical Record Linkage. In the Proceedings of the International Symposium on Record Linkage in Medicine held in Oxford, 1967. E. & S. Livingstone, Ltd.

FAIRBAIRN, A.S. (1967) Diagnostic Differences at Successive Hospital Admissions. In the Proceedings of the International Symposium on Record Linkage in Medicine held in Oxford, 1967. E. & S. Livingstone, Ltd.

ACHESON, E.D. and RANG, E. (1968) The Clinical Significance of Deaths after Discharge from Hospital Unrecorded in the Hospital Notes. Lancet, 2, 908.

FAIRBAIRN, A.S. and ACHESON, E.D. (1969) The Extent of Organ Removal in the Oxford Area. J.Chron.Dis., 22, 111-22.

ACHESON, R.M. and FAIRBAIRN, A.S. (1970) The burden of cerebrovascular disease in the Oxford Area in 1963 and 1964. Brit.Med.J., 2, 621-6.

VESSEY, M.P. et al. (1970) Postoperative thromboembolism and the use of oral contraceptives. Brit.Med.J., 3, 123-6.

FAIRBAIRN, A.S. (1972) Hospital admissions following common surgical operations. Proc.Roy.Soc.Med., 65, 239-40.

BALDWIN, J.A. and FREESTONE, D.S. (1971) Risk of early post-partum pregnancy in context of post-partum vaccination against rubella. Lancet, 2, 366-7.

EVANS, N., GATH, D. and BALDWIN, J.A. (1974) The incidence of cancer among inpatients with affective disorders. Brit.J.Psychiat., 124, 518-25.

FEDRICK, J. (1973) Epilepsy and pregnancy: a report from the Oxford Record Linkage Study. Brit.Med.J., 2, 442.

FEDRICK, J. (1973) Sudden unexpected death in infants in the Oxford Record Linkage Area: 1. An analysis with respect to time and place. Brit.J.Prev.Soc.Med., 27, 217.

BALDWIN, J.A. (1973) Linked record medical information systems. Proc.Roy.Soc.Lond.B., 184, 403-20.

BALDWIN, J.A. (1974) Medical record linkage. Medicine, 35, 2048-51.

FEDRICK, J., SIMMONS, H. and BALDWIN, J.A. Methodological considerations in analysing a file of linked diagnostic data. (In preparation)

HOBBS, M.S.T. et al (1976) The study of disease associations from linked records. Brit.J.Prev. Soc.Med., 30, 141.

BALDWIN, J.A. and FEDRICK, J. (1977) Thyroid disease and asthma. Brit.Med.J., 4, 1539.

Reports:

BALDWIN, J.A. and GILL, L.E. Computing requirements of the Oxford Record Linkage Study. Unit of Clinical Epidemiology and Oxford Record Linkage Study. Research Report No. 3, June, 1972.

Unit of Clinical Epidemiology and Oxford Record Linkage Study. A medical information system for general hospital inpatients: preliminary assessment of a pilot scheme. Research Report No. 1, June, 1971.

BALDWIN, J.A. (Editor) The master index: a guidebook for medical records officers. Oxford Regional Hospital Board, 1972.

Related Projects:

Oxford Community Health Project (Ref. F2.1);
Oxford Drug Monitoring Project (Ref. E103);
Oxford Psychiatric Case Register(see Suppl.);
KODIAC Automatic Coding System (Ref. B6.1);
ORLCODE Automatic Coding System (Ref. B6.17.)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number E1.2

Project Title:	Northern Ireland Medical Record Linkage Project
Location:	Queen's University, Belfast
For Further Information Contact:	Prof. A.A. Greenfield. Department of Medical Statistics, Queen's University, Belfast, N. Ireland, BT12 6BJ; Dr. A.L. Walby, Director of Research & Intelligence, D.H.S.S. (N.I.) Dundonald House, Belfast.
Key Topics:	Interface; research information; linkage; computer systems (batch); key entry systems.
Summary:	This project aims to provide a routine system of linked medical records for Northern Ireland. The system currently includes child health records, school health records and some additional local authority records. The most successful aspect of the programme has been the child health systems and this fits well with the interests of those who originated the project in the problems of genetically determined disease. Very extensive work has been done on the various technical problems involved in record linkage. The computer processing is done using the University ICL 1900 series machine and much of the data entry uses Olivetti key-to-cassette systems. Extensive use is made of the standard SPSS and FIND packages for data retrieval.
Costs:	Data processing: 6 full-time equivalents. Computer time: a modest allocation on the University machine. More precise figures are not available.
Transferability:	The programs are written largely in Frotran, but how specific they are to the particular situation in Northern Ireland is not known. The administrative arrangements are somewhat different than in other parts of the U.K.
Documents on File:	Paper SC39 - Medical Records Linkage Steering Committee. Report on Medical Record Linkage in N. Ireland, 1964-72. Working Documents for Linkage Study RLU1-5.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E1.3

Project Title:	Leeds Information Project
Location:	The University of Leeds
For Further Information Contact:	Professor H. McDonnell, Institute of Health Studies, University of Hull, Hull, HU6 7RX.
Key Topics:	Interface; research information; linkage; computer systems (batch); graphics.
Summary:	This project aims at developing an alternative method for gathering medical and epidemiological data for a given geographical region. The Local Authority in Leeds has developed a Local Authority Management Information System (LAMIS) which makes it possible to derive grid references for any address in the metropolitan area. Methods are being developed to interface with this system in order that the data collected for Hospital Activity Analysis, registrations of births and deaths, child health surveillance, etc. may be aggregated for each one kilometer square. Similar reporting systems from the Local Authority (Social Services, Education, Planning, etc.) are capable of integration on this depersonalised basis. Small Census data on the Km^2 basis are mounted to yield base populations. The Km^2 data are capable of aggregation and disaggregation. Much work has been devoted to developing graphical techniques for drawing contour maps using this data. At the present time, the H.A.A. data from the Leeds General Infirmary have successfully been used to test the feasibility of the system. Systems studies leading to the development of the remaining medical aspects are going ahead at the present time.
Costs:	The project is jointly funded between the Area Health and Local Authorities. A review of future development costs is currently under way, but no figures are as yet available.
Transferability:	Several other local authorites are investigating the possibilities of implementing the LAMIS system which is based on standard ICL 1900 series equipment.
Comments:	This system represents an interesting alternative in gathering comprehensive medical information on a region to the more traditional epidemiological techniques and record linkage studies. It is crucially dependent on the co-operation of the local authority and the existence of the Local Authority Management Information System.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number E1.4

Project Title: Care of the Elderly

Location: Institute of Biometry and Community Medicine, Royal Devon and Exeter Hospital (Wonford), Barrack Road, Exeter.

For Further Information Contact: Mr. M.S. Jeans, Asst. Director (Research & Training), Devon County Council, Social Services Dept., County Hall, Exeter.

Key Topics: Interface; recall and screening; form design.

Summary: This project, funded by the King's Fund, aims to devise and implement a follow-up record system for surveillance of the elderly, using linked medical and social data. Administration is handled by Devon County Council Social Services Department.

The basis of the system is a card index 'at risk' register kept by general practitioners and updated both by them and by social service and health workers. Lack of contact with an elderly person by any agency over a period of one year will initiate a home visit.

The system concentrates on patients over the age of 75. A structured index card has been designed and produced to carry information which assesses the degree of risk.

At the present time, four group practices are piloting the scheme for evaluation purposes and are reported to find it very useful and easy to use.

Costs: Stationery costs are minimal. However, the system does rely upon personal interview to complete the data base and all follow-up is by means of a home visit. There could, therefore, be a considerable amount of time involved. Pilot studies so far have shown home follow-up to be necessary in 9-14% of patients over 75 (mean is 34 visits for a 3-man practice).

Transferability: This system is now in independent use in 10 additional practices outside the county.

A high degree of co-operation with Health Visitors and Social Workers is mandatory if the scheme is to succeed, as is the co-operation of receptionists and a high level of G.P. motivation. However, given such goodwill, the data base and G.P. portion of the system could be operated from any surgery.

Comments: Development is now considered complete, and the method is being publicised in professional journals to encourage its adoption by general practitioners. The roles of social workers and health visitors have been clearly defined, and the value of the system is undergoing assessment with encouraging results.

Documents on File: Annual Report, 1975; sample index card.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number E2.1

Project Title: Patients as Record Holders

Location: St. Mary's Maternity Hospital, Portsmouth.

For Further Information Contact: Mr. F.A. Murray, Consultant Obstetrician.

Key Topics: Interface; G.P./hospital communication; patient held records.

Summary: Beginning with a trial in 1972, this Unit has operated a policy of having all maternity patients hold their complete records during their antenatal care. The full information is therefore available both to the hospital and to their own general practitioner. In addition, more than two thousand hours per year of secretarial and clerical time are saved by eliminating the pulling and refiling of notes and the audio typing of notes to general practitioners. Out of the first 12,000 records carried, only four have been irretrievably lost.

The system has been extended to the general practitioner unit, and here the patients are also given their records to bring with them to their post natal visit. Initially, more records were forgotten for this visit, but this problem is being overcome with improved patient education. The requirements of the maternity H.A.A. system have so far made it impossible to extend the post natal portions of the system to the consultant unit.

Costs: Major saving in clerical and secretarial time.

Transferability: Several centres are proposing to adopt the basic system.

Comments: This project goes considerably beyond the cooperation cards which have become widespread in recent years in that virtually the entire record is given to the patient. Problems have been minimal. Most participants feel that the scheme has real advantages for both the doctors and their patients as well as producing considerable costable saving in staff time. The loss rate is so low that few hospital record systems could claim comparable availability of records.

Selected Publications:

MURRAY, F.A. and TOPLEY, L. (1974) Patients as Record Holders. Health & Soc.Serv.J., July 27, 1675.

MURRAY, F.A. and TOPLEY, L. (1974) H.A.A. and S.H.3. Information Systems - their Role in Functional Management. Health & Soc.Serv.J., Nov.16, 84, 2652.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E2.2

Project Title:	Combined General Practice & Community Hospital Records.
Location:	Wallingford Medical Centre and Community Hospital.
For Further Information Contact:	Dr. M. Lee-Jones, The Medical Centre, Reading Road, Wallingford, Oxfordshire.
Key Topics:	Interface; form design; G.P./hospital communication; flow sheets.

Summary:

Dr. Lee-Jones' practice has a unique relationship with a local Community Hospital and has developed an integrated general practice/community hospital record structure. It has led to a number of major changes in the interface between general practitioner and consultant.

The Community Hospital is manned entirely by general practitioners and takes many early discharges from the District General Hospital for convalescence and after-care. A number of consultants hold clinics regularly at the Health Centre so that communications are extremely important. It is considered that immediate access to much more detailed information than is usually contained in a discharge summary is essential.

Three records are involved. 1) A single record, kept at the surgery, covers the care of the patient by general practitioner and during inpatient stays at the Community Hospital; 2) the normal records are kept separately for inpatient stays at the District General Hospital; 3) separate records are maintained at the Day Hospital. In the case of early discharge from the District General Hospital, the entire record goes with the patient to the Community Hospital, and is returned following discharge from there, after the general practitioner has extracted sufficient information to enable him to give continuing care. These are laid out as flow sheets rather than as traditional notes. The problems are listed down the left hand margin, and successive dates across the top of the page. Data for each problem is entered opposite that problem in the appropriate dated column. There is a facility for placing a reference to entries on the reverse side or in the regular general practice continuation notes to allow for more extensive comments than will fit in the limited space provided.

Costs:	Stationery and minimal secretarial time.
Transferability:	The system depends on having the community hospital organised as an extension of general practice.

Comments: This group of practices seems to have been quite successful in developing a system of notes to take advantage of their unique situation and bring about a much closer integration of the general practice and hospital care of their patients. The organisation of the community and day hospital notes as flow sheets is a variation which has not been used elsewhere in the U.K., although similar schemes have been used abroad.

Documents on File: Sample records; 'Medical Records and Medical Audit in Community Hospitals' (an extended version of a recent publication).

Selected Publications:

KIRK, C. and LEE-JONES, M. (1976) Medical Records, Medical Audit and Community Hospitals. J.Roy. Coll.G.P., 26, (163), 143-6.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E2.3

Project Title:	Integration of General Practice and Hospital Obstetric Care
Location:	General Practice Teaching and Research Unit, St. Thomas' Hospital Medical School, 80, Kennington Road, London, SE11 4TH.
For Further Information Contact:	Dr. L. Zander
Key Topics:	G.P./Hospital Communication; Patient Held Records.
Summary:	Since 1976, as part of a general project in the integration of primary and hospital obstetric care, all patients receiving care through this practice have been given their complete obstetric record routinely. This was originally done because the patients are seen in the group practice by the obstetricians and their notes would not otherwise be available at the time of labour. However, since the inception of the study it has been found that the practice has considerable other advantages in patient education and improved availability of notes at the time of labour.
Costs:	Probable considerable savings in staff time.
Comments:	This project appears to confirm the findings of Topley (Ref. E2.1) concerning the practicality, low loss rate, and acceptability of patient held records for Obstetrics and Antenatal. Although obstetrics is a special case it is to be hoped that other experiments in other specialties with these methods will be attempted.
Selected Publications:	MORRELL, D. (1978) "Integration of General Practice and Specialist Antenatal Care" J.Roy.Coll.G.P. 28, 455. MORRELL, D. (1978) "The General Practitioner Role in Obstetrics". J. of Mat. & Child Hlth.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E2.4

Project Title: Hypertension Co-operation Sheet

Location: Royal Infirmary, Newcastle Upon Tyne, NE1 4LP.

For Further Information Contact: Prof. D.N.S. Kerr, Dept. of Medicine, University of Newcastle upon Tyne, NE1 4LP.

Key Topics: G.P./Hospital Communication; Patient held records.

Summary: As part of a general programme for improving the care of hypertensive patients in the Newcastle area, the Department of Medicine has instituted a system whereby the patients are given copies of a management flow sheet. Both the hospital doctors and the general practitioners make entries on this sheet. The information covers treatment, level of hypertension, plans, etc.

The sheets have been well received during their initial trial period and are now in routine use in at least four outpatients clinics of Newcastle Hospitals and the practices which refer patients to them.

Evaluation: The reaction of general practitioners was favourable.

Costs: The latest version of the shared record is supplied free by a manufacturer of antihypertensives (Stuart Pharmaceuticals) on a complimentary basis. We accept that there is no such thing as a free lunch, or a free complimentary card, but the cost of this service appears to be very small indeed. Its cost in medical time has not been priced but is small since it takes no more time to fill in the record card than to search conventional notes.

Selected Publications:

EZEDUM, S. and KERR, D.N.S. (1977) Collaborative care of hypertensives, using a shared record. Brit.Med.J., 2, 1402-1403

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E3.1

Project Title: Scottish Automated Follow Up Register (SAFUR)

Location: Department of Therapeutics and Clinical Pharmacology, University of Aberdeen.

For Further Information Contact: Dr. P.D. Bewsher, Department of Therapeutics and Clinical Pharmacology and Mrs. H. Thomson, SAFUR Central Registry, Grampian Health Services Information Unit, University Medical Buildings, Foresterhill, Aberdeen, AB9.2ZD.

Key Topics: Interface; form design; recall and screening; G.P./hospital communication; computer systems (batch)

Summary: This project's original aim was the follow-up of patients who had been treated for hyperthyroidism but it has been extended to cover the management of a number of other thyroid abnormalities. It involves a high degree of co-operation between the general practitioner and the hospital clinic, between whom the care of these patients is shared.

Data is collected on special forms completed by the doctor and clinic staff at the time the patient is admitted to the register and at each follow-up visit. The data is punched, and entered onto the computer file. Lists of patients due for follow up along with printed labels for letters to their general practitioners and for the various follow up documents required are produced. If the patient's general practitioner has agreed to collaborate with the system, a letter is sent along with a brief form to be completed and a tube for a serum sample. (The small number of patients whose doctors do not use SAFUR are recalled to the clinic for these procedures.) Samples are returned to the central register and the results are printed by the computer, as well as lists of all abnormal findings. The system now provides a follow-up service for the general practitioners and hospital doctors of patients in Inverness, Aberdeen, Dundee, Edinburgh and Glasgow.

The system runs on the Grampian Health Board ICL 2904 computer and is written entirely in Cobol.

Costs: Stationery; 1 full-time secretary in the Central Registry plus variable secretarial time for patients in the individual centres (approx. quarter time); a modest amount of data preparation and computer time.

Transferability: The forms and general procedures should be reasonably general. The programmes are written in Cobol for a 2904. The WAFUR project (Ref. E3.2) has converted them to ICL 1900 Cobol. Unfortunately, the documentation of both systems is very poor, and modifications and maintenance are therefore difficult.

Comments: Because post treatment hypothyroidism is an iatrogenic disease, and because one of its chief symptoms may be a reduction in mental function which increases the risk of patients being lost to follow-up, it seems particularly important that adequate facilities should be available to monitor these patients. At least four systems of this type are in operation for thyroid disease. This system and WAFUR (Ref. E3.2) differ particularly from the remaining two by a greater emphasis on the participation by the general practitioner and on the service as opposed to the research functions of the registers.

Documents on File: Sample forms and letters.

Selected Publications:

HEDLEY, A.J., SCOTT, A.M. and DEBENHAM, G. (1969) A computer-assisted follow-up register, Meth. Inf.Med., 8, 67-77.

HEDLEY, A.J., SCOTT, A.M. WEIR, R.D. and CROOKS, J. (1970) Computer-assisted follow-up register for the North East of Scotland. Brit.Med.J., 1, 556-8.

HEDLEY, A.J., ALEXANDER, E. and INNES, G. (1977) Patient identification and documentation of deaths in a follow-up register. Health Bull. Edinb. 35, (2) 73-77

Related Projects: Welsh Automated Follow-Up Register (WAFUR) (Ref.E3.2)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E3.2

Project Title:	Welsh Automated Follow-Up Register (WAFUR)
Location:	WHTSO Computer Centre and University Hospital of Wales.
For Further Information Contact:	Dr. J. Lazarus, Department of Medicine, Welsh National School of Medicine, Heath Park, Cardiff; Mr. John Phillips, WHTSO Computer Centre, Velindre Road, Whitchurch, Cardiff.
Key Topics:	Interface; form design; recall and screening; G.P./hospital communication; computer systems (batch); key entry systems.
Summary:	This project was derived from an early version of the Scottish Automated Follow-Up Register (SAFUR). The basic objectives and procedures followed are as described for project Ref. E3.1 but the extensions of the system to cater for additional clinical conditions differ from SAFUR. For example, data has been generated from patients with non-toxic goitre, which it is hoped will prove useful in the future. Expansion of the system is underway in several areas of Wales and co-operation from general practitioners is excellent. At present there is a total of approximately 1,000 patients listed on WAFUR. The system has been converted to run on an ICL 1900 series machine, and the input to the system is via a key-to-disc system.
Costs:	Personnel: 1 part-time secretary. Data Preparation: 1-2 hours per week. Computer Time: Very modest. A preliminary costing of the system estimates a 20% saving over routine follow-up at outpatients. Operation costs over three years, with increasing numbers, indicate that further savings could be made.
Transferability:	The system should be readily useable by any centre with access to an ICL 1900 configuration. Up-to-date documentation is available.
On-Site Evaluation:	Some evaluation has been made for the years 1974-1976 inclusive. A considerable number of false positive results were obtained, and attempts are being made to reduce these. In addition, detailed evaluation of the diagnostic score index is being done.

Related Projects: Scottish Automated Follow-Up Register (SAFUR) (Ref. E3.1)

Selected Publications: LAZARUS, J.H. (1978) Follow up of thyroid disease: three years' experience of an automated system. Health Trends. (10) 66-69. (Aug.)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E3.3

Project Title: Sheffield Thyroid Follow-Up System

Location: Trent Regional Health Authority, Sheffield

For Further Information Contact: Mr. B.W.H. Molteno, Trent Regional Health Authority, Fulwood House, Old Fulwood Road, Sheffield, S10.3TH.

Key Topics: Interface; form design; recall and screening; G.P./hospital communication; computer systems (batch).

Summary: This project was designed considering the features of the Birmingham (Ref. No.E3.4) and Scottish (Ref. No.E3.1) Follow-Up Registers but also including additional components intended mainly for clinical research. The system provides a follow-up facility for patients treated for hyperthyroidism (by both destructive and conservative methods) and also hypothyroidism. The basic 21 month cycle used by the Birmingham system - questionnaire at twelve months, blood sample at 21 - has been adopted. However, the self-administered questionnaire is different in content and uses the symptom complex chosen by Billewicz et al. (1969) in their diagnostic index for hypothyroidism. General practitioners are brought into the follow-up cycle only for the collection of blood samples from those patients living 15 miles or more from the out-patient clinic. The treatment record carries somewhat more extensive information than either the Birmingham or the Scottish system.

Introduction of a new computing facility at the Trent Regional Health Authority has necessitated rewriting the program suite and led to a reconsideration of the entire system. Work is in progress on a new design which will allow the user a choice among follow-up programmes. The aim is to produce a suite with modular configuration and comprehensive documentation which will be capable of application in other clinical areas for the provision of long-term surveillance of at-risk patient groups. This would involve a core minimum of data to which other data could be added for research purposes.

Costs: Personnel: half to one whole time equivalent secretary/clerk per registry.
Data preparation: £5. per month.
Computer time: very modest (£25.per month).

Transferability: It is hoped that the revised system will be highly transferable, but detailed comment at this time is not possible.

Selected Publications:

BILLEWICZ, W.Z. et al. (1969) Statistical Methods Applied to the Diagnosis of Hypothyroidism. Q.J.Med., 38, p.255.

Related Projects:

Birmingham Thyroid Follow-Up System (Ref. No. E3.4)
Scottish Automated Follow-Up Register (SAFUR) (Ref. No. E3.1)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number E3.4

Project Title: Birmingham Thyroid Follow-Up System

Location: Department of Medicine, Queen Elizabeth Hospital, Birmingham.

For Further Information Contact: Professor J.M. Bishop, Department of Medicine, Queen Elizabeth Hospital, Edgbaston, Birmingham, B15 2TH.

Key Topics: Interface; form design; recall and screening; computer systems (batch).

Summary: This project was developed in parallel with, but independently from, the Scottish Automated Follow-Up Register (Ref. No. E3.1). Its initial aim was to detect late-onset hypothyroidism following radio-iodine therapy, but it has since been broadened to cover other categories of thyroid patients including those treated surgically. The procedures involve a 21 month cycle. At twelve months each patient is given a self-administered nine-point symptom questionnaire. If this suggests hypothyn, blood tests are carried out at that time, otherwise blood tests are carried out after an additional nine months have elapsed. General practitioners are not involved in the basic system, but their help is asked in tracing or examining patients who have not responded to follow-up requests. Defaulters are traced by a specially appointed home visitor. Originally, patients were dropped from the system if replacement therapy for hypothyroidism was initiated but modifications have been made so that now this high-risk group continue to be followed by the system.

Costs: Personnel: Two part-time secretary/clerks, one of whom has been trained to carry out home visits, interview patients and perform venepuncture.
Data preparation: low but not separable from other work at the computer centre.
Computer time: very modest, less than 15 mins./week.

Transferability: The programs are written in Cobol for the Univac 418 at the Queen Elizabeth Medical Centre. It has recently been transferred from Fortran on an IBM 1440 and is reported to be modular and well documented.

Selected Publications:

BARKER, D.J.P. and BISHOP, J.M. (1969) Computer based screening system for patients at risk of hypothyroidism. Lancet, 2, 835-8.

BARKER, D.J.P. and BISHOP, J.M. (1970) Computer analysis of symptom patterns as a method of screening patients at special risk of hypothyroidism. Brit.J.Prev.Soc.Med. 24, 193-6.

GARDNER, M.J. and BARKER, D.J.P. (1975) A Case Study in Techniques of Allocation. Biometrics, 31, 931.
BARBER, S.G. BISHOP, J.M. & CARTER, D.J.,(1977) System for long-term review of patients at risk of becoming hypothyroid. Further experience. Lancet, 2, 967-70.

Related Project: Sheffield Thyroid Follow-Up System (Ref. No. E3.3)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E3.5

Project Title:	Doncaster Thyroid Follow-up Register
Location:	Doncaster Royal Infirmary, Doncaster, DN2 5LT.
For Further Information Contact:	Dr. John Doar
Key Topics:	Follow-up Register; G.P./Hospital communication
Summary:	The Doncaster thyroid register is a completely manual system which is used to follow patients receiving treatment for thyroid disorders. Approximately 200 patients' records are kept on 'Visirecord' cards. Patients are recalled at yearly intervals for thyroid function tests and to fill out a form giving current drug therapy. The results are reviewed by the physician in charge, and if abnormal appropriate action taken. If the results are normal a letter is sent to both the patient and his General Practitioner. A copy of the thyroid register entry is kept in the patient's clinical notes along with an appropriate warning. The patients on the thyroid register form about 25% of patients with thyroid disorders under hospital supervision.
Costs:	Secretarial: 1 day per week.
Transferability:	The system should be easily usable for any relatively small clinic of this type.
Comments:	The system reported to be well liked by the doctors who use it. Without the system of laboratory tests, without actual clinic attendances, the endocrine clinic would be quite unmanageable.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number E4.1

Project Title: Tayside Master Patient Index

Location: Tayside Health Board

For Further Information Contact: Mr. J.H. Scott, Computer Manager, Tayside Health Board, "The Bughties", 76, Camphill Road, Dundee, DD5 2LX.

Key Topics: Interface; recall and screening; drug monitoring; research information; evaluation; linkage; computer systems (on-line, real-time); computer systems (batch); Master Patient Index.

Summary: The Tayside Master Patient Index provides a unified identification system and source of primary administrative data for the entire population of the Tayside Health Board. This facility is being used to rationalise the various record systems, FPC functions, and screening systems throughout the area. In addition, drug monitoring records and the contact records for one general practitioner (see Ref.No. F2.12) are currently being kept on the system. A linkage with a hospital-based computer has been implemented. For systems integrated with the master register, there is no need to store identification details beyond the index number which is self-checking.

Data for the system is gathered by a combination of batch mode and on-line terminals. The computer used is an ICL 1903T. Microfiche is used for additional copies of the register. The input documents used are relatively complicated and require specially trained operators. Network links to other hospitals in the area and other computers in the health service are being developed.

Costs: Costs for operating the system in a routine manner are not available. The cost of registering 100,000 patients is approximately 1,075 person/days.

Transferability: As the system has been developed for the standard DHSS configuration for regional computers, it is easily transferable. In addition, much of the experience with conversion of the FPC records should be of immense value to others contemplating similar exercises.

The system has now been transferred to Argyle and Clyde Health Board on an ICL 1903T, and to the Salford District of the North West Regional Health Authority on an ICL 2904. Agreement has also been reached on using the index for Dumfries and Galloway Area Health Board, Ayrshire and Arran Area Health Board, Grampian Health Board and the four Area Health Boards of Northern Ireland.

The Tayside Health Board is taking 'special responsibility' for the development and maintenance of this software. To date the transfers appear to have gone very smoothly.

Comments:	The Master Patient Index should be useful in two ways. It should rationalise numerous AHA and FPC functions and reduce duplication of effort and information storage. It should also make it very much easier to mount many other projects. However, it does present potential problems in terms of confidentiality, which must continue to be monitored.
Documents on File:	Booklet: "The Tayside Master Patient Index". Published by the Tayside Health Board, June, 1976, revised October, 1978.
Selected Publications:	GRAHAM, R.C. (1974) The Tayside Master Patient Index - How and Why. Hosp.Hlth.Services Rev., November, 385-7.
Related Projects:	A Teaching Practice Records System (Dr.F.B. Proudfoot, (Ref. F2.12). Argyle & Clyde Master Patient Index (Ref. E.4.3) Salford Master Patient Index (Ref. E.4.2)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number E4.2

Project Title: Salford Family Practitioner Committee/Area Health Authority Master Patient Index.

Location: Family Practitioner Committee, The Willows, Lords Avenue, Salford. M5 2JR.

For Further Information Contact: Mr. N. Chester, Salford Family Practitioner Committee.
Mr. P. Pritchard, Management Services Division, North Western Regional Health Authority.

Key Topics: Master Patient Index; Computer Systems (on-line); General Practice;

Summary:

The project aims to provide a master patient index for co-ordinating the administrative information from the two major hospitals in the Salford A.H.A. and the Family Practitioner Committee. They have taken the Tayside Master Patient Index system intact, and installed it on an ICL 2904 system, purchased by the A.H.A. The project is funded by the D.H.S.S. as one of its 'experiments in transfer'.

The take-on has been done entirely using display units and the facilities of the master patient index system itself. It has required approximately 42 weeks of work for 16 job creation people.

The take-on is complete: the system has three VDU's at the Family Practitioner Committee and several at each of the two major hospitals.

Future plans include interfaces with the batch out-patient system developed at the University of Nottingham, although a definite date has yet to be made, and with the commercial version of the Phoenix Lab. system when it is ready for transfer. They are also considering a link to the WHTSO National Vaccination and Immunisation register which is already in use on the regional computer.

Costs: The basic configuration for the computer has cost approximately £250,000 plus an annual charge per year for software rental, plus maintenance. Take-on has been done remarkably cheaply using job creation personnel, but would otherwise have been a considerable cost - 12-16 people for the better part of one year.

Transferability: The system was transferred with remarkably little difficulty from the ICL 1900 series machine in Tayside. The Tayside group are continuing to provide limited software support.

Comments: This is the one implementation of the Tayside Master Patient Index system in England and Wales. It will be extremely interesting to see whether there are any difficulties which arise with the different structure of the family practitioner committees here. It should be noted that Salford is a relatively small A.H.A. with approximately 270,000 patients in total. However, as far as we are aware, the system is not intrinsically limited by size, though of course the amount of storage and the effort required for take-on would be proportionately increased for larger application.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number E4.3

Project Title: Argyll & Clyde Master Patients Index

Location: Argyll & Clyde Health Board, Gilmour House, Paisley, Scotland.

For Further Information Contact: Dr. John S. Bryden, Chief Administrative Medical Officer, Argyll & Clyde Health Board, Paisley.

Key Topics: Master Patient Index; Computer Systems (on-line); General Practitioner Systems.

Summary: Argyll & Clyde Health Board is one of the Scottish groups which have implemented the Tayside Master Patient Index system. They have placed special emphasis on two aspects of the system. At their request the facilities for Primary Care System (equivalent to the English Family Practitioner Committee) have been extended. All functions are now covered including the complicated land and water mileage systems for rural Scotland. They have also organised the automatic printing of the N.H.S. cards and other stationery for the general practitioners.

Secondly, they are emphasising the use of the system as an aid to the delivery of preventive care. Their philosophy is that immunisation and other preventive systems should concentrate their resources on those who fail to take them up, rather than on those who take them up routinely. The existence of a Master Patient Index provides the opportunity to extend the services in this way. They have linked their system to the vaccination and immunisation system for Scotland, developed separately in Glasgow, and motivated its extension in numerous ways.

They are also hoping to use the system as an aid to general practitioners in a number of ways. They are providing printed age/sex registers on request, improved facilities for checking the accuracy of Primary Care System lists against patients actually in the surgery, and providing other similar services.

It is hoped that two group practices in the Health Board area will soon have small micro-computers for their own information services which will be linked to the Master Patient Index System so that registration information in both systems can be updated automatically.

The conversion from the manual system was done using the computer system itself, using optical character typing and reading as data entry, and direct entry via V.D.U's. It required approximately 18 months for a population of 460,000.

Costs:

The system is run on the Health Board's I.C.L. 1900 computer which is also used for a number of other purposes. It probably represents 25-30% of the use of this machine. The personnel time should certainly not be greater than with the manual system, and would probably be less except that additional services have been incorporated.

KING'S FUND MEDICAL RECORDS PROJECT

INTERFACE PROJECTS IN BRIEF

Reference Number: E101

Project Title: S.W. Surrey Health District, Guildford Hospitals.

For Further Information Contact: R.P. Barrowman, Medical Records Officer, S.W. Surrey Health District, 3rd Floor, Buryfields Clinic, 61, Lawn Road, Guildford, Surrey. GU2 5AZ.

A number of systems have been established in this District's hospitals. Besides redesigned mount sheets and prescription/recording sheets, they have insitituted a revised discharge letter including the drugs to be taken home and a patient filled questionnaire which is mailed to patients prior to their outpatient visits. Special patient information booklets on the management of angina and recovery from myocardial infarcts are also available.

Reference Number: E102

Project Title: 'The Geriatric Assessment Questionnaire'

For Further Information Contact: Dr. Jeremy Cobb, East Berks. Community Physician East District Dept. of Community Medicine, Kipling Memorial Building, Alma Road, Windsor, SL4 3HG.

This questionnaire has been developed on the basis of need for independence. It can be used by any worker in the health field to assess the need of the elderly person in the community. The technique for using the questionnaire is based on the subjective evaluation of the worker in the community but is so developed as to keep the information in a clear and systematic form suitable for organisational and management purposes.

Reference Number: E103

Project Title: Oxford Drug Monitoring Study

For Further Information Contact: Dr. David Skegg, Department of the Regius Professor of Medicine, Radcliffe Infirmary, Oxford OX2 6HE.

This two-year study was designed to assess the feasibility of monitoring major adverse reactions to medicines prescribed in general practice and to develop methods which could be used in the future on a larger scale. The study population consisted of the patients registered with 20 general practitioners in six practices - a total of approximately 40,000 people.

Using photocopies of relevant prescriptions obtained from the Prescription Pricing Authority, drug information was coded and added to the computerised basic patient data files of the Oxford Community Health Project (Ref.F2.1) Further drug information and details of morbidity were obtained from the participating general practices, both directly and through the Oxford Record Linkage Study (Ref.E1.1). Analysis of the resulting consolidated computer files could thus determine association between drugs and subsequent events, G.P. prescribing habits and distribution of prescriptions in a defined population.

Monitoring potential drug interactions is becoming one of the major problems of contemporary medicine. In addition to those projects mentioned in other parts of this gazetteer (Ref. Nos. D1, D3 and E4.1) three special projects are being developed. These do not affect the clinical records directly but extract information from them in one way or another for drug monitoring purposes. They are:

E.201 - The Queen's University of Belfast, Department of Therapeutics and Pharmacology, intensive drug monitoring study.
E.202 - Southampton General Hospital, Department of Therapeutics, drug monitoring study.
E.203 - Liverpool Royal Infirmary pharmacy system.

For further information on projects which contain an element of interface, please see reference numbers D5 and F2.6.

KING'S FUND MEDICAL RECORDS PROJECT

SECTION F: PRIMARY CARE

This section has been divided into two types of project -- those which deal specifically with the layout of the actual clinical record, and those which provide an information retrieval capability. Many projects fall into both categories and cross references between the two sections have been provided.

Clinical Record Format

Major changes in format have been precluded by the constriction of the "Lloyd George" envelope (although individual G.P.s have converted, at their own expense, to A4 formats, at least since Dr. Humphrey Booth pioneered such conversion in King's Lynn in 1962, and have been followed by sponsored projects such as that at Wantage). The resistance of hospitals to modifying their letter size to fit, unfolded or with one fold, coupled with the reluctance of G.P.s to throw anything away, has meant that the medical record envelope of any patient with serious or multiple problems became highly packed. Accordingly, G.P.s have shied away from additional sheets or routines that would increase the number of continuation cards enclosed. The Royal College of General Practitioners introduced its Obstetric Record Card in the early '60s and the Wright Pre-School Health Record in the late '60s. It also provided both narrative form summary cards, and the S4 coded summary card. The DHSS has recently provided summary cards too.

Nevertheless, some doctors have been willing to "preen" records and throw out material that is no longer useful or valid, and many have adopted conventions such as keeping diagnostic statements to the right hand margin, and/or "boxing" them. Many have tried to include medication cards, but the multiplicity of prescriptions and the changeability of the treatment regimes have defeated most. Problem Orientated Medical Records represent the only comprehensive innovation in general practice, and as elsewhere, they have met with a wide range of response, from enthusiastic acceptance, through partial implementation, to vigourous rejection. As has been said with regard to hospital

problem orientated medical records, adoption of only some components of POMR will not yield the benefits theoretically resulting from the use of the whole system. Many G.P.s have, for long enough, written their progress notes in the S.O.A.P. order, without raising a problem list, and many have introduced "flow sheets" for such conditions as diabetes and hypertension. But POMR, as a whole philosophy of clinical information handling, is gaining ground only slowly. This is due to three main reasons: firstly that medical records have never been seen to be an important concern for the busy doctor (always having occupied a lowly place on the educational totem pole); secondly that the mechanics of such radical change are daunting; and thirdly that the apostles of Weed are promulgating differing doctrines. One group say, theoretically correctly, that the first priority is a data base for every patient and that the development and validation of an appropriate data set for general practice is an urgent research need. The other group say that, while they agree in theory, in practice the validation of a basic data set is a very long job, and meanwhile patients are at risk to poor care which could be improved by the insertion, into their records, as a first aid measure, of problem lists. (On these, Problem 1 should be written "incomplete data base".) Several workers are using patient filled questionnaires either as a data base, or to be transferred to a data base by the doctor or practice nurse, with varying degrees of patient acceptance.

Practice Indeces and Logs: the capability for cohort review

The clinician in primary care thinks mainly in terms of individual patients and their problems. If, however, he bases his record keeping system solely on this approach, he can only respond to individual patients' needs at the time of the consultation. The G.P. as a primary care physician has a registered population, for whose health as well as sickness he is nominally responsible, and thus some of the skills and methods of population medicine can profitably be brought to bear on the task of caring for the needs of the population as a whole.

In addition, the ability to retrieve and inspect the record of a patient other than on the occasion of a consultation benefits the individual patient through comparison with similar patients, critical review of management, consideration for preventive medicine procedures, etc.

Such methods require that the clinical records be supported by other instruments which enable the doctor to undertake cohort review, i.e. the ability to identify and retrieve the records of a cohort of patients having some factors (age and sex groups, diagnosis, or other factors) in common. Most of the techniques developed for this purpose in general practice emerged and were publicised by the Royal College of General Practitioners as research tools, in the fifties and early sixties, as a first response to a serious lack of data on the content and volume of work in general practice. This work reached its full flowering in the Second National Morbidity Study carried out by the RCGP and the OPCS in 1970/71. This study, as well as establishing a major data base for primary care, showed the needs for and difficulties in multi-observer studies in general practice. It only later received general recognition that they also conferred upon the participating practices capabilities for practice administration and planning, preventive medicine, quality control (audit), and educational planning. So strongly were these instruments identified with research that GPs who did not aspire to do research have not seen any reason to instal them. Their potential as tools for patient care and practice management has gone largely unrealised.

Several basic instruments were pioneered and promulgated by the Royal College of General Practitioners: the age/sex index, colour tagging of records for key conditions and disease registers or diagnostic indeces. The latter included the W Book, a simple loose leaf book with a page for each diagnosis on which the names of all patients with that disease could be recorded; the E Book, rather more complicated and modified to record all utilisation for each episode, using coded diagnoses; and the F Book (see Project Ref. F2.8), designed to record patterns of

illness in families. These are the fundamentals of a "practice information system", and have been well described in the literature. In addition, many GPs have found it useful to keep log book records of patients referred and admitted, lab and x-ray referrals, and other items of the process of care. These may be kept by the doctor who makes entries at the time of the event in separate notebooks, but may be facilitated by the use of an "encounter form" on which various items of process could be recorded for any consultation, and which could then be used by a secretary to compile the log books. The Records and Statistical Unit of the Royal College of General Practitioners developed the "L Sheet" for this purpose, but many doctors have developed their own. Other workers, notably Fry, have used edge punched cards rather than encounter forms, for the same purpose. The advantage is that the card stack constitutes the entire logging system. The use of "Feature Cards" provides the same capability usually over a wider range of items of process.

Essentially, the instruments are in common use, and have been well described in the literature. The entries in this gazetteer describe both new instruments, and, very importantly, new uses of such instruments, and the interrelationships between such instruments and the clinical records. In addition, some long standing systems are described because of their proven effectiveness (cf. Fry, F2.13; Hodgkin, F2.14; and Kuenssberg, F2.8).

Two points should be made. The first is that a cohort review system is only as effective as the quality of the records retrieved by it allows. Since a practice information system relies for its effectiveness on good clinical records, it is usually worthwhile to structure these to the extent that the information needed for the cohort review is easily captured and retrieved. As an example, the "boxed diagnosis" or a column for problem statements facilitate entry into the disease register. The second is that it must be clearly recognised that the precision of diagnosis and nomenclature necessary for the research uses of these instruments in epidemiological surveys, etc., is not necessary for administrative, preventive, educational, or quality control purposes. These

two areas of activity are different enough in their requirements to be seen as separate but related. The difficulty in attaining the precision necessary for research should not discourage GPs from using the same, or similar instruments for practice management. For the former purposes, only the proven cases should be considered for research, so that others are excluded. For the latter, probable cases should be included to be eligible for the benefits accruing, 'fine focus' criteria being applied at the time of application. While the ICD and its RCGP and ICHPCC derivatives provide convenient classification of diagnoses, they do not provide a useful taxonomy of either symptoms or psychosocial problems. There have been several attempts to expand these coding systems to make them more useful in primary care. Unfortunately, these extensions are not completely compatible. As well as work on their own OXMIS code, work has gone forward at the Oxford Community Health Project (Ref No. F204) to cross index this scheme with the other major coding systems. (A primary care subset of the SNOMED nomenclature is also in the final stages of preparation, but has not yet been tested in the U.K.).

Automated and semi-automated aids for maintaining these registers have been developed at a number of centres. Simple edge-punched cards have been used by several practitioners, most prominently by Bull (Ref. No. F2.2) More recently, the use of 'feature cards' has been developed by Harden and others as a much more flexible method for maintaining practice registers facilitating simple research which is nonetheless inexpensive (see Ref. No. F2.4 and F2.5). Feature cards have much to recommend them to many doctors who want to establish a practice management system with a wider range of capabilities than provided by simple ledgers, but who do not wish to become involved in the many practical difficulties of a computer-aided system or have no access to computer facilities.

Computer-aided systems range in complexity from very simple systems for maintaining the basic patient registers to those involving total replacement of the clinical notes. Many of the issues in developing and selecting these systems are similar to those discussed in the introduction to section D on Hospital Speciality Systems: how much data to collect, whether to collect it as an integral part of the regular production of clinical notes or separately, whether the data should be coded and if so how and by whom, and the balance between the service and research functions of the system.

In addition, in general practice systems there is the question of the scale of integration which should be sought. Should the system aim only at individual practices or should it be part of a District, Area or Regional plan for information collection?

There is also the important issue of to what extent the manual system must be optimised and rationalised before any automated system is implemented and to what extent the automated system should be regarded as facilitating the necessary changes and instrumental in creating the attitudes to make them possible. It is easiest and most productive to implement an automated system where the manual system has been refined and rationalised. On the other hand, it is only when presented with the data from an information retrieval system that many doctors fully realise the changes needed. Certainly, it is unwise, given the present state of ferment in practice organisation, preventive care, and medical audit to assume that any systems analysis, however well performed, can produce a set of procedures which will not have to be modified in the light of experience. Flexibility is necessary in any system.

The sudden rapid drop in the cost of microcomputers during 1979 and 1980 and the increasing public awareness of their potential has created a great deal of excitement. The increase in interest and acceptance among general practitioners of the possibilities of computers in their practice has been dramatic. Computer exhibitions put on by the RCGP, universities, drug companies and others have been oversubscribed. At the same time, the dramatic reduction in the cost of mass storage has forced groups who have pioneered in this field to rethink their basic assumptions about what is likely to be practical.

Worries about the confidentiality of centrally held information have made practice based computer systems particularly attractive. The central position of general practice as the sole point of entry for most patients into the NHS, makes it potentially extremely valuable as a site for the collection of much data for epidemiologic research and for health service's planning. The avowed intention of shifting much of the increasing burden of care for the chronically ill to

general practice and the increasing importance of preventive care and the care of the elderly are making the need for improved tools more apparent. There is also a clear potential for a modest increase in the revenue of the individual doctor through improved take up of procedures which do attract special payment and improved business practices such as stock control in dispensing practices. The Post Office Prestel system is about to provide a medium whereby information can be disseminated very rapidly and inexpensively. Several commercial companies have entered the field of general practice computing - a sure sign that it is getting beyond the stage of being a laboratory curiosity.

But there are still serious problems to be overcome in both the design and evaluation of systems and in the areas of organisation and funding. Careful attention must be given to the 'human engineering' problems involved. Whether or not the record itself should be kept on the computer or whether the computer should be used primarily as an adjunct to the notes, providing indexing and information retrieval services remains to be seen. Designs and evaluations are needed both of what is immediately practical with current technology and for what clearly will be practical by the middle of the decade. The potential of radically new techniques such as computer interviewing, patient access to information resources such as Prestel, and computer aided decision making must be explored. Above all, careful thought must be given to ensuring that the end result benefits the patient.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.1

Project Title: Primary Care Information Project

Location: Welsh National School of Medicine, General Practice Unit, Llanedeyrn Health Centre, Cardiff.

For Further Information Contact: R. Harvard Davis, Professor of General Practice, Department of General Practice, Llanedeyrn Health Centre, Cardiff.

Key Topics: Primary care; form design; audit; research information; morbidity recording; evaluation; POMR; A4 folders; family folders; typed records; computer systems (batch); nomenclature; encounter forms.

Summary:

This project aims to improve the accuracy, quality and readability of the individual patient record; to improve communication between members of the health care team and to improve the education of both trainees and members of staff.

Problem orientated notes are typed from uncomplicated encounter forms. The problem sheet has entries for all problems including transient episodic illnesses. When the problem list extends to 40 episodes, it is summarised by a doctor who extracts the problems likely to have long term significance on to a master problem list.

All members of the practice meet weekly to discuss unselected records. From these critiques the need to standardise the definition of some problem descriptions has emerged. Minimal criteria for many common problems have been established, and work to standardise the use of terms throughout the practice is a continuing stimulus to improved clinical communication. Increasing emphasis on the better definition of clinical goals is another product of review meetings.

Some members of the practice keep the records of patients from the same household together in family folders.

It is planned that the registration information and all data from the problem lists be entered on a computer file for analysis. To date this has had limited success because of the difficulties experienced with the computer facilities available, programming problems and staff changes. A simplified system which does not depend on computer storage evolved successfully. Use of an improved computer facility is expected to commence shortly.

Costs: Staff: Roughly one secretary per two doctors to type notes.
Computer: Not applicable as the system had no dedicated personnel in the computing field.

Transferability: The forms and general procedures are completely transferable although those at other sites might differ at some points in the definition of problem categories.

Comments: This project illustrates the potential educational benefits of using the POMR format and demonstrates what can be done with a relatively modest investment of staff time to improve the quality of the information gathered. The experience with attempts to process the information by computer illustrates the difficulties of handling medical data and the potential problems of casual arrangements with university computer centres which are not normally geared to providing this type of service. It also demonstrates why quality control at all levels of such a system is absolutely essential if the data is to be trusted.

Documents on File: Sample record folder; handbook of minimal criteria for key words/statements, clinical terms and socio-psychiatric problems; Technical Users Guide to the Record System (2nd Edition).

Selected Publications:

WALLACE, B.B. and DAVIS, R.H. (1970) A record system for general practice. J.Roy.Coll.G.P., 20, 163.

STOTT, N.C.H. and DAVIS, R.H. (1975) Clinical and administrative review in general practice. J.Roy.Coll.G.P., 25, 888-96.

STOTT, N.C.H. and JONES, M. Systematic evaluation of the quality of data stored in a record system for general practice. Unpublished operational studies (1973-5).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.3

Project Title: Problem Orientated Medical Records in Primary Care

Location: The Health Centre, Coker Close, Bicester, Oxon.

For Further Information Contact: Dr. Alistair J. Tulloch

Key Topics: Primary care; form design; recall and screening; G.P./hospital communication; research information; evaluation; POMR; A4 records; flow sheets; patient questionnaires; age/sex register; computer systems (batch); nomenclature.

Summary: This practice uses problem orientated records in A4 folders and uses the facilities of the Oxford Community Health Project to provide patient registers and to maintain 'recall groups' for surveillance and research.

An initial summary/problem list precedes the SOAP format notes. This is compiled from a patient registration form, patient-filled questionnaire, and patient record. The initial summaries for 8,600 patients were compiled by a specially trained nurse in eighteen months. Only ongoing problems are recorded and this is now updated by a practice secretary under Dr. Tulloch's surveillance. Columns are provided on the problem list for entering patients into risk registers and for a disease code. Problems are not numbered within the progress notes but firm diagnoses are underlined each time and offset to the right of the form. Detailed 'Plans' are made for chronic diseases only.

The data base kept for geriatric patients is somewhat more comprehensive than that kept for younger patients, and in addition, problem lists for the over-65's have been computerised. Building on this experience, it is planned to computerise the problem lists of all patients registered with Dr. Tulloch, although this plan does not extend to the remainder of the doctors at the Centre.

The practice runs a chronic disease recall and surveillance programme, a cervical smear programme, and has developed a number of flow sheets including one for diabetes, one for hypertension and one for oral contraception. The practice is further involved in an audit of geriatric prescribing and a review of out-of-hours calls.

One of Dr. Tulloch's prime interests is in improving methods of shared care between hospital consultant and general practitioners. He is at present developing a programme for the shared care of diabetic patients combining continuing education for the participating general practitioner with a flow sheet used as a 'co-operation card' and held by the patient.

Costs: 6 hrs./week clerical time to code Dr. Tulloch's manual problem lists for computer input; otherwise primarily stationery, plus some secretarial time.

Transferability: The manual portions of the system are completely transferable. The system of computer registers is linked to the Oxford Community Health Project (Ref. F2.1).

Evaluation: Two separate evaluation exercises have been undertaken. Using the geriatric data system, an attempt has been made to assess the impact of better screening and surveillance. More generally, the effect of problem orientated medical records on patient care has been the subject of research. Papers on both exercises have been submitted for publication.

Selected Publications:

TULLOCH, A.J. A Problem-Oriented Record System in Primary Medical Care. Report of a Nuffield Foundation Travelling Fellowship.

TULLOCH, A.J. et al. (1975) Hospital Discharge Reports: Content & Design. Brit.Med.J., 4, (5994), 443-6.

TULLOCH, A.J. (1976) (M.D. Thesis) The Design and Evaluation of a Modern Medical Record System.

TULLOCH, A.J. The Evaluation of an A4 Problem orientated record system in primary care. (In preparation).

TULLOCH, A.J. A randomised controlled trial of geriatric screening and surveillance in general practice (submitted for publication).

TULLOCH, A.J. Integrated Patient Care. (Submitted for publication).

Related Projects: The Oxford Community Health Project (Ref. F2.1)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.4

Project Title:	Problem Orientated Medical Records in EC6/7 Format
Location:	Alton Health Centre, Anstey Road, Alton, Hants.
For Further Information Contact:	Dr. Hugh Bethell
Key Topics:	Primary care; form design; POMR; flow sheets.
Summary:	This practice has instituted a system of problem orientated medical records using standard EC6/7 formats. They have their summary cards over-printed with a data base and problem list structure. Flow charts are kept on diabetic and hypertensive patients. Notes are kept in a standard SOAP format. Conversion was done by the doctors themselves slowly over a considerable period of time.
Costs:	The overprinting costs about £15. per thousand cards once the plates have been made.
Transferability:	Complete.
Documents on File:	Basic data base cards; flow charts for diabetes and hypertension.
Selected Publications:	BETHALL, H.J.N. (1978) Order out of chaos - how one G.P. solved the problem of records. Mod.Medicine, 23, (6) 81-3.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.5

Project Title:	Upgrading General Practice Records
Location:	General practice in North Yorkshire
For Further Information Contact:	Dr. Keith S. Walker, 14, Falsgrave Road, Scarborough, North Yorkshire, YO12.5AT.
Key Topics:	Primary care; form design; recall and screening; family recording.
Summary:	In this practice, standard E6/7 cards have been overprinted for family planning, thyroid disease, and basic data base information using an EMGEE hand duplicator. The standard envelope has also been overprinted with a family tree and space for housing information. A printed repeat prescription card, incorporating some features of the Aldeburgh system, is in use.
Costs:	Repeat prescription cards cost 0.8p. each. All other costs are negligible.
Transferability:	The EMGEE hand duplicator is available at most commercial stationers, and is the only piece of equipment needed.
Comments:	This project merits inclusion as the hand duplicator represents a very cheap alternative to expensive local printers.
Documents on File:	Sample overprinted cards and envelope.
Selected Publications:	WALKER, K.S. (1976) Update, February, p. 738 (family planning) WALKER, K.S. (1971) J.Roy.Coll.G.P., 21, p.748. (repeat prescription)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.6

Project Title: A problem orientated records system

Location: General practice in South Kensington

For Further Information Contact: Dr. Robert Lefever, The Promis Unit of Primary Care, 1 Malvern Court, Pelham Street, London SW7 3HU.

Key Topics: Primary care; form design; POMR; patient questionnaires; encounter forms.

Summary: This single-handed practice with an NHS list of 3,500 has instituted a problem orientated medical records system despite a very high population turnover (30% per annum).

Records are kept in an EC6/7 format, each record containing a problem list and problem orientated continuation notes. During the past three years, a data base has been completed for all new patients registering, constituting 90% of the current practice population. Priority is being given to building up data bases for the remaining, stable, 10% of patients.

Data is collected by patient-filled questionnaire, supplemented by personal interview at registration. Physical parameters are added following tests after the initial consultation. From these a problem list is completed. The practice does not maintain an age/sex index as the high turnover would severely limit its accuracy. The practice also has a very biased age/sex structure (predominantly young females). No disease register is maintained at present; Dr. Lefever is planning to install a mini-computer and the latest edition of the data base is pre-coded for eventual computerisation. Additional coded information on each patient contact will also be entered. Output will be used for risk analysis for individuals and cohorts of patients and for research purposes, but is not intended to contribute to the current records.

No decisions regarding hardware and software have yet been reached.

Costs: The implementation of problem orientated records has involved little cost over and above stationery. No costs can yet be assessed for computerisation.

Transferability: The problem orientated medical records can be used in the same way in any NHS practice, although practices with a more stable population would need a different routine for completing data bases. No judgment is possible on the transferability of the proposed computer system.

Comments:	The creation and maintenance of problem orientated records of this quality in such difficult circumstances is an important demonstration of their practicability and practicality. It is now Dr. Lefever's intention to demonstrate the capabilities of a mini-computer in an average group practice.
Documents on File:	Prototype of new edition of encounter form; design paper on computer analysis in general practice (ms form).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.7

Project Title: A P.O.M.R.-based information system for general practice.

Location: General Practice Teaching and Research Unit, St. Thomas' Hospital Medical School, 80 Kennington Road, London SE11 4TH

For Further Information Contact: Dr. L. Zander

Key Topics: Primary care; form design; research information; morbidity recording; family recording; POMR; A4 records; flow sheets; patient questionnaires; age/sex registers; computer systems (batch); nomenclature.

Summary: This practice has developed a recording system based on problem orientated records, but employing a number of modifications. The records are filed in A4 folders. Special features include:

a) modification of the continuation pages to provide a separate column for the problem identification and limitation of the problems listed on the master problem list to those selected few of most importance;
b) a family tree format for recording the family and social history;
c) patient self-administered questionnaires for obtaining base-line information from newly registering patients;
d) linked morbidity and age/sex registers held on computer tape.

Following each consultation, all problems identified are listed in a special column at the right of the continuation sheet. A list of serious or chronic problems (approximately 450) has been established after considerable study within the practice. If any of these problems are present, they are listed on the Summary Problem Sheet in the front of the folder, thereby ensuring that the patient's more significant problems are not obscured by less important or self-limiting conditions. The Summary Problem Sheet also has a special column marked "action" which refers to any special longer term program of management for that problem, e.g. annual thyroid function tests following treatment with radio-iodine. It is envisaged that whether or not the appropriate action has actually been undertaken could be checked by a clerk, and might provide a form of audit for these conditions.

The extraction of problems from the problem column of the continuation sheet on to the Summary Problem

List is undertaken by a clerk following each consultation. At the same time, these problems are added to the computer file.

Family and social history is recorded using a "family tree" and copies of these are placed in the records of all registered family members. When information from the Summary Problem List is added to the family tree of any one member of the family by the clerical staff, it is added to the trees of all of the registered family members. At the moment this system is being used solely for newly registering patients and families of particular concern to the doctor, and the procedures for updating the family records must still be regarded as experimental.

Information for the data base for newly registered patients is obtained using the self-administered questionnaire.

Experiments are taking place in the use of flow charts for the management of certain chronic conditions (see Ref. No. F1.8). Following a detailed systems analysis of the possible use of more extensive computing facilities the group is actively seeking an on-site mini-micro computer system to extend the range of the work.

Costs: Clerical time: 30 hours per week
Computer time: Minimal.

Transferability: One other practice is in the process of converting their records to our system and a second practice is conducting discussions about developing a similar computer based record.

The forms and techniques should be generally applicable, although there might need to be some changes to fit local requirements. The present suite of computer programs is unlikely to be widely applicable.

Comments: The work which this group has done on what problems they wish to record permanently should be of interest to many users. By placing all problems in a separate column in the continuation notes, they achieve a balance in which the problem list itself is uncluttered but a rapid review of the total pattern of the patient's history is still possible without reading the notes in detail. The use of a special column for 'action' on the problem list is also worth noting.

Documents on File: Flowsheets; patient questionnaires; sample record cards. First Report, April, 1976. "A Study of the Effects of a change in the Design of the Medical Record on the Quality of Medical Care Delivered to Patients Suffering from Chronic Disease" (unpubl.)

Selected Publications:

ZANDER, L.I. et al. (1978) 'Medical records in general practice.' Occ.Paper No. 5, Roy.Coll.Gen.Pract.

ZANDER, L.I. (1977) Recording family and social history. J.Roy.Coll.G.P., 27, 518-20.

Related Projects:

Evaluation of Flow Sheets in General Practice (Ref. F1.8)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F1.8

Project Title: Evaluation of Flow Sheets in General Practice

Location: St. Thomas' Hospital General Practice Teaching and Research Unit, Department of Community Medicine.

For Further Information Contact: Dr. C.J. Watkins, General Practice Teaching and Research Unit, St. Thomas' Hospital Medical School, 80, Kennington Road, London, SE11.4TH.

Key Topics: Primary care; form design; audit; GP/Hospital communication; evaluation; flow sheets; patient questionnaires.

Summary: This project constituted a controlled study of the impact of a structured medical record (the flow sheet) on the quality of medical care provided for patients suffering from diabetes mellitus and cardiac failure.

Instruments which were especially developed for the evaluation of quality of medical care included a self-administered questionnaire for the patient, a questionnaire for the general practitioner and a booklet by which the medical records may be audited. The questionnaire for the patient measured perception of those symptoms which should thecretically decrease in severity or frequency if an improvement in management occurs, and also contained questions designed to measure functional impairment and impairment of activity. The questionnaire for the doctor asked him to predict his patients' illness behaviour by answering independently questions about his patient identical to those presented to the patients themselves. The clinical audit booklet was designed to extract at each consultation, the observations which the doctor carried out and recorded in the medical record. The results of the study are still pending.

Costs: Stationery, postage, doctors' time, (the time required is slight but the current system does require that some items be entered on both the flow sheet and the standard continuation notes.)

Transferability: Flowsheets: complete, but individuals would probably want to make slight modifications in the forms.
Method: promising, although all attempts to evaluate health care delivery are fraught with problems.

Comments: The project is of particular interest for its attempts to evaluate the effect on standards of clinical care of a change in medical information handling and for the audit booklet which was developed in order to evaluate the completeness of the doctors' notes. Useful adaptations have also been made of several questionnaires developed within other practices.
It has now been completed and the final reports and dissertations should soon be available.

Documents on File: Flowsheets; patient questionnaires; audit booklet; study protocol; First Report, April, 1976.

Selected Publications:

WATKINS, C.J. 1980. "Experimental research into the quality of medical care delivered to patients suffering from chronic disease". Published Ph.D. thesis. University of London.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.9

Project Title:	A Data Base for General Practice
Location:	General Practice, Aldeburgh, Suffolk.
For Further Information Contact:	Dr. Ian Tait, Danes House, Aldeburgh, Suffolk, IP15 5HG.
Key Topics:	Primary care; morbidity recording; form design; POMR; patient questionnaires; age/sex register; miscellaneous ledgers.
Summary:	Data base cards have been produced (in conjunction with the Cardew Stanning Foundation). Using the EC6/7 format, they comprise a Summary Card for diagnoses, problems and 'significant events'; a Family and Personal History card for social and occupational data, family structure and family history of significant disease; a Treatment Card for long and short term medication and sensitivities; a Repeat Prescription Record Card; and a multi-purpose flow sheet for long term care. Data for these cards is gathered by means of a patient questionnaire. Problem lists are only used for some patients with complex problems, but all progress notes are given a problem heading. A4 record folders are used to allow letters and reports to be filed flat, but clinical recording is continued on EC6/7 cards. (For details see Tait (1977). The practice records are supported by a standard RCGP age/sex register and a disease register for cohort review.
Costs:	The Background Data Cards cost in the region of £10. per thousand, however, a limited quantity of cards can be provided free through the Central Information Service because of its support by the Cardew Stanning Foundation.
Transferability:	The Data based cards have been piloted in twenty practices on over 1,000 patients with encouraging results. A growing number of practices report successful introduction of the cards. Further information and sample cards are available through the Central Information Service, Royal College of General Practitioners, 14, Princes Gate, London.
Documents on File:	Questionnaire; data base cards.

Selected Publications:

TAIT, I, and STEVENS, J. (1973) The problem orientated medical record in general practice. J.Roy.Coll.G.P., 23, 311-5.

TAIT, I. (1974) Medical Records and a new Look at an Old Problem. in The Health Team in Action, B.B.C. Publications, London.

TAIT, I.G. (1977) The clinical record in British General Practice. Brit.Med.J.,2, (6088) 683-8.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.10

Project Title: Integrated Records and Information System in General Practice.

Location: General Practice, Abbots Langley, Herts.

For Further Information Contact: Dr. Peter Tomson, The Group Surgery, Vine House, 87, High Street, Abbots Langley, Herts, WD5 OAL.

Key Topics: Primary care; recall and screening; audit; morbidity recording; POMR; flow sheets; patient questionnaires; E-Book; age/sex register; form design.

Summary: This practice provides an excellent example of enhanced EC6/7 type records, supported by a basic practice information system.

The clinical records are problem orientated and the data base (patient questionnaire) is on a folded sheet to fit the EC6/7 envelope. At the design stage, this questionnaire underwent extensive trials, resulting in the phrasing of questions in an open-ended format. Studies were also undertaken on acceptability, and an overall acceptance rate of 75% was reported. This has since been improved upon.

Dr. Tomson sees the chief function of the data base as the identification of problems and presenting to the doctor on the front page a family structure diagram.

The problem lists are conventional and have been completed for 95% of Dr. Tomson's patients. Many carry a preventive medicine flow sheet, showing dates of last blood pressure measurement, cervical smear, etc.

Continuation notes are also problem orientated. Records are ruthlessly preened of unnecessary paper by extracting and copying information from pathology and x-ray reports and shorter letters so that they are transferred, often on gummed paper, to the progress notes in chronological sequence and under the appropriate problem title.

Flow sheets have been designed for hypertension, diabetes mellitus and anaemia. Research is being done into whether the inclusion of the flow sheet improves the process of care.

A contraception record card is included in the system, drug cards are in use for those patients on long-term medication and the under-5 child assessments are recorded on the RCGP (Wright) Pre-School Record Card. (This is completed from conception so that even the earliest of risk factors is included).

The spines of the records of hypertensives, diabetics, anaemics and thyroid patients are tagged for easy identification to facilitate annual compliance checks. The clinical records are supported by an age/sex register and a selective morbidity index kept in an E-Book and used for preventive medicine and quality control as well as teaching and research.

Costs: The practice has spent a considerable amount on having high quality cards printed to their specifications for the data base, for the flow sheets, for the problem list and for the drug cards. However, compared to the cost of A4 conversion, the amount spent is negligible.

Transferability: All these systems can be used in any ordinary National Health Service practice.

Comments: It is interesting to note that the records system has been installed in this partnership in a situation in which not all partners put records at an equally high priority. This circumstance has often been held to be an absolute bar to improvements in medical records.

Documents on File: Data base; problem list; flow sheets; drug cards.

Selected Publications:

MURRAY, M. et al. (1974) A questionnaire as a data base in problem-orientated records. J.Roy.Coll.G.P., 24, (145), 572-5.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.11

Project Title:	Contraceptive Record Card and Flow Sheet
Location:	General Practice in Cheltenham
For Further Information Contact:	Dr. Clive Froggatt, 129, St. George's Road, Cheltenham, Glos. GL50 3ER.
Key Topics:	Primary care; form design; flow sheets.
Summary:	A structured contraception card has been developed which fits into a record envelope, but can be adapted for A4 records. It is intended for use over a 6 to 9 year period. Space is provided for personal/family history, menstrual history and obstetric history on one side of the card. The other side contains identification data, extensive information from the initial consultation and parameters for assessment of further contraceptive advice.
Costs:	The card is available free on request from several drug companies: Ortho, Wyeth, Schering, Organon, and Searle.
Transferability:	Individual general practitioners may wish to make minor modifications, but this card could be used in any practice.
Documents on File:	Sample cards
Selected Publications:	FROGGATT, C. (1977) A Contraception Card for use in General Practice. J.Roy.Coll.G.P., 27, (175) 107-9.
Related Projects:	Edge-Notched Cards in General Practice. (Dr. M.J.V. Bull. Ref. No. F2.2)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F1.12

Project Title:	New Record Folder for use in General Practice
Location:	"The Gables Partnership" and "Church Street Partnership", Wantage Health Centre, Garston Lane, Wantage, Oxon. OX12.7AY.
For Further Information Contact:	Dr. J.K. Hawkey, Gables Partnership Dr. I.S.L. Loudon, Church Street Partnership
Key Topics:	Primary care; form design; A4 records
Summary:	Over a three year period, a number of doctors in Wantage experimented with possible alternative A4 sized folders. 46 General practitioners took part in trials of the new folders which contained a clinical notes sheet, summary sheet, nurse's and health visitor's sheet, immunisation record sheet; maternity record sheet; x-ray and pathology report sheet and general purpose chart. The record folders were designed for lateral filing on open shelves, at a rate of 30-45 records per foot, or in a 5-tier rotary filing cabinet which will hold 1,200 folders. From a questionnaire sent out to participating general practitioners it was found that an overwhelming number were in favour of replacing the medical record envelope and felt that the A4 format should be adopted. Both the Gables and Church Street partnerships have subsequently converted completely to A4 records.
Costs:	Detailed costing was carried out when the project started. At that time (1971) the average cost of a folder and inside sheets was just under 7p.
Transferability:	Total, provided only that sufficient filing space is available.
Documents on File:	Sample record folder
Selected Publications:	HAWKEY, J.K. et al. (1971) New record folder for use in general practice. Brit.Med.J., 2, 667-70. HAWKEY, J.K. et al. (1968) Brit.Med.J., 2, 699. LOUDON, I.S.L., (1975) Record Keeping in General Practice. Update. Feb.
Related Projects:	A4 records in general practice and embossed plates for identification (Ref. No. F2.16)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F1.13

Project Title: "Family Portraits" on Data Base

Location: General Practice in Edinburgh

For Further Information Contact: Dr. J.J.C. Cormack, Ladywell Medical Centre, Ladywell Road, Edinburgh. EH12 7TB.

Key Topics: Primary care; form design; recall and screening; POMR; family recording; A4 records; flow sheets.

Summary:

The opportunity is being taken, while changing over to A4 records, to insert an informally structured data base into the record. The crucial feature of this is what Dr. Cormack calls "Family Portraits" - a diagrammatic representation of the patient's family covering three generations.

The portrait is built up with square boxes which represent male patients and round boxes which represent female patients, for which Dr. Cormack has had rubber stamps made. He has evolved a convention for annotations as to names, dates of birth, profession, marital status and significant illnesses which are then added to the basic structure. Thus, any doctor familiar with the convention can, at a glance, see the structure of the family and a good deal of its medical and social history.

These data bases are built up on the summary sheet recommended by the Working Party on General Practice records which have been adopted by this practice. The summary sheet also carries data as to drug sensitivities, blood groups, other significant previous illnesses and a problem list.

The practice also uses a preventive medicine flow sheet designed by the Joint Working Party on the Redesign of Medical Records in General Practice, which combines data on immunisations and data on cervical smears, urine tests and blood pressure.

Costs: Minimal. Stationery and rubber stamps, plus some doctor time.

Transferability: Has been adapted for use by St. Thomas' General Practice Teaching & Research Unit. (Ref. F1.7) Could be used in any normal National Health Service practice.

Documents on File: Family portrait data base; preventive medicine flow sheet.

Selected Publications:

CORMACK, J.J.C. (1975) Family Portraits - a method of recording family history. J.Roy.Coll.G.P. 25, (156), 520-6.

KING'S FUND MEDICAL RECORDS PROJECT

PRIMARY CARE RECORD FORMAT PROJECTS IN BRIEF

Reference Number: F.100

Project Title: "Pruning" G.P. Records

Location: General Practice

For Further Information Contact: Dr. C. Salisbury, 90, Station Road, Carlton, Nottingham.

This practice has developed simple and effective procedures for eliminating excess material from the patient records and cutting the correspondence and reports down to a size to fit the Lloyd George Envelope. They have also evolved a system of colour coding different items in the record in order to make them stand out for quick review or reference.

Reference Number: F.101

Project Title: Teaching Practice Records

Location: General Practice

For Further Information Contact: Dr. Alan Murphy, The Health Centre, Midland Street, Long Eaton, Notts.

This practice extensively pruned their records using the EC6/7 envelope and maintained a simple problem orientated format with all records being typed from dictation. They have now converted to A4 records.

Reference Number: F.102

Project Title: Problem orientated medical records

Location: General practice

For Further Information Contact: Dr. T. Venables, The Surgery, St. Wilfred Square, Calverton, Notts.

This practice maintains a careful problem orientated records system based on an A4 type folder. A variety of flow sheets and special forms are in use.

Reference Number: F.103

Project Title: Problems of Medical Records

Location: Aberdeen University, Department of Public Health and Social Medicine

For Further Information Contact: Professor R.D. Weir

Professor Weir's Department has been instrumental in a number of projects in both primary care and hospital record keeping, although they are not currently involved in any one specific project.

Reference Number: F.104

Project Title: The "W-Book"

Location: General practice

For Further Information Contact: Dr. P.A. Walford, Springfields, Felstead, Essex.

Dr. Walford was the originator of the "W-Book" which is a simple cumulative disease register, easier to keep than the "E-Book" but not allowing a detailed analysis of utilisation and morbidity. It is, however, useful for cohort review for audit, teaching and planning.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.1

Project Title: Oxford Community Health Project

Location: Oxford Regional Health Authority, Old Road, Headington, Oxford, OX3 7LF.

For Further Information Contact: Dr. John Perry, Oxford University Unit of Clinical Epidemiology, Oxford Regional Health Authority.

Key Topics: Primary care; recall and screening; research information; morbidity recording; linkage; A4 records; age/sex registers; computer systems (batch); encounter forms; key entry systems; nomenclature; audit; G.P./hospital communication.

Summary: This project provides G.P.s with a registration system, encompassing an up-to-date age/sex register with address and telephone number. Printouts of patient populations can be ordered by age and sex, or by geographical area or street address or postal code. The latter facilities aid practice management with regard to taking on patients, organising visits and health visitor work. The system is currently in use by 27 practices comprising 96 doctors of widely differing types, including not only teaching practices and training practices but ordinary service practices as well.

Additional systems available, and used by some of the doctors, include patient recall systems with defaulter warnings. The doctors specify the conditions or types of patient to be recalled. Widely used recall categories include immunisation, cervical cytology, hypertension and diabetes. The facility to enter patient problem lists and update them on the computer is also provided.

All problems and diagnoses are coded using the OXMIS code based on the ICD and cross-referenced to the RCGP morbidity code and the International Classification of Health Problems in Primary Care (ICHPPC).

Data entry is via forms filled in by the practice staff which are then entered at the R.H.A. using their key-to-disk system.

Costs: The cost of operating the system is low, at 9p. per record, per year. Minimal additional secretarial staff is required by the practice using the system.

Transferability: Forms: complete, although other users might wish to make modifications.
Computer system: written entirely in ICL 1500 Cobol.

Comments: The project aims to develop slowly those services which doctors actually want and will use. At this stage little emphasis has been placed on controlling the quality of the data collected to ensure its validity for epidemiological research purposes.

Considerable attention has been paid to the question of confidentiality. All identifying data must be encyphered before transmission.

Documents on File: Patient questionnaire; complete set of records and forms; "Progress and Priorities 1976": A Discussion Document; OXMIS Problem Codes, 1975.

Selected Publications:

ACHESON, E.D. and FORBES, J.A. (1968) Experiment in the Retrieval of Information in General Practice. Brit.J.Prev.Soc.Med., 22, 105-9.

BALDWIN, J.A. and EVANS, J.H. (April 1970) The Community Health Project: proposal for development of a comprehensive health information system for the new city of Milton Keynes.

PERRY, J. (1972) Medical information systems in general practice: a community health project. Proc.Roy.Soc.Med., 65, 241-2.

SEMMENCE, A.M., EVANS, J.H. and GEARY, J.E. (1972) The construction of a computer held file. The Practitioner: "Economics of General Practice".

BALDWIN, J.A. (1974) Community health information systems. R.Soc.Health Congress.

PERRY, J. (1974) Use of the Oxford medical information system in the support of primary medical care. Colloques IRIA, 1, 367-78.

EVANS, J.H.E. and SEMMENCE, A.M. (1975) The Computer. (In) Screening in general practice. Edited by Cyril Hart, Livingstone.

PERRY, J. (preprint) A primary care morbidity code based on the International Classification of Diseases. Medical Data Processing Symposium, Toulouse.

COBB, J.S. and BALDWIN, J.A. (Submitted) Some Aspects of Consultation Patterns in a General Practice.

MELLORS, et al. (Submitted) Cervical cytology in a general practice.

Proceedings of a Symposium on Community Health Information Systems, Oxford, 5-8 September, 1972.

Related Projects: Oxford Drug Monitoring Project (Ref. E.103); Oxford Record Linkage Study (Ref. E1.1); General Practice Records System (Dr. M.G. Sheldon, (F.204); Problem Orientated Medical Records in Primary Care (Dr. A.J. Tulloch, Ref. F1.3)

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F2.2

Project Title:	Edge-Notched Cards in General Practice
Location:	East Oxford Health Centre, Cowley Road, Oxford, OX4 1XD
For Further Information Contact:	Dr. M.J.V. Bull, East Oxford Health Centre
Key Topics:	Primary care; recall and screening; research information; edge-notched cards.
Summary:	A file of edge-notched cards is kept for all IUD and oral contraceptive patients. There are approximately 500 cards in all and a simple template has been designed for reading the cards. It is possible to select patients within a certain age-group, or sharing certain characteristics by the use of a simple knitting needle. The system is used for recall and surveillance and for limited epidemiological studies. As a practice aid it has been found extremely useful.
Costs:	Minimal. Cope-Chat cards cost £19 per thousand unprinted or approx. £45 per 1000 printed. Both they and the hand punch (£4.57) are available from branches of Copeland Chatterson Ltd. For the limited system in use here, personnel time is negligible.
Transferability:	The system can be used in any practice for any set of criteria.
Selected Publications:	BULL, M.J.V. (1973) An IUCD Record Card. J.Roy. Coll.G.P., 23, (134), 656-7.
Related Projects:	Contraceptive Record Card and Flow Sheet (Dr. C. Froggatt, Ref.F1.11)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.4

Project Title: Data Collection in General Practice

Location: The Health Centre, Milngavie Road, Bearsden, Glasgow, G61 2DN.

For Further Information Contact: Dr. K.A.Harden, The Health Centre.

Key Topics: Age/sex register,; morbidity recording; computer systems (batch).

Summary: This practice has maintained an extensive morbidity and practice management information system for a number of years. Originally feature cards (see Ref. F2.5) were used in their traditional manner. However, over a period of time the limitations of the system for complex retrieval became evident. With the availability of a system for converting the material from the feature cards to punched paper tape, they have switched to a system which uses the same physical cards, but in a different manner, as ordinary item cards. Each patient has one card kept in their A4 folder. This card is overprinted with appropriate abbreviations for the different entries concerning that patient. As the patient presents with problems, these are marked on the card with a fluorescent 'highlighter' pen. At the end of the year an assistant is employed for a few weeks to punch all the marked positions on the cards, and they are then read into the university computer via the special card to paper tape readers.

Information is maintained on basic problems, reason for consulting, practice work loads, nursing utilisation and for special research projects.

Cost: Personnel: 6 clerical weeks for punching.
Hardware: Punch £120, cabinets £250, cards 11p. each.

Transferability: The system is limited by the difficulty in obtaining the device for reading the 'Feature cards'.

Comments: This represents a novel method of data collecting which might be convenient to a number of practices. It is interesting that the practice decided after considerable experience with the Feature card system, that the range of analyses which they wished to perform went beyond those which were possible using the basic system.

Documents on File:	Sample feature cards; protocols
Selected Publications:	HARDEN, R.M. et al (1975) Punched feature cards retrieval systems in clinical research. J.Hosp. Med., Feb. HARDEN, R.M. et al.(1974) New approach to information handling in general practice. Brit.Med.J., 2, (911), 162-6. REEKIE, D. et al. (1975) Handling information in general practice using feature cards with computers. J.Roy.Coll.G.P.,25, (154), 369-72.
Related Projects:	Information Systems for General Practice (Ref.No. F2.5).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.5

Project Title: Information Systems for General Practice

Location: Craigshill and Howden Health Centres, Livingston, West Lothian; Dedridge Health Centre, Livingston.

For Further Information Contact: Dr. M.P. Ryan, West Lothian District, Department of Community Medicine, Bangour General Hospital, Broxburn, West Lothian; Mrs. A. King, Howden Health Centre, Livingston, West Lothian; Mr. K. Burchell, Senior Systems Designer, Lothian Health Board, 11, Drumsheugh Gardens, Edinburgh, EH3 7QQ.

Key Topics: Primary care; form design; recall and screening; G.P./hospital communication; research information; drug monitoring; morbidity recording; POMR; A4 records; typed records; flow sheets; patient questionnaires; age/sex registers; feature cards; computer systems (batch); nomenclature; encounter forms.

Summary: The system is intended, by marrying the structured information contained in a Problem Orientated Medical Record to a simple, inexpensive method of data storage and retrieval to accomplish three aims: to provide readily available information to assist the doctor in the efficient management of his practice; to provide information about the working of health centre practice and its interaction with the hospital and other services; and to provide the facility for epidemiological and other research activities.

The doctors at these health centres have incorporated a number of different developments into their practices. The majority of records are typed from notes dictated into hand-held recorders at the time that the patient is seen. All notes are kept in A4 size folders.

Several of the doctors used a computer-based morbidity recording system for a number of years with considerable success, but this system was abandoned in favour of one based on feature cards. It was operated in batch mode with data collected from encounter forms; but was felt to be too expensive and time-consuming to merit its continuation. However, the registration system continues to be maintained on a computer file.

For the feature card system a specially trained clerk records basic practice information plus the problem(s) dealt with at each visit, any referrals made, and certain medications given. This gives an extensive morbidity index, referral log and selected therapeutic index. Problems are recorded using the WONCA code.

These doctors maintain their notes in a problem orientated format and use a patient-filled questionnaire to gather basic data. The questionnaires are placed in the record folders permanently and used by the doctor as an aid in formulating the initial problem list for each patient. They also use a structured referral note for all referrals and special flow sheets for screening procedures and continuing prescriptions.

Prototype equipment is available to convert the feature cards to computer compatible paper tape; however, an adequate computer interface has been difficult to achieve and remains a major drawback of the system.

Evaluation: A formal evaluation is in progress and the results should be available shortly.

Costs: The majority of patients' records are typed and this has meant that there is an increased secretarial establishment.

The feature card system requires one full-time secretary for eight doctors. The initial cost of the punch is £150. The cabinet costs about £450. The feature cards cost approximately £0.8p. each and each doctor requires approximately 500 cards per year.

Transferability: All of the systems could be implemented in another practice with no particular difficulty. The conversion of the feature cards to a computer compatible medium is the only portion of the project which requires expensive equipment or computer programming.

Comments: All information is kept within the practice, retrieval of patients who satisfy multiple conditions simultaneously is easy (e.g. 20-30 year old, male, hypertensives), and the system is easily understood and operated by the doctors and their staff. Punching is easy, requires no specialised training and is very accurate. The system is easy to adapt to the changing needs of the practice or to special studies. The vast majority of the information used in most studies can be coded.

The disadvantages are that the system may become unwieldy if too many patients are involved because each group of 2,500 patients requires a separate set of cards, and certain unusual types of retrieval are clumsy. Both these difficulties may be overcome if the equipment to transfer the records to computer is available. It is, however, not possible to recover information concerning which 'features' occurred together to form a single episode or encounter. Thus, although it would be possible to determine that a patient had, at some time, during the past year, had a urinary

tract infection, bronchitis, and been treated with tetracycline, it would not be possible without recourse to the notes to determine if the antibiotic had been given for the bronchitis, the urinary tract infection, both, or for an entirely different condition altogether. This difficulty is unlikely to be of serious consequence in practice to most users.

The typed notes and A4 folders are believed to be a success. In common with others, they found initally that it took some time to become accustomed to dictating good, brief, notes. At least a portion of the high secretarial costs for typing is the result of the particular organisation of this practice.

Documents on File:

Patient questionnaire; sample feature cards; coding system for initial computer based morbidity recording system; problem sheets and drug sheets; structured referral note.

Selected Publications:

BARCLAY, R. et al (1976) Towards an integrated medical record. Health Bull., Jan. 36-42.

BAIN, D.J.G. and HAINES, A.J. (1975) A year's study of drug prescribing in general practice using computer-assisted records. J.Roy.Coll.G.P., 25, 41-8.

BAIN, D.J.G. (1975) Prescribing psychotropic drugs for children. J.Roy.Coll.G.P., 25, 49-53.

BAIN, D.J.G. and HAINES, A.J. (1974) A treatment room survey in a health centre in a new town. Health Bull. (Edinb.) 32, (3), 111-9.

BAIN, D.J.G. (1974) The results of developmental screening in general practice. Health Bull. (Edinb.) 32, (5) 189-93.

BAIN, D.J.G. (1973) Health centre practice in Livingston New Town. Health Bull. (Edinb.) 31, (6), 290-6.

BAIN, D.J.G. (1973) Annual Reports from General Practice, 1971: 1. Craigshill Health Centre. Update, April, 1183-200.

BAIN, D.J.G. et al. (1973) Difficulties encountered in classifying illness in general practice. J.Roy.Coll.G.P., 23, (132), 474-9.

BAIN, D.J.G. (1973) A criticism of the use of tricyclic antidepressant drugs in the treatment of childhood enuresis. J.Roy.Coll.G.P., 23, 222-4.

BAIN, D.J.G. (1976) The continuing care of the handicapped child. Update, 12, 707-20.

BURCHELL, K. et al (1975) The use of the problem orientated medical record and feature cards in practice management and research. Health Bull., (Edin.) 33, (5) 210-3

RYAN, M.P., BUCHAN, I.C., BUCKLEY, E.G. Medical Audit - A preliminary report from general practice. J.Roy.Coll.G.P., 1979. 29. 719-722.

STARK, G.D., et al. (1975) Paediatrics in Livingston new town: evaluation of a child health service. Brit.Med.J., 4, (5993), 387-90.

Related Projects: Feature Card System (Ref. F2.4); Computer Based Record System for General Practice (Ref. F2.7)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.6

Project Title: Exeter Community Health Computer Project

Location: Exeter

For Further Information Contact: Mr. J. Sparrow, Director, Exeter Community Health Services Computer Project, Royal Devon & Exeter Hospital (Wonford), Barrack Road, Exeter EX2 5DW.

Key Topics: Primary care; G.P./hospital communication; morbidity recording; computer-generated summaries; computer systems (on-line, real-time); graphics; natural language retrieval; master patient index.

Summary:

The principal aim of the project is the integration of information so that all relevant data is quickly and easily available at any point at which a patient makes contact with the Health Service. Eventually it is hoped to include the records of all of the general practitioners in the NHS district and all of the diagnostic services and nursing notes in the District General Hospital. Some integration with the social services, health visitors, etc. is also anticipated. The broad objectives of the project are to help provide: better patient care; increased clinical and administrative efficiency; and better facilities for management and research.

The entire project is based on a real-time computing system which has now been used to keep the entire medical records of one group practice for 4 years and of a second for 2 years. The main administrative functions, nursing system and pharmacy system for the hospital computer system are working, but the diagnostic services subsystems are not yet completed.

In the general practice system the doctor interacts directly with Visual Display Units. The doctor types his notes directly on the terminals, correcting them as necessary. Items are entered under the various headings (diagnosis, treatment, etc.) but no restrictions are placed on their expression. In effect, the system provides the doctors with an electronic blackboard on which to make their notes, with appropriate safeguards to satisfy the legal requirement that nothing be actually lost when it is 'erased'. Extensive confidentiality locks are provided, so that the doctor can specify that particular items are available only to certain personnel. No item which is restricted in any way is ever printed on any of the 'hard copy' devices, although an indication that some data has been suppressed is printed.

Eventually, selected data from the general practice record will be available directly in the hospital when the patient is referred. Currently a summary is printed and sent. It is hoped that this complete summary may make it possible to reduce the amount of time which is required for the initial assessment of the patient by the consultant at the first out-patient visit. Data from the hospital diagnostic services will eventually be available to the G.P. directly.

Microfiche records of all patients are printed directly from the computer files (omitting all restricted data) every month. These provide the back-up for the doctors if the main system breaks down. They are highly portable and may be carried with the doctor on home visits. The records for the entire list of 10,000 patients may be carried in a coat breast pocket. A portable reader is also available. Strict accounting procedures for outdated sets of the microfiche records are in force.

The D.H.S.S. has recently approved a project to convert the entire system to run on a mini-computer on the general practitioner's own premises.

Details of the hospital information system are reported elsewhere (see Ref. No. D5)

Costs:

G.P. System:
Secretarial/clerical: nil (possible savings)
Doctor's time: less than one minute per patient, with average consultation time remaining at six minutes.
Computer: it is difficult to allocate costs among the various applications and developmental work. Using current hardware the cost is estimated at £1.73p. per patient per year. Using newer mini-computers housed on the G.P.'s premises the expected cost is estimated at 80p. per patient per year.

There is evidence to show that a 3% saving in drug costs is produced (nationally this could save £26M.) and that by using the system for patient recall, for which items of service payments are made, the G.P. can increase his income by some £600 - £700 per annum.

Transferability:

The current system is written for the ICL 1900 series computers in the Assembly language and so is specific to that machine, although many of the specifications might be transferred to another machine. Each application has been written independently and specially tailored to its environment so that it is not clear to what extent they would be adaptable to a different hospital or district. However, the general practice system is now being rewritten in a high level language.

On-Site Evaluation:

There is an on-site evaluation group funded with and integral to the project. They have conducted studies of the time required to use the G.P. system, the G.P. system's cost, and administrative studies of the hospital procedures.

The primary care systems are being evaluated according to the new performance criteria methods set up and agreed by the R. & D. Committee. Several surveys on patient, doctor and other user satisfaction have been carried out.

Comments:

The most interesting aspect of the project is the fact that the general practitioners involved find it practicable to enter their data directly on the VDU terminals. The doctors are enthusiastic and claim that any extra effort required is more than made up for by the more rapid retrieval of information. Although it requires perhaps one minute per doctor-patient contact more to enter the data, the average consultation time of six minutes has not changed since computerisation. They also report being extremely surprised at the number of times they have discovered items which they did not know previously, even concerning patients whom they thought they knew well. Some of the doctors, however, do prefer to enter the data between consultations rather than during them.

Although the practice using the system was involved in the design of the system, it is in no way an academic or demonstration practice. A second practice has now used the system successfully for 2 years. The system has been used successfully now for some 4 years. However, the final verdict must await as it is extended to more practices.

The doctors like the portability of the microfiche notes and find them valuable when going on home visits. This facility, however, poses very serious problems for confidentiality since each packet contains identifiable information on the entire patient list of a health centre. Even though restricted information is not printed, the potential for embarrassment, or worse, if a packet were lost or stolen is serious. The Regional Health Authority has purchased their own equipment which is used for all NHS microfiched production within the region. Whilst it is questionable whether the risk to confidentiality involved in passing tapes containing identifiable data from numerous health centres through any central facility are justified, an NHS unit is much more acceptable than a commercial bureau. The idea of the microfiche records is so appealing and inexpensive that more satisfactory solutions to the problems of confidentiality should be sought.

Documents on File:

"The Exeter Community Health Services Computer Project" (undated). A document describing the aims and scope of the project; "VDU against NHS envelope" (1975). Report of a pilot exercise.

Exeter Community Health Services Computer Project (1976) "A Description of the Nursing Services"

Exeter Community Health Services Computer Project (1977) "A Proposal for the Further Development of Computing in Primary Care".

Exeter Community Health Services Computer Project (1978) "Proposal for Primary Care Computer Systems at Exeter".

Other Documents Available:

Evaluation report on operational systems (Nov.1975); Appraisal report on future systems (March,1976); Using Computers in the NHS, the long term view; J. Sparrow & R.H. Fisher.

Selected Publications:

GILLINGS, D.B. & PREECE, J.F. (1971) An Analysis of the Size and Content of Medical Records Used during an On-Line Record Maintenance and Retrieval System in General Practice. Int.J.Biomed.Comput., 2, (2), 151-69.

ASHFORD, J.R. & PEARSON, N.G. (1971) A Community-Based Medical Computing System. Comm.Health,Bristol, 3, (1), 5-14.

SPARROW, J. (1975) Problem of creating a Community Health Record. Medical Record,(Winter.)

BRADSHAW-SMITH, J.H. & GRUMMITT, A. (1975) Real Time Record Management in General Practice. ICL Computer Users Conference, Harrogate, 1975.

BRADSHAW-SMITH, J.H (1976) A Computer Record-Keeping System for General Practice. Brit.Med.J., 1, (6022), 1395-7.

CLARKE, D.J., FISHER, R.H., & LING, G.(1979.) Computer-held Patient Records: the Exeter Project. Info.Privacy.,1. (4).(March.)

CLARKE, D.J., (1978) A Patient Data Base for the NHS Comp.Bull. Sept.

ROUSE, J.D. (1978) Hospital Computer Registration System with Community Links. Med. Rec., 19, (1).(Feb.)

HEAD, Miss A.E., (1977). Maintaining the Nursing Record with the aid of a Computer. Conference Proceedings of MEDCOMP. 77.

GRUMMITT, A. (1977) Real-time Record Management in General Practice. Int.Jou.Biomed.Comp. (8)

ZUMPEL, Z. (1978) Referral letters - the enclosure of the General Practitioner's Computerized Record Jo.Roy.Coll.G.P., 28, pp.163-167.(March.)

BRADSHAW-SMITH, J.H. (1977) General practice record-keeping using a real-time computer. MEDCOMP, 77. p.303-14. Uxbridge: On-Line Conferences Ltd.

Related Projects:

Exeter Community Health Project (Hospital Information System) Ref. No. D5.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.7

Project Title: Computer Based Record System for General Practice

Location: University of Southampton, Primary Medical Care, South Academic Block, Southampton General Hospital.

For Further Information Contact: Dr. Ewen Clark, Primary Medical Care, South Academic Block, Southampton General Hospital, Tremona Road, Southampton, SO9 2XY.

Key Topics: Primary care; form design; recall and screening; G.P./hospital communication; research information; drug monitoring; morbidity recording; POMR; A4 records; typed records; computer generated summaries; age/sex registers; computer systems; encounter forms; key entry systems; nomenclature; audit; data linkage.

Summary: An extensive morbidity and treatment register collected from an elaborate encounter form is maintained on computer. Diagnoses and drugs are coded manually by coding clerks before entry. The information is typed on a teletype connected to a paper tape punch as the forms are produced in the doctors' surgery. The paper tape is then read into the computer and any errors corrected immediately. Errors recognised include omissions, items incorrectly formatted and items inconsistent with previous entries in the patient's record.

The structure of the record is based on an adaptation of the problem orientated format. Use of the format by the doctor is mandatory. Encounters referring to one problem are grouped into 'episodes' by the computer and are then summarised automatically in order to speed retrieval and conserve storage space. Only the coded data is actually stored by the computer.

The system is fully operational, data stored from 1975 till the present time.

The system has been used during the past several years for a series of studies developing methods for investigating the process of care (see Clark and Forbes, 1979). These methods have been based on having the doctors specify their objectives for their actions in advance and comparing outcomes with these objectives. The programme of research would seem to provide an interesting alternative to more traditional methods of 'medical audit'.

All coding of problems is done in the CCS:P (Clark) code.

Costs: Personnel: One part-time secretary and one part-time coding clerk (for 8,500 patients). Two programmers.
Doctors' Time: The encounter forms which are the only notes taken require 1.5 to 2 minutes each. A visit schedule of one visit per 10 minutes is maintained in a teaching practice.
Hardware in practice: One teletype terminal (approximately £1,000 new).
Central hardware and equipment: implemented on CTL modular 1 computer. The system requires a computer capable of supporting a 28K word Cobol partition, an on-line terminal, and 30 M.byte disk storage with backup.
Communication: telephone links and modems.

Transferability: The system is implemented on a Modular I computer, a relatively common British made machine. The programming is in COBOL and should be relatively easy to adapt to other machines. Very full documentation is available, including a section on features to be taken into account on transferring to other machines. Facilities required would include the terminals with a means of collecting data off line (e.g. paper tape, cassette, or floppy disk), a machine large enough for the largest COBOL partition in the program suite (28K), sufficient disk space (approx. 750-1000 characters per patient), and an operating system which will allow the terminals to be connected on line.

Comments: The data is collected as an integral part of the doctors' routine note-taking. This is probably essential to any system which is to be used successfully over a long period of time. The large amount of data held on each patient allows extensive checks for consistency. Because the vetting is done on-line, errors can be corrected while the records are still immediately available. In this way the error rate is reduced by an order of magnitude. The system is a promising compromise between having real time terminals in the doctor's surgery and traditional batch systems. However, the encounter form, though apparently complicated at first glance, has been designed by the users and requires only one to one and half minutes to complete. Using less complex forms is possible.

So far over 300 data enquiries have been serviced requiring over 700 program runs. These have been used for service, teaching and research in PMC as well as other disciplines.

Documents on File: Patient questionnaire; registration form; encounter forms; problem list; personal history card; sample output.

Selected Publications:

ABRAMS, M.E. (1971) Computer terminals in a health centre. Comm.Health (Bristol), 3, (2) 81-5.

CLARK, E.M. (1974) Problem orientated records. Disease coding in a problem orientated general practice. J.Roy.Coll.G.P., 24, (144) 469-75.

FORBES, J.A. (1971) Record Linkage and the Community. Comm.Health (Bristol), 3, (1), 2508.

CLARK & FORBES (1979) Evaluating Primary Care Croom Helm.

CLARK, E.M. & CLIFF, K.S. (1979) Record Linkage as a tool for Planning. Pub.Hlth. Lon. (93) 242-245

BASDEN, A. & CLARK, E.M. (1979) Errors in a Computerized Medical Record System (Clinics) Medinfo. (4) No. 4. 203-208.

BASDEN, A. & CLARK, E.M. In press. Data Integrity in a General Practice Computer System (Clinics) Int.J.Biomed.Comp.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.8

Project Title: Group Practice Medical Information System using the "F-Book"

Location: West Granton Medical Group, 191, Crewe Road North, Edinburgh, EH5 2NT.

For Further Information Contact: Mrs. M. Whalen, Administrative Secretary; Dr. E.V. Kuenssberg, General Practitioner.

Key Topics: Primary care; research information; morbidity recording; family recording; miscellaneous ledgers (F-Book); nomenclature.

Summary: This practice has maintained a register by families of all of its patients, for both administrative and research purposes, the "F-Book". This replaces the standard age/sex register. The register is completely manual and is kept in ledgers by the practice clerical staff. Each family is placed on one page of the ledger and each member of the family in one column. Identifying and demographic details are given on one side of the page; on the other a list of the codable diagnoses attributable to that member of the family appears. 90 selected ICD codes are used. Unlike most other practice registers, patients remain registered in the F-Book permanently, even after they have left the practice.

The practice team finds the system extremely valuable for tracing patients in this highly mobile population and find that it provides a valuable source of information for social services, health visitors, and district nurses. It is also a key means of communication between the two practice sites. Data for research purposes is extracted by a manual search of all of the ledgers for a particular diagnosis.

All records are colour coded using the standard RCGP scheme. Letters are cut to size so that they fit in the standard envelope folded only once, and are held together with glue sticks. The glue sticks have been found to be less bulky than treasury tags or multiple staples.

Costs: Stationery: minimal
Clerical time additional to normal requirements: 1 hour per day for this large group practice of 8 doctors and 2 trainees.

Transferability: The system is entirely manual and could be used in any practice willing to invest the clerical time necessary. However, a practice wishing to establish a new, similar system might wish to redesign some aspects of it to make it more compatible with data processing equipment which has become much more widely available since the system was originally instituted.

Comments: The practice team finds the ledger linking patients by family extremely useful for practice administration and "team care". The system's usefulness for research is limited by the time needed for the complete manual search of all families needed to derive data from it. A system designed today would probably be made compatible with some form of automatic data processing which might overcome this defect. A manual system to address many of the same needs might be based on a limited morbidity index kept in the format of the E-Book and a linked, but separate, family index. Retrieval of simple morbidity data from such a system would be easier, but one would lose the ability to examine the morbidity pattern of an entire family at a glance. Dr. Kuenssberg emphasizes that filing the notes by household is not practical in an urban practice with a high turnover, as it involves complicated and time consuming indexing to keep up with the changes.

Documents on File: Staff list; notes on relationships for family index; list of selected ICD codes in use.

Selected Publications:

KUENSSBERG, E.V. and SKLAROFF, S.A. (1961) Family follow-up studies into the eugenic aspects of morbidity. Eugenics Rev., 52, 225-228.

KUENSSBERG, E.V. and SKLAROFF, S.A. (1962) Do diseases run in families? Discussion. Practitioner, 188, 253-61.

KUENSSBERG, E.V. and SKLAROFF, S.A. (1963) Family diseases in NHS general practice. Eugenics Rev., 55, 21-7.

KUENSSBERG, E.V. (1962) Age-sex registers. Between Ourselves, No. 20, June.

KUENSSBERG, E.V. (1964) Recording of morbidity of families. F.Book J.Coll.Gen.Pract., 7, 410-22.

KUENSSBERG, E.V. (1962) Are duodenal ulcer and chronic bronchitis family diseases? Proc.Roy. Soc.Med., 55, 299-302.

KUENSSBERG, E.V. (1971) General practice through the looking glass. J.Roy.Coll.Gen.Pract., 21, 3-16. Practitioner, 206. 129-45. (James Mackenzie Lecture, 17th, 1970)

KUENSSBERG, E.V. (1956) Volume and cost of keeping records in a group practice. Brit.Med.J.Suppl. i,341-3 (9/6)

KUENSSBERG, E.V. (1966) Medical record research opportunity in a state sponsored health service. Can.J.Publ.Hlth., 57, 234-7.

KUENSSBERG, E.V. (1968) A new record system for general practice. Report from Research Committee, Scottish Council of Royal College of General Practitioners. Recorder E.V. Kuenssberg. Brit. Med.J., 2, 420-3

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.9

Project Title: A data processing system for use in general practice.

Location: East Anglian general practice

For Further Information Contact: Dr. G.M. Clayton, 1, Trinity Street, Norwich. NR2 2BQ.

Key Topics: Primary care; recall and screening; research information; morbidity recording; age/sex registers; computer systems (batch); encounter forms; nomenclature.

Summary: A simple and flexible computer 'catalogue' of 10,000 patients is stored on magnetic tape; using a University of East Anglia ICL 1905 machine.

Data stored includes a unique patient identification number; personal and registration details; 'event' information; disease episodes using RCGP codes; clinical measurements (highest, lowest and most recent) for five factors; family history; procedures undertaken, flexible space for coded information related to specific research interests; and a facility for ongoing utilisation counts.

The programming language for file maintainence is Cobol and a validation program is run on all new and amendment data. The National Computing Centre's Filetab package is used to produce reports; and Fortran programs using University of East Anglia sub-routines have been used to plot histograms and scatter diagrams.

Data is entered directly onto coding paper at consultation by the doctor or his secretary and later transferred to 80-column cards by either the practice secretary or the computing centre staff. Entry and alteration of basic data and certain routine clinical data is the responsibility of the secretarial staff.

The 'catalogue' is run in parallel with normal EC5/6 records which remain the definitive document for individual patients.

The system provides space to record only seven illnesses per patient. If this number is exceeded, the doctor must decide which are important enough to save.

Numerous reports have been produced to date including immunisation status; incidence of selected diseases; age/sex register; address

listing; a scatter diagram of anaemia and other variables distributed by age and sex; a histogram of age of diagnosis in diabetes; family register; diastolic pressure tables; cervical cytology reports; alphabetical patient register; thyroid disease report; obesity report; and many others, including coronary risk factor analysis.

Costs: This is a very low budget system, utilising only a small amount of the doctor's time, one half-time equivalent secretary and minimal computer costs.

Transferability: The forms are quite clear and should be manageable by any practice with sufficient interest to maintain the effort required to fill them in consistently.

The programs are written in ICL Cobol and NCL Filetab and should run on any 1900 series machine with minimal adaptation.

Comments: The system has been kept deliberately simple and orientated towards service functions rather than research. The amount of data which can be recorded has a fixed limit, which Dr. Clayton feels is at the same time a great weakness and a great strength. It makes for simplicity and frugality but does limit the amount of data storable. The file is used as a basic general purpose practice catalogue. Record space can be increased by linked specialist files and event recording has been explored.

The system is unusual both in that Dr. Clayton did most of the programming himself, and that he has had very adequate service from the University Computer Centre and from the School of Social Studies. Good co-operation from a computer centre would be required to implement the system elsewhere, but another doctor would not need to do any programming.

The system has provided unusually useful data, despite its technical limitations. The crucial element is the enthusiasm and interest not only to collect the data but to use it once collected. It should provide real encouragement to others with limited resources but vigorous imaginations.

Documents on File: Upjohn Fellowship Report, 1972.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F2.10

Project Title:	A manual records system for general practice.
Location:	Royal College of General Practitioners Research Unit, Birmingham.
For Further Information Contact:	Dr. D.L. Crombie, The Royal College of General Practitioners, General Practice Research Unit, Lordswood House, 54, Lordswood Road, Harborne, Birmingham, B17.9DB.
Key Topics:	Primary care; recall and screening; morbidity recording; A4 records; patient-held records; E-book; age/sex registers; nomenclature.
Summary:	This group practice incorporates a number of systems which are operated both for the practice itself and as prototypes of relatively simple systems which might be adopted by other centres. The clinical notes themselves have, until recently, been kept on the standard EC6/7 continuation cards, but these have been placed in an envelope in the back of an A4 folder in which all correspondence is kept. Although the records are not formally problem orientated, diagnoses or problems are recorded in the upper right hand corner of the note, and treatment at the end. The diagnoses are extracted by coding clerks using the RCGP code into standard E-Books and age/sex registers are maintained using the RCGP cards. The same clerks enter data abstracted from the clinical notes onto coding sheets for subsequent punching and computerisation (see Project Ref. No. F2.16.) A file of all repeat prescriptions is maintained. One copy is given to the patient to be carried with them, the other is retained in the practice. A series of follow-up registers are maintained in separate files using RCGP age-sex cards, and a formal evaluation of these registers is scheduled during the coming year.
Costs:	For a practice of 15,000 patients, five doctors and one trainee, maintaining both the manual and computer registers (Ref. No. F2.16) requires 2½ full-time equivalent clerks. It is estimated that the manual system alone would require about one full-time equivalent.
Transferability:	The manual system utilises standard RCGP materials which are appropriate to any practice.

Comments: This practice has acted as a testing ground for many projects of the Birmingham Research Unit of the Royal College of General Practitioners which operates partly from its premises. The manual systems developed are simple and effective and appear to be well integrated into the day-to-day operation of the practice. The automated systems are described under Ref. No. F2.16. Evaluations of all systems are either in progress or planned.

Selected Publications:
PINSENT, R. (1976) A practice register. Gen.Pract., 7th May, p.15.
CROMBIE, D.L. (1975) Monitoring adverse drug reactions. J.Roy.Coll.G.P.,25, (154), 337-43.

Related Projects: An automated records system for general practice. (Ref. No. F2.16)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.11

Project Title:	Improved Record Keeping in General Practice
Location:	Armagh, Northern Ireland.
For Further Information Contact:	Dr. J.O. Woods, The Mall, Armagh, Belfast
Key Topics:	Primary care; form design; morbidity recording; A4 records; family folders/recording; recall and screening.
Summary:	The notes in this practice are kept by household in A4 folders. Each patient's notes contain a problem/summary card. A drug card is used to maintain a compact record of all prescriptions. A geriatric card has been developed which the health visitors find of particular value. A set of risk registers is maintained covering 19 categories of patients (e.g. hypertensives and those with chronic chest disease). These are used primarily for practice management rather than research. The summary/problem list card and the drug card are being adapted for use in traditional EC6/7 envelopes and are to be used in all teaching practices.
Costs:	Stationery plus some secretarial time.
Transferability:	The main elements should be adaptable to any practice. The list of conditions to be included in the risk registers might vary somewhat according to local conditions.
Comments:	A number of relatively simple improvements which should make the records very much easier to use.
Selected Bibliography:	WOODS, J.O. (1974) Improved record keeping in general practice. J.Roy.Coll.G.P., 24, 865-74.

Comments: This practice has acted as a testing ground for many projects of the Birmingham Research Unit of the Royal College of General Practitioners which operates partly from its premises. The manual systems developed are simple and effective and appear to be well integrated into the day-to-day operation of the practice. The automated systems are described under Ref.No. F2.16. Evaluations of all systems are either in progress or planned.

Selected Publications:
PINSENT, R. (1976) A practice register. Gen.Pract., 7th May, p.15.
CROMBIE, D.L. (1975) Monitoring adverse drug reactions. J.Roy.Coll.G.P., 25, (154), 337-43.

Related Projects: An automated records system for general practice. (Ref.No. F2.16).

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.12

Project Title: A Teaching Practice Records System

Location: General practice, Dundee

For Further Information Contact: Dr. F.B. Proudfoot, 21 Inverary Terrace, Dundee, DD3 6BS

Key Topics: Primary care; audit; research information; drug monitoring; morbidity recording; linkage; POMR; A4 records; typed records; computer systems (batch); encounter forms; nomenclature.

Summary: This teaching practice is affiliated to the Department of General Practice at the University of Dundee. It utilises the Tayside Master Patient Index (Ref.E1.3) with two specific objectives in mind: 1) as an audit of the work of the practice; and 2) as a research tool. Among the projects at present being evaluated is an examination of presenting symptoms related to confirmed diagnoses, and the provision of a common problem list from general practice, hospital and community records.

Practice records are maintained in a problem orientated format in A4 folders with separate inserts for clinical notes, summary sheets on important illnesses and investigations, nurse and health visitor records, etc. All records are typewritten.

Data for the Tayside Master Patient Index is collected by means of various encounter forms, prepared by the secretarial staff and checked before submission by a senior member of staff. The diagnoses are coded using the I.C.D. code, the drugs using the Aberdeen Drug and Medicine Information nomenclature and the occupations using the Classification of Occupations code, 1970. Data is transferred to standard 80-column punch cards by the Tayside Health Board Computer Department, who are responsible for the computing side of the project.

Costs: The practice employs one full-time and three part-time secretaries plus one part-time receptionists for 3,500 patients. It is not possible to estimate how much clerical and doctor time is involved in operating the system.

Transferability: This project relies upon the Tayside Master Patient Index for its data processing. The computer used is an ICL 1903T configuration well within that specified by the DHSS standard. The A4, POMR, typed records would transfer to any general practice.

Comments:	The data gathered over the period 1973-1978 has been the subject of a M.D. thesis.
Documents on File:	Sample encounter forms
Related Projects:	The Tayside Master Patient Index (Ref. E4.1)
Selected Publications:	PROUDFOOT, F.B. (1979) An Information System for General Practice. Glasgow University. Unpublished M.D. Thesis.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F2.13

Project Title: A Basic, Manual, Practice Information System

Location: General practice in Beckenham, Kent.

For Further Information Contact: Dr. John Fry, 138 Croydon Road, Beckenham, Kent.

Key Topics: Primary care; audit; research information; morbidity recording; age/sex register; edge-notched cards; miscellaneous ledgers; encounter forms.

Summary:

Dr. Fry's record system is an important example of a simple, effective and readily transferable information system, which has proved its worth over the course of time.

An encounter form is completed for each session, one line per patient, which records age, sex, "disease group", lab and x-ray investigations and referrals. The "disease group" does not coincide with the main ICD categories although it represents common and important problems in general practice. No use is made of numerical codes.

This data is transferred weekly to a thirty column ledger, with a column for each disease group, lab reports, x-rays and referrals. One row is used for each age group. The entries represent only the numbers of patients in each age group and disease group. This provides work load and utilisation data, but does not facilitate cohort review. For the purposes of cohort review, all new cases of specific diseases are entered into a small notebook and the diagnoses ringed in the records, thus providing incidence data. The names and addresses of all patients diagnosed as having the disease are transferred to index cards annually and those cards are filed in a separate box for each disease. These cards provide prevalence data and may be used for audit and preventive medicine.

A system of edge-notched cards for each patient giving identification, social, diagnostic and referral data which was analysed yearly has recently been discontinued because of storage difficulties and problems of processing.

Clinical records are conventional EC6/7 cards with ringed diagnoses and boxed referrals. In addition, all reports and correspondence are referenced in the continuation sheets in chronological order with the clinical notes.

Costs: Negligible.

Transferability: Completely transferrable to any practice.

Comments: At the one practice level, this is an extremely cost effective means of providing all the basic practice information necessary. By choosing ICD categories and diseases it could be made more compatible with computer supported practice record systems and access to a computer would obviate much laborious information transfer and analysis.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.14

Project Title: A diagnostic index in primary care

Location: General practice in Teesside

For Further Information Contact: Dr. D.C. Ingledew, The Health Centre, Coatham Rd., Redcar, Cleveland.

Key Topics: Primary care; recall and screening; morbidity recording; age/sex register; nomenclature; A4 records.

Summary: This is an example of a well-tried system which has been in use since 1954. The practice is two-thirds of the way to completing transfer to A4 records in each of which a summary sheet is being inserted. The problem statements and any ongoing medication are filled in at the top of every continuation sheet to alert the doctor when he sees the patient, rather than using a problem list. The doctor's diagnosis or problem statement is ringed, and when the record is returned to the office, is transferred by the secretary to a day sheet. This is basically the instrument of the appointment system and at a later date the diagnoses are transferred to a card index. There is one card per year for each diagnosis, coded by I.C.D. code (except for 'popular' diagnoses, where there may be several cards for one year). For each diagnosis, the date, name and address, and date of birth are entered. This index is therefore a precise diagnostic index of the incidence of disease.

The disease index is used for research and was the basis for many of the papers published by Dr. K. Hodgkin, visiting Professor of Family Medicine at the Memorial University of Newfoundland at St. John's - now Visiting Professor of General Practice, Dundee. It is also used for trainee projects, the preparation of teaching material and the identification of high-risk patients such as those needing influenza vaccination. It will also be used for an impending chronic disorders study which is in the nature of an audit.

The practice also has an age/sex index which has been used to construct an over-65 home visiting programme and supplied the health visitors with a nominal roll of those under the age of five.

Costs: Moderate. Some stationery costs plus secretarial time.

Transferability: This system should work well in any general practice with an interest in research or teaching.

Selected Publications:

PERKIN, J.M. (1972) Allergy in General Practice. The Practitioner, 208, 776-83.
PERKIN, J.M. (1972) Illness Seen in General Practice. Med.Dig., 17, (1), 21-32.
HODGKIN, K. (1973) "Towards Earlier Diagnosis". 3rd Edn. Churchill Livingstone.

In preparation:

Appendicitis in General Practice, Suspected and Proven: a 20-year Retrospective Survey, 1956-75.
Drug Treatment in the Elderly
The Management of Epilepsy in General Practice.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F2.15

Project Title: A4 records in general practice and embossed plates for identification.

Location: Newbury Park Health Centre, Perrymans Farm Road, Barkingside, Ilford, Essex, IG2 7LE.

For Further Information Contact: Dr. A. Elliott, Newbury Park Health Centre, Perrymans Farm Road, Barkingside, Ilford, Essex, IG2 7LE; Mrs. Pearle, Redbridge and Waltham F.P.C., Ilford Lane Chambers, Ilford Lane, Essex, IG1 2QU.

Key Topics: Primary care; A4 records; age/sex register.

Summary: When A4 records were installed at this practice, a system was implemented whereby all the identifying details for each patient are kept on embossed "addressograph" type plates. All requests for diagnostic procedures have the patient identification printed on them using this plate.

The plates are made on a Bradma machine by the Family Practitioner Committee and a side effect of the system is that the register is updated much more consistently and accurately than is usually the case as all changes must pass through the F.P.C. office. At the same time a file of the list is updated providing an automated age/sex register.

The full benefit of the A4 format will not be realised until the time-consuming summarisation of old records has been carried out by the GPs concerned.

Costs: 15,000 A4 folders at 7p each; cards and envelopes at 2.5p each; machine to make cards is used 1 hour per week. Conversion required two full-time staff working for seven months. The system uses part of the time of a number of personnel, probably totalling a little over one full-time equivalent.

Comments: The Bradma registration system works well but is quite expensive. A later machine is the Farrington Dymo Compact Card Writer and Labelmaster which is more lightweight and portable. The A4 folders are felt by all to be highly successful. Putting all registrations through the F.P.C. allows a degree of accuracy in the registration list otherwise unobtainable.

Documents on File: "The Computerised Registration System at West Sussex F.P.C." F.P.C. Project Presentation, 1975. Record formats.

Selected Publications:

ELLIOTT, A. et al. (1975) Complete conversion of health centre medical records to A4 size. Brit.Med.J., 4, 773-4.

ELLIOTT, A. et al (1979) An evaluation of the A4 folder system in general practice. J.Roy.Coll.G.P.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.16

Project Title: An automated records system for general practice

Location: Study Practice of the Royal College of General Practitioners (Dr. D.L. Crombie and partners) in collaboration with Health Services Research Unit, Medical School, Birmingham, 15.

For Further Information Contact: Dr. K.W. Cross, Department of Social Medicine, Medical School, Birmingham, 15 and Dr. A. Benn, Lordswood House, 54, Lordswood Road, Birmingham, B17 9DB.

Key Topics: Primary care; recall and screening; research information; morbidity recording; computer systems (batch); encounter forms; nomenclature.

Summary: A computer-based patient registration system has been in operation in the practice since 1971 (Farmer & Cross, 1972) and for several years a limited amount of information on each doctor-patient contact was stored on the computer at the Birmingham Medical School. This system ran in parallel with the manual systems described in Project Ref. Number F2.10.

A more extensive system was implemented in October, 1976. The essential feature of the new system is that all data are recorded on specially designed punch cards which have been termed 'return-cards'. All patient records were transferred into A4 folders, in the front inside cover of which there is one slot to hold the return-cards and a second to house the medical envelope.

On each return-card patient identification data are pre-punched and interpreted; and on the front of each folder a label carries computer printed registration information about the patient. The doctor makes his clinical notes on a simple encounter form displayed on the top of other clinical records which are fixed into the folder in chronological order.

The diagnoses and problems are coded by reference to the RCGP Code and entered on return cards by the coding clerks who also maintain a manual system (Project Ref. Number F2.10). In addition, they code any referrals made, and eventually it is hoped to code treatments prescribed. The doctor may also make free form comments which are stored but not analysed. The computer produces summary sheets for each patient including both these free text comments and a summary of the coded data.

Costs:	It is difficult to be precise as to the costs of the computer-based system because much of the clerical work overlaps with that arising from the practice's manual systems (Ref. No. F2.10). However, for a practice of 15,000 patients, five doctors and one trainee, it is estimated that the system requires one and half full-time equivalents at the practice and one-fifth of a full-time equivalent for data preparation at the Medical School.
Transferability:	The procedures involved have been thoroughly tested and documented. Pre-requisites to transferring the system are A4 folders and practice staff trained in diagnostic coding. The programming itself is done in Fortran for the Queen Elizabeth Hospital Univac computer, and is also well documented.
Comments:	Considerable experience has now been gained from the operation of the system; and a detailed costing and evaluation of the system is in progress.
Selected Publications:	FARMER, R.D.T. and CROSS, K.W. (1972) An automated records system for general practice. Brit.J.Prev. Soc.Med.,26, (3), 148-52.
Related Projects:	A manual records system for general practice, (Ref.No.F2.10).

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F2.17

Project Title:	MEDRISK and MEDOL - micro- and mini-computer based systems for general practice.
Location:	General Practice in Oldham, Lancs.
For Further Information Contact:	Dr. R.A. Johnson, "Thorns", 16c, Clough Lane, Grasscroft, Oldham, Lancs.OL4 4EW.; Eclipse Computer Services Ltd., Wheatsheaf Industrial Estate, Bolton Road, Swinton, Manchester, M27 2TB.
Key Topics:	General practice; recall and screening; morbidity recording; computer systems (on line/real time); micro-computers.
Summary:	MEDRISK is a system for storing basic morbidity data on a very small computer, with especial emphasis on its retrieval. This allows a limited degree of screening in real-time of the individual patient's record against the drug he or she is about to receive. Age/sex registers, defaulters' file and other registers are maintained. The data is stored and entered in numeric codes, in response to plain English "menus" displayed on the screen. Patients are identified by numeric reference to a separate register with provision for printing out names and addresses. One 5" floppy disk is compacted to store 1800 names and addresses (with NHS numbers, date of registration, etc.) on a random access basis. There are facilities for recording information on up to 500 named drugs and 60 diagnostic categories, of which 10 may be allocated by the individual user. Trent or ICHPPC codes may be included, although without presentation in clear on the screen. A 5" floppy disk should store 3 years doctors' data, an 8" hard disk 18 years for 10 doctors, with 800 names and addresses. MEDOL is a more detailed system which captures all encounter data (symptoms, signs, diagnoses, referrals and treatments), and has been in continuous use in one practice before and after entry so that there is no need to memorise them.
Costs:	MEDRISK currently is implemented on a 32K PET computer using small floppy disks. Estimated cost, complete with documentation is approximately £2,500. MEDOL is currently running on a mini-computer and not yet fully developed. Eventual estimated cost is in the order of £6,000-£8,000.
Transferability:	MEDRISK is to be released in PASCAL for the Commodore PET and is expected to be transferable to other machines. However, a prospective user would normally buy the hardware with the software in mind. MEDOL is still under development and written in FORTRAN IV.

Comments: The two systems described are linked in their general philosophy and structure but otherwise distinct. Both aim at providing a service relatively cheaply at some cost in convenience and ease of use. MEDRISK began definitely as a 'minimalist' approach but has become more sophisticated as equipment becomes cheaper. Their interest lies in the demonstration of how much can be done with relatively inexpensive equipment. The two systems are definitely aimed at different markets, the more sophisticated system, MEDOL, may only become really practical with the introduction of the next generation of cheaper more powerful micro-computers.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.18

Project Title: Installation of a large micro-computer system in a group practice.

Location: 32, New Road, Chippenham, Wilts. SN15 1HR.

For Further Information Contact: Dr. Robin While

Key Topics: General practice; recall and screening; morbidity recording; computer systems (on line/real-time); micro-computers.

Summary: The project is an attempt to develop a variety of resources using computer assisted methods. This is the first site to install the Health Computing Limited System. The groundwork for the system lies in the conviction that in the large (16,000 patient) practice neither administrative nor health care objectives can be met by manual methods.

Specific objectives are:

1. To create a Practice Register on computer, using structured Patient's summary sheet with details of sensitivities, immunisation, family and personal risk factors, current and past clinical problems, repeat prescriptions and a facility to record important consultations or encounters. 2. To experiment with recall and management of certain conditions like hypertension according to a predetermined clinical management plan. 3. An evaluation of the impact of using a micro-computer on all aspects of patient care will be undertaken by the Wiltshire Area Health Authority as part of the funding arrangement.

The system includes facilities for basic patient registration, a free form problem summary, diagnostic index, repeat prescription and drug information, recall and audit, practice analysis and practice accounting packages. There is also a word processing system. It is being installed as a single terminal system although the equipment is capable of managing a multi-user environment.

Costs: The project is being 50% supported by the A.H.A. and was supplied at a 'special discount' by H.C.L. as a demonstration site. The eventual end-user cost of the current system would be in the order of £23,000 without these reductions.

Comments: Because this is one of the prototype systems, it should be watched with interest. The practice is large, but it is not an academic practice, and the decision to install a major computer system has brought with it many tensions and difficulties in establishing priorities and general agreements. The practice should be a prime example to watch for the problems and advantages of practice reorganisation which are required by a computer system.

Documents on file: Data Base and Explanation of Patient Record.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.19

Project Title:	General Practice Records
Location:	St. Mary's Hospital Medical School
For Further Information Contact:	Dr. C.M. Harris, Dept. of General Practice, St. Mary's Hospital Medical School, Lisson Grove Health Centre, Gateforth Street, London, NW8.
Key Topics:	G.P. Systems; computer systems (mini-micro);morbidity recording; drug monitoring.
Summary:	This system planned to provide a computer-assisted practice information system, initially, linked to a study of the modification of prescribing habits of the general practitioners involved. The system will provide an extensive set of registers for registration data, diseases, special risks, and treatments, and supplements rather than replace the traditional clinical notes. The data will be entered from special forms filled in by the practice staff, the doctors, and specially trained coding clerks. These forms will be sent to the department of general practice for entry via a V.D.U. It is intended to record a basic set of data on each patient and further data from each patient encounter. The ICD9 coding system will be used. The data will be used for both practice management and research.
Costs:	Staff: The project is part of a larger research effort employing - 2 sessions of a senior lecturer 1 computer programmer 3 secretaries/research assistants/VDU operators plus additional part-time staff. Equipment: PDP 11-03 (LSI 11) with hard disks.
Evaluation:	The project is in its initial stages and no evaluation is yet possible.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.20

Project Title:	Feature Card Information System for General Practice
Location:	The Health Centre, Marylebone Road, March, Cambs. PE15 8BG.
For Further Information Contact:	Dr. Thomas S. Warrender, The Health Centre, Marylebone Road, March, Cambs. PE15 8BG.
Key Topics:	Feature Cards; Recall systems; Morbidity recording; Medical audit.
Summary:	This practice has instituted a very extensive information system based on feature cards. The system includes an age/sex register, facilities for morbidity recording, screening, administrative problems and research. The information is entered onto the feature cards by a practice secretary. The practice has found the system economical and easy to use. The cards form an integral part of the practice administration for control of such items as contraceptive claims, and a variety of research projects have been undertaken. Problems encountered include the difficulty of updating the cards from year to year and the difficulty of using feature cards for longitudinal rather than cross sectional studies. However, despite these problems the group feels that feature cards represent a highly economical and practical method of data collection and management for general practice.
Costs:	Cards are approximately £25. per doctor per annual set.
Transferability:	Two colleagues at the Health Centre have taken up the system.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.21

Project Title: Milton Keynes Medical Records System

Location: Wolverton Health Centre, Gloucester Road, Wolverton, Milton Keynes, MK12.5DF.

For Further Information Contact: Mr. Arthur Rowley, A.H.A. Manager, Milton Keynes Medical Records System

Key Topics: A4 records; P.O.M.R., Computer Systems (Batch); form design.

Summary:

Considerable effort has gone into the arrangements for providing A4 size folders for the doctors operating in 11 out of the 16 practices in Milton Keynes. This includes the pre-assembly of the folders by patients at various Occupational Therapy Departments and, upon F.P.C. recall, their subsequent de-conversion by patients at the Wolverton Day Hospital. Folders in respect of patients re-registering with doctors in the New City who use an A4 size folder are not de-converted as described but are transferred direct to the new practitioner under "by-pass" arrangements made with the Buckinghamshire and Northamptonshire Family Practitioner Committees. Under these arrangements the medical record envelope only is forwarded to the F.P.C. for "ciphering".

The degree of flexibility which is exercised by individual practitioners is demonstrated by the fact that POMR is not standardised throughout. Provision is made for practitioners to use a standard Problem List, departures therefrom being the prerogative of each individual practitioner.

The Milton Keynes Medical Records System is to be viewed against a background of computer activity in which all Milton Keynes practitioners participate. Computer aspects of the system are the responsibility of the Oxford Community Health Project to which reference should be made in this Gazetteer under the reference Number F2.1.

Quarterly Removal Statistics have been produced over the past five years and a fairly high rate of "inter city removals" has been manifested. In an attempt to categorise these patients, computer-produced lists in N.H.S. order have been analysed and the work is still continuing.

At one surgery in the New City the total practice file has been converted to a numerical filing system and it is interesting to note that in 90% of patient contacts, either in person or over the telephone, the patient uses the folder number shown on his reference card.

Costs: Salary costs represent the employment of three full-time members and two part-time members of staff. In addition, the stationery requirement is enhanced by the fact that sales of A4 size records to outside doctors are permitted. Outwork of folder assembly by the various Occupational Therapy Departments is provided for and the annual overall budget (excluding salaries) is currently in the region of £7,500 for 52 doctors.

Transferability: Apart from the basic folder, the use of A4 size insert sheets is at the discretion of each individual practitioner. Four basic insert sheets, however, are provided in each folder. The system is capable of being extended in so far that the degree of flexibility and the number of insert sheets is limitless. Although the basic system was designed for use within the New City of Milton Keynes, interest has been expressed by many doctors practising throughout the country and those wishing to change over to an A4 size system and who are having difficulty in obtaining the necessary A4 size folders are advised to contact the Manager.

Selected Publications:

ROWLEY, A. (1975) The Future Role of Health Centres in the N.H.S. from a Medical Records Point of View O.R.H.A.

ROWLEY, A. (1973) Hospital Size Folders in General Practice. Hospital and Health Services Review. 375-376.

ROWLEY, A. (1977) Numerical Filing of Health Centre Records. Hospital and Health Services Review.236-240.

MILES, D.P.B. and ROWLEY, A. (1979) Turnover of G.P. Lists in a New Community. J.Roy.Coll.G.P. (in press)

Related Projects: Oxford Community Health Project (Ref.No.F2.1.)

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.22

Project Title: Microcomputer system for general practice - Eaton Socon Health Centre.

Location: Eaton Socon Health Centre, 274, Great North Road, Eaton Socon, Huntingdon, Cambs. PE19 3BJ.

For Further Information Contact: Dr. S.R. Mayhew, Eaton Socon Health Centre.

Key Topics: Age/sex register; diagnostic index; drug monitoring; A4 records; microcomputers; encounter forms; computer generated summaries.

Summary: The practice has installed a microcomputer to aid in the various research projects carried out in the practice. Initially it will hold the age/sex and diagnostic registers, and a drug index. Information is captured via a combined prescription and encounter form. Drug information is captured by using carbonless copy paper to produce a copy of the prescription. Problems and other information are written in spaces at the side. Encounter information is being recorded for all patients contacts and will be used to produce both the disease register and patient problem lists.

The practice already employs a full time research assistant and has engaged an additional person to assist with data entry. There has been a slight increase in the data recorded by the doctors on the encounter forms, but this does not appear to be a problem.

All basic information is kept on-line, and the system uses a hard disk with floppy disks for back-up.

Transferability: The system is supplied by Primary Care Computers, and it is hoped that it will be applicable in other practices.

Costs: The practice has estimated that the total cost over the five year period will be approximately £35,000 at 1979 prices, including hardware, software, maintenance and personnel time. Basic system cost is approximately £15,000.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.23.

Project Title:	The Use of the MEDIDATA System for General Practice
Location:	The Surgery, Alma Road, Romsey, Hampshire. SO5 8ED.
For Further Information Contact:	Dr. F. Akerman.
Key Topics:	Age/sex registers; Morbidity recording; drug monitoring; encounter forms; computer generated summaries; microcomputer systems.
Summary:	This group of five doctors in a dispensing practice on their own premises have obtained a microcomputer system from a local Systems house. A highly compact system has been provided which provides for disease and age/sex register, repeat prescription programme, routine recall and surveillance, and accounting. Consideration is being given to a stock control programme for the dispensing practice. Most information is entered from routine investigation reports and from prescriptions after they have been filled. When a doctor wishes to enter a new problem on a patient, the notes are flagged and then they are passed by the filing staff to the computer staff to the computer operator for data entry. All information is entered in numeric form and patients are identified by number. This produces an extremely compact record which is stored on floppy disks, roughly two for each doctor's patients. The repeat prescription program has not been implemented at the time of writing, pending receipt of appropriate stationery.
Evaluation:	A study of the rate of rubella immunisation using the system is under way. Careful cost accounting of the increase in fees for services received is in progress.
Costs:	The practice maintains the full allowed staff of two ancillary personnel per doctor but has not employed any additional staff for the period of changeover. Estimates are that 1 full-time and 1 half-time staff will be required. The basic system cost approximately £7,500 including hardware and software. Stationery costs for labels are considerable: £200 per 50,000 labels.
Comments:	At the time of writing the system has been in use for nine months, and despite initial scepticism and teething problems is now accepted by staff and doctors. To this time the group has not found any serious problem in having to exchange the floppy disks in order to achieve adequate storage.
Documents on file:	Example coding sheets and user documentation.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.24

Project Title: Drug usage in a rural community.

Location: The Health Centre, Deddington, Oxfordshire.

For Further Information Contact: Dr. P.J. Fell.

Key Topics: Age/sex register; Morbidity register; Micro-computer system; Drug monitoring; Computer generated summaries.

Summary: This practice has participated in the Oxford Community Health Project for a number of years. A micro-computer was obtained in 1979, and they have gradually been transferring many of the functions from the O.C.H.P. to it. The practice is particularly interested in prescribing and drug information.

A coder enters information directly from the doctors' notes into the computer system.

The practice is a dispensing practice, and the data from all prescriptions are entered following their being filled. The practice is active in research and data for various projects is entered by the research nurses. Other information is taken by trained coding staff from the doctors' notes. There is a computer produced problem list for each patient, but otherwise the clinical notes themselves are unaffected by the system.

The present system uses floppy disks for storage, but application has been made to upgrade the system to one using a hard disk, to avoid the inconvenience of repeatedly changing the relatively low capacity floppy disks.

Costs: The practice employs 1½ w.t.e. coding clerks,
1 w.t.e. programmer
3 research nurses.

Hardware: The system runs on a micro-nova computer with a basic price between £10,000-£15,000 for hardware.

Comments: It is worth noting that exchanging floppy disks to achieve an adequate storage capacity has not proved satisfactory to this practice. Whether this reflects the use made of the system or inadequacies in the system design cannot be said with certainty, but the necessity to maintain a number of separate disks has obvious limitations, which must be traded off against the cost savings.

Documents; on File:

Reprint from The Practitioner, June, 1979. vol. 222. "Allergy affecting the head and neck": Watson, N.P., Fell, P.J., O'Donnell, H.F.

WATSON, FELL and O'DONNELL, "Drug Monitoring in a Rural Practice"

"Longer Term Effects of Live Influenza Vaccine in Patients with Chronic Pulmonary Disease." Lancet.1977.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.25

Project Title: The Nottingham General Practice Information Project

Location: Department of Community Health, University of Nottingham Medical School, Clifton Boulevard, Nottingham, NG7 2UH.

For Further Information Contact: A.L. Rector* or M.G. Sheldon. Department of Community Health, University of Nottingham Medical School.

Key Topics: Computer Systems (on-line); recall and screening; audit; morbidity recording; evaluation; POMR; automatic encoding; micro-computers.

Summary: The project is concerned primarily with the development and evaluation of different methods for information handling in general practice. A demonstration computer assisted system has been implemented and the basic elements have been in routine use in one 12,000 patient practice since 1978 and two additional practices are being converted. In addition, the system is used in batch mode by a number of practices. The system provides for the routine registration and administrative functions, a diagnostic index, and recall system. A repeat prescription system has been developed but not yet implemented and tested in practice.

Systems for routine encounter recording and a variety of systems for ancillary staff are under development. All systems are fully compatible. All key data is stored in coded form, and routines have been developed for the automatic encoding of common problems from plain English phrases. Coded data is believed to be important in order to facilitate the eventual development of 'active' information systems which monitor and prompt for the performance of routine tasks and the delivery of timely information.

The systems have been developed in MUMPS on the Department's PDP 11/34, but it is intended that they be transferred to suitable microcomputers for use on the doctors' premises for eventual implementation. The use of a microcomputer for data collection for practices using the system off-line is under development.

Comparisons with the practice prior to implementation and with similar practices suggest that the system is significantly more completely accurate for both registration and diagnostic functions and requires considerably less time for the practice staff to operate than did the pre-existing manual system.

Costs:

The current prototype system on a central mini-computer involves hardware costs of:
VDU & Printer: £2,000 per practice or £700 per year.
Telephone and other costs: £600 per year per work station depending on location.
Central system to be shared among 2-4 practices with 20,000-40,000 patients - £25,000 or £7,000 per year, per practice.
Hardware: total - roughly 30p. per patient per year, although this figure would vary with the selection of modules and the quantity of data stored.

It is expected that micro-computer implementations would give substantially reduced costs in the near future.

Software and programming: developmental costs have been modest.
Ancillary staff: The system saves considerable time over equivalent manual procedures, but the practices have taken on increased activities.

½ wte. per doctor for a reasonably sophisticated system would probably be a reasonable expectation.

Comments:

The main emphasis of the group has been on evaluation, and the systems developed are therefore extremely flexible. They allow new configurations to be implemented rapidly. It has been felt that this was a more reasonable approach for the time at which the project began than the use of the smallest hardware available.

* The authors wish to point out their personal involvement in the system and therefore limit their comments to the above.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F2.26

Project Title: Medical Records in a General Practice Health Centre

Location: The Health Centre, Streatham;
Department of Medicine, King's College Hospital Medical School.

For Further Information Contact: Dr. Ashby, The Health Centre, Streatham.
Prof. J. Anderson, King's College Hospital Medical School.

Key Topics: Record Format; Microcomputers

Summary:

The objective of this project is to produce, in computer held form, a brief medical record which contains sufficient ancillary and administrative data to be used for both auditing practice care and for administration. It must cover both Family Practitioner Committee accounts and investigations and therapy. It is to be designed so that the system can be used by doctors, nurses, social workers, and practice administrators. It should also provide a means of linking the computer record with the Health Service Record System.

The work is currently in the design stage. Emphasis is being laid on data being captured by the person who can do so most easily and reliably. Some changes in practice procedures will clearly be required. It will be evaluated primarily on the cost effectiveness of the eventual implementation using microprocessors.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number F2.27.

Project Title: Epidemic Observation Unit of the R.C.G.P.

Location: Epidemic Observation Unit, Royal College of General Practitioners, c/o Maths Dept., University of Surrey, Guildford.

For Further Information Contact: P.R. Grob, Epidemic Observation Unit, Address as above.

Key Topics: Research information; computer systems (batch, micro); drug monitoring.

Summary:

The Epidemic Observation Unit is one of the Research Units of the R.C.G.P. It is operated in close co-operation with the Department of Mathematics and the Institute of Industrial and Environmental Health and Safety and the University of Surrey.

The Unit has developed a network of sentinel general practices which make regular records of selected infective and non-infective conditions seen. These data are analysed at the University and used for a variety of purposes ranging from the surveillance of individual diseases to research and planning. The network maintains a constant surveillance on approximately 228,000 people.

An extension of this network has been undertaken in the Oxford Region in which a specially selected recording group of doctors has undertaken to provide epidemiological information underpinned by microbial investigations.

Projects are under development for a system of drug surveillance in general practice and to evaluate the role of a practice-based micro-computer linked with the main frame computer used for the current studies. It is envisaged that this would both provide the doctor with drug information and similar services and facilitate central data collection and analysis.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number F2.28

Project Title:	Heuristic Approach to General Practice Information Systems
Location:	"Four Winds", Belmont, Durham; Teesside Polytechnic, Borough Road, Middlesborough.
For Further Information Contact:	Dr. Alistair Malcolm, "Four Winds", Belmont, Durham. J.K. Darby, Teesside Polytechnic.
Key Topics:	Computer Systems (micro); Research Information
Summary:	This project is primarily concerned with enabling general practitioners themselves to explore the potential of information systems in their practices. A prototype system is being developed which is designed to facilitate this 'heuristic approach' to the use of computers in general practice. The system will give the doctor the opportunity to 'play around with' information processing economically without having to learn an undue amount about the details of computer techniques. The design includes a wide range of special, built in functions and separate screens for the control dialogue and data display. It emphasises hardware functions rather than software packages and the data to be processed (and its organisation and form) rather than the programs which process it. The machine will also be compatible with Prestel in order to make information services developed on 'viewdata' immediately available.
Costs:	Not yet known but a major objective is to produce a basic system at a very low cost.
Comments:	The concept of a specially designed device to allow doctors to explore the possibilities of computing in a simple and friendly environment is extremely attractive. Its development will be watched with interest.

KING'S FUND MEDICAL RECORDS PROJECT

PRIMARY CARE SYSTEMS IN BRIEF

Reference Number: F.200

Project Title: Computer-aided Registration System

Location: The Woodside Health Centre, Barr Street, Glasgow, G20 7LR.

For Further Information Contact: Dr. F.A. Boddy, Senior Lecturer, Department of Epidemiology & Preventive Medicine, Glasgow University.

A computer-aided registration system and age/sex register has been implemented for all of the practices in this large health centre, whose problems are complicated by an unusually high patient turnover. As well as standard alphabetical and age/sex lists, the system provides a list sorted by address for use by health visitors and in planning home visits.

Reference Number: F.201

Project Title: Immunization Reminder System

Location: The Surgery, Ryan Court, 293 Streatham High Road, London, SW16.

For Further Information Contact: Dr. Stanley Allen

This practice has instituted a simple and successful immunization reminder system, which has been in use for several years. Immunization records are kept on 3" x 5" cards, which are reviewed annually. Patients due to come in for an immunization during that year have their records colour-tagged according to the quarter in which they should present. Reminders are sent, and a check is kept on those patients who do not respond.

Reference Number: F.202

Project Title: Morbidity Recording in General Practice

Location: The Long House, 73, East Trinity Road, Edinburgh, EH5 3EL.

For Further Information Contact: Dr. H.P. Dinwoodie

Dr. Dinwoodie maintained a computerised record of all patient contacts using a simple encounter form. There have been no recent developments, but interest is maintained, and the intention is to resume processing the data accumulated over 12 years on a small microprocessor when such hardware becomes an economic proposition.

Reference Number: F.203

Project Title:	Evaluation of the Impact of a New Health Centre (Data Recording in General Practice)
Location:	Department of General Practice, University of Dundee
For Further Information Contact:	Prof. J.D.E. Knox, Department of General Practice, University of Dundee, 166 Nethergate, Dundee, DD1 4DR. Dr. A. Jacob, Wallacetown Health Centre, Dundee.

The basic aim of this study is to evaluate the effects of entry into a new health centre on several different practices. In order to accomplish this an extensive encounter form has been developed. The instrument has been used during a three week period of data collection to establish the state of the practices before the change. Revisions prior to the studies of the practices after the move are in progress. Unusual features of the form include details of the degree of "psychotherapeutic content" in the encounter and a classification of drugs used as "specific" or "symptom/placebo". The form requires one full A4 page per encounter.

Reference Number: F.204

Project Title:	General Practice Records System
Location:	Hightown Road Surgery, Banbury, Oxfordshire.
For Further Information Contact:	Dr. M.G. Sheldon, Department of Community Health, University of Nottingham Medical School, Clifton Boulevard, Nottingham.

For several years this practice was one of the principal practices involved in the Oxford Community Health Project. In addition to keeping A4 POMR records filed by household, the practice made use of the facilities provided to maintain a household register, prescription register, and to conduct a variety of research projects. Of particular interest is the method used to collect linked prescribing and diagnostic data using a form which fits under a standard prescription form. The drug data is collected as a carbon copy of the prescription and the diagnostic data written to the side of each drug. Also of interest were a series of experiments in giving patients their problem lists. Dr. Sheldon has now left the Banbury practice to become Senior Lecturer in the Department of Community Health at Nottingham.

Reference Number: F.205

Project Title: Leeds Information Project

Location: Institute for Health Studies, University of Hull, Hull, HU6 7RX. N.Humberside.

For further Information Contact: Prof.H.McDonnell, Director

In the context of the developments described under Project Ref. E1.3 this project is attempting to provide information retrieval systems for a number of general practices, and plans are not yet finalised.

Reference Number: F.206

Project Title: Patient Address Register

Location: Drs. Lishman, Wilkinson and Rajan, 11, Westfield Lane, South Elmsall, Pontefract, WF9 2QA.

For Further Information Contact: Dr. D.I. Lishman

At the same time that this practice constructed its age/sex register, it found it convenient to produce a register of their patients by address which they have used for organising visits and to develop a geriatric register.

Reference Number: F.207

Project Title: A Ledger Method of Morbidity Recording

Location: The Surgery, 27 Station Road, Leigh-on-Sea, Essex.

For Further Information Contact: Dr. M.A. Basker

Dr. Basker uses a modification of the original 'L-Book' for recording basic data about each patient contact on a simple log sheet. He has found the system satisfactory, but hoped that it might be possible to provide assistance to transfer the information from the log sheets to a standard 'E' or 'F-Book'.

Reference Number: F.208

Project Title: Computer Registers for General Practice and Research

Location: M.R.C. Clinical and Population Cytogenetics Unit, Western General Hospital, Crew Rd., Edinburgh EH4 2XU.

For Further Information Contact: Dr. W.H. Price

The identification data and National Health Service lists for four group practices comprising approximately 35,000 patients are kept on a computer file for use in cytogenetic research. They are also used as an age/sex register and address register for the practices conerned as an aid to administration. Data is entered by a secretary on-line at the Cytogenetics Unit to the Edinburgh University on-line computer system. At the end of 1979, owing to cutbacks, the link with the MRC is being reduced to a small study population of 500 patients. Summary cards are being maintained within the practices.

Reference Number: F.209

Project Title: Clinical Data Summary Cards

Location: The Surgery, 46, Ferry Road, Edinburgh, 6.

For Further Information Contact: Dr. A.G. Donald

In co-operation with the M.R.C. Cytogenetics Unit in Edinburgh, this surgery is collecting summaries of clinical data. These are entered both on a summary card which is returned to the file for the use of the practice and on to the Edinburgh multi-access system for eventual use in research. The summarising is done by two former nurses, both of whom work part-time. Whilst the records are not formally problem orientated, the summary cards do include information on social and medical items which are not sufficiently defined to allow a traditional diagnosis. The summary system is seen within the practice primarily as being of benefit to the trainees when faced with very thick records.

See also Ref. No. F1.7

KING'S FUND MEDICAL RECORDS PROJECT

SECTIONS G. and H.

AUTOMATIC PATIENT INTERVIEWING AND COMPUTER AIDED DECISION MAKING

Introduction

Automated Patient Interviewing and the creation of Decision Aids are two areas which have not yet had a great impact on the medical record itself, but seem likely to do so over the next few years as micro-computers become much less expensive and more widespread. Both raise the possibility of radically changing the role of the clinical notes and medical information systems. In both, while technical problems exist, the problem of how to get appropriate input from doctors and others is at least as important as the computing techniques.

Of the two, the technical problems involved in patient interviewing are better understood and the software for sophisticated systems more readily available, most obviously in the form of the National Physical Laboratories' 'Mickie' system (see Ref. Nos. G1.2 & G1.3). This provides a very simple system whereby doctors or others not familiar with computer techniques can create their own questionnaires and dialogues. However, it should be stressed that the creation of good patient dialogues involves much more than just medical knowledge, and that collaboration with psychologists and other specialists will be necessary to achieve the maximum benefits. As with Computer Assisted Learning on which much of the software has been based, it is likely that creating dialogues which actually do provide the information the doctor requires as well as the other benefits to the patient will prove to be a special skill in its own right. On the other hand, one of the most consistent findings of workers in this field is that many patients find it easier to 'discuss' sensitive topics with the impersonal computer system than they do in a face to face confrontation. Some workers have even felt that the extra attention which the system allows the patient to receive can have a therapeutic effect.

Providing the doctor with decision aids is a somewhat more complicated problem. Statistical techniques have existed in a few areas such as Abdominal Pain since the early 1970's and it has been demonstrated

repeatedly that they can improve the accuracy of both diagnosis and decision making. However, they have not yet become as widespread as their technical success might have led one to expect. Much interest is also being raised currently by 'expert systems'. These are systems which attempt to model human thought processes and so are more able to 'explain' their conclusions than purely statistical systems. However, despite considerable success both in this country (see Ref. No. H1.1) and abroad, these systems are still experimental and much fundamental work is required before they will be widely available.

Perhaps the most interesting aspect of these systems is that they have been shown to be particularly useful as aids to teaching. De Dombal and others have shown that doctors' performance improves when feedback from the decision systems is provided. Workers in other fields are finding that the data prepared for the 'expert system' can provide a better source of information for students than any currently available text.

At a simpler level it is possible with current technology to perform simple checks for adherence to protocols (see Ref. No. B2.2) or drug interactions and contraindications (see Ref.No. D1). McDonald's (1976) work in the States has made it very clear that doctors at all levels fail to adhere to standard medical practice even when the protocols are carefully laid down and worked out in advance. The problem appears not to be individual carelessness but a fundamental limit to human information processing capacity in the very busy environment of normal daily medical practice.

In neither area is the intent to replace the doctor, rather it is to free him for those tasks he does best. In both areas, there is the promise of using information systems to improve the performance of the medical system as a whole to bring it closer to the ideal of providing the best care possible with current knowledge to the widest possible population.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number G1.1

Project Title: Automatic Patient Interviewing Systems

Location: Diagnostic Methodology Research Unit, Southern General Hospital, Glasgow, G51 4TF.

For Further Information Contact: Dr. R.W. Lucas, Dr. R.P. Knill-Jones and Dr. G.P. Crean, Diagnostic Methodology Research Unit, Southern General Hospital, Glasgow, G51 4TF.

Key Topics: Decision aids; patient interviewing

Summary: This Unit is concerned with the development and application of formal (mathematical) methods to a range of clinical problems. As well as research into statistical methods of discrimination between diagnostic/treatment classes, the Unit has also been concerned with the investigation of doctors' performance; cost of investigations, etc. A major part of the work has involved the study of patient-computer interaction for the purpose of eliciting medical history data.

The principal project has been the development of a Diagnostic Decision System for Dyspepsia which comprises both computer interviewing and diagnosis perhaps for the first time.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number G1.2

Project Title: Computer Assisted Patient Interviewing in General Practice

Location: North End Medical Centre, 211, North End Road, London, W14 9NP.

For Further Information Contact: Dr. G. Dove

Key Topics: Computer interviewing; microprocessors

Summary: This project (initiated in 1974) examined the implementation of an automated questionnaire to obtain a patient's history in a general practice. The patients examined (mainly women) were subsequently interviewed by the doctor who had introduced them to the computer in the first place. Thus they did not feel the computer had replaced the doctor whom they had come to consult.

The computer interview obtained a large amount of information about the patient, which was presented to the doctor as a completed summary.

The friendly and logical branching nature of the computer interview and the many questions asked not only made the patient feel at ease but the subsequent face to face consultation with the doctor was enhanced. Also, it often allowed the doctor to concentrate immediately on a particular patient problem, and thus be more affective in the use of his time.

It is hoped to demonstrate that, apart from all other aspects of computer interviewing, the patient does feel better as a result of the encounter with the machine, and research into this question is currently underway.

This project uses the 'Mickie' software and is one of the D.H.S.S. sites for evaluation.

The practice has also experimented with a number of other uses of computers, including Exeter project (Ref. No. F2.6) and the Southern General Hospital, Glasgow (Ref. No. G1.1).

Costs: Basic Hardware & Software: about £5,000 capital outlay.

Commnets: A Medical Computer Group meeting on a six-weekly basis has been formed looking at the possibilities of the use in diagnosis of the information from the computer interview, the use to investigate the etiological basis of certain illnesses, and the social and economic factors effecting the doctor/patient relationship.

Selected Publications: DOVE, G. et al. (1977) The therapeutic effect of taking a patient's history by computer. J.Roy.Coll.G.P.,Aug.

Related Projects: 'Mickie' Computer Based Interviewing System - Ref. No. G1.3

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number G1.3

Project Title: 'Mickie' Computer Based Interviewing System

For Further Information Contact: Mr. J.L. Alsop, O.B.E., D.H.S.S., Ray House, 6, St. Andrews St., London, EC4.

Key Topics: Computer based interviewing.

Summary: The 'Mickie' project began a number of years ago at the National Physical Laboratories under the inspiration of Chris Evans. A microcomputer based patient interviewing system was developed which provides easy interaction with the patient and a detailed summary of the information collected for the doctor. The software is flexible and designed to allow the users themselves to develop their own interview protocols.

A formal evaluation of Mickie investigating its acceptability to users - doctors, their staffs, and patients - and its technical feasibility is being carried out by the D.H.S.S. and the results will shortly be available. It has aimed to evaluate Mickie in a wide variety of clinical situations and specialities.

In addition to Project No. G1.2 reported separately sites using Mickie include the 3 other sites in the evaluation and a number of additional sites which have taken on the project independently.

G1.4. Dr. J.S. Stuart & Mr. G.E.T. Raine, Dr. Shirley Sommerville; West Middlesex Hospital (back pain and abdominal pain);
G1.5. Dr. M.E. Richards, Sandwell Hospital, East Birmingham, (Psychosexual counselling);
G1.6. Dr. A. Seaton, Institute of Occupational Health, Edinburgh (chest problems in relation to miners and ex-miners);
* G1.7. Dr. Abe Guz, Charing Cross Hospital (chest follow-up);
* G1.8 Dr. Hugh Price, Charing Cross Hospital (occupational disease).

Transferability: The 'Mickie' system is now being marketed by Abies Informatics, 38, Dover Street, London, W1X 3RB.

Costs: Hardware & software are available from approximately £2,500-£3,500.

Comments: The 'Mickie' system represents one of the major efforts in the U.K. in the field of computer based interviewing. This is a field which has been widely studied on a somewhat theoretical basis abroad, but which is only now with the advent of relatively inexpensive microcomputers becoming really practical for widespread use. The detailed evaluation by the D.H.S.S. should be of considerable interest when it is available.

* Separate from D.H.S.S. evaluation.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number G1.4

Project Title: Computer Assisted Interviewing in Gynaecology.

Location: Department of Obstetrics and Gynaecology, University of Leeds Medical School, Leeds, 2.

For Further Information Contact: Professor J.S. Scott, University of Leeds Medical School.

Key Topics: Patient filled questionnaires; computer assisted interviewing; micro-computers.

Summary: This project uses a two-stage patient filled questionnaire to collect the basic background data and information on the presenting problem for outpatients in the Gynaecology outpatient clinic. A basic portion collects general background information, and a second stage deals with the presenting problem in detail.

At the clinic a non-medical assistant uses a programmed typewriter to transcribe the data into a typewritten history which the doctor is given before the patient is examined.

Costs: The system compares favourably with the conventional handwritten summary.

Transferability: The system would be easily implemented on many of the common micro-computer systems currently available.

Comments: The group finds that the questionnaire is only useful to the clinician when combined with the automatic transcript facility. In this form it compares favourably with the traditional notes. The system has been acceptable to patients and doctors alike.

This relatively simple form of word processing could probably make a considerably contribution to data gathering at a minimal cost in equipment. It is one of the applications which should be considered when the potential advantages of buying word processing or other office equipment are considered.

Selected Publications:

ROBINSON, D.W. et al (1975) Histories obtained by two-stage questionnaire with automated transcript in specialist gynaecological practice. Brit.Med.J., 4, 510-513.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number H1.1

Project Title: Experimental Computer Assisted Decision Making

Location: University of Sheffield
M.R.C. Applied Psychology Unit, Mushroom Lane,
Sheffield. S10 2TN.

For Further Information Contact: Dr. John Fox or Dr. Mike Fitter.
M.R.C. Social & Applied Psychology Unit.
University of Sheffield, S10 2TN.

Key Topics: Computer aided decision making/diagnosis; Computer systems (on-line)

Summary: This project is part of a long term programme looking at both the practical applications of computer aided decision making and the theoretical implications of this work with regards to the psychology of cognition. The group's focus is the improvement of "human factors" aspects of interactive systems in general, as in design of programming languages and improvement of interactive dialogues. This particular project is aimed at determining what services and what presentation of these services, actually help clinicians make better decisions.

An on-line system for the diagnosis of dyspepsia has been implemented using the data base and methods developed by de Dombal (see Ref. No. H1.2) The doctor enters the information into the system during the consultation using a system of mnemonics, and the 'probabilities' of the various diagnoses are constantly updated in real-time. At the beginning of the consultation the system produces formatted history sheets on which the clinician can make his notes and at the end a summary of data entered into the computer and its diagnostic analysis are printed. Considerable effort has gone into making the system easy to use and flexible, and various experiments are underway using different combinations of the facilities available. For instance, an experiment has been conducted in which the doctors' behaviour was compared with and without the immediate visible updating of the probabilities displayed on the VDU.

The system is in routine use in an out-patient department where it is receiving a clinical and a psychological evaluation.

Other work includes investigations into the use of systems based on explicitly stated rules rather than statistical concepts. It is hoped that these will be more easily able to 'explain' their decisions to clinicians and therefore be more understandable and acceptable by them. There is also considerable work concerning the psychology of clinical decision making.

Costs: The system is currently implemented on a stand-alone mini-computer, with a total cost of approximately £15,000, but much of the cost and effort relate to its development. Ongoing costs should be minimal, except for the hardware maintenance.

Comments: This project represents an extremely interesting collaboration between psychologists interested in the processes of decision making and the man-machine interface and clinicians.

Documents on File:

Fox, J.(1979) Effects of on-line symptom-processing on History-taking and diagnosis - a simulation study. Int.J.Bio.Med.Comp.,10, 151-163.

Fox, J.(1980) Towards a reconciliation of fuzzy logic and standard logic. Working Paper. (February)

Sample patient's summary sheet.

KING'S FUND MEDICAL RECORDS PROJECT Reference Number H1.2

Project Title: Computer aided Decision Making in the Acute Abdomen, Dyspepsia and other G.I. Disease Bayes Algorithm

For Further Information Contact: Mr. F.T. de Dombal, St. James' Infirmary, Leeds. LS9 7TF.

Key Topics: Decision Aids; micro-computers.

Summary: Since 1969 the Leeds Unit has carried out a series of studies on the use of statistical techniques, primarily Bayes Algorithm and small computer systems for computer aided diagnosis and decision making. The best known work concerns the acute abdomen, but successful projects have also been conducted into the diagnosis of dyspepsia, inflammatory bowel disease, and numerous other areas.

The projects have been highly successful, with accuracy rates in the acute abdomen approaching 90% when used by someone trained in and familiar with the system. However, the success of the system depends on precise agreement on the definitions of the terms used, and without this agreement the system gives much poorer results. However, it consistently provides a degree of discrimination among the common diseases included in its data base, superior to that of the individuals providing the information.

The basic algorithm is very simple and can be implemented on most computers from the more personal computer computing size upwards. Modifications of the system have also been used manually in numerous centres, both in this country, on the continent, and as far away as Thailand.

Data for entry into the system is collected on special pro formas, converted into codes, and entered onto the computer. These are combined with the data base to produce a series of "probabilities" for the diseases in the given data base. These may then be used by the clinician, rather in the manner of an additional laboratory test, or X-ray procedure, as an additional piece of evidence.

Transferability: The data base and algorithm have proved to be remarkably robust in a number of different centres. With the exception of pancreatitis, the system has performed well in most centres in diagnosing the acute abdomen. The availability of inexpensive personal computers and the relative simplicity of the algorithm should make its transfer to interested centres techniquely easy. However, the problem of training the personnel involved in the terminology and use of the system must be considered.

Costs: With current technology, it seems likely that a stand-alone system could be obtained for between £1,000-£2,000. The price will depend primarily on the sophistication of the interface required and the extent to which available programs must be rewritten. The current system in BASIC requires a machine with 16 K.bytes storage.

Comments: This project is of importance for a number of reasons. It is the first project in the U.K. to show successful use of computer assisted diagnosis or decision making in a clinically important area. The team has strong evidence that in both the acute abdomen and dyspepsia improvements in both patient care and allocation of resources can be achieved using the system.

It is also significant that the team has used the statistical algorithm as a way of distinguishing between failure to collect or tend to data and failure to integrate data as causes of diagnostic error. They have found (Wilson 1975) that when using information collected by junior doctors, the difference between the junior doctors' own diagnostic performance and the computers is consistent over a considerable range of skills. Put another way, using the information collected by a junior doctor, the system scores approximately 10% better in diagnostic accuracy than does that doctor, whether that doctor is currently scoring 50% or 80% accuracy. This implies that much of the error is in the information collected rather than its integration.

Furthermore, the team has shown that feedback of information on their performance to junior doctors can rapidly and dramatically improve their diagnostic and decision making performance. The group has used similar techniques to investigate whether or not the presentation of various syndromes is consistent in different centres.

A large portion of the group's success must be put down to two factors which should be heeded by other groups entering the field. They have consistently chosen areas of clinical importance, medical interest and they have collected their basic data basis with meticulous care and attention to standardisation, consistency, and accuracy.

Selected Publications:

deDOMBAL, F.T. (1979) Computers and the Surgeon - A Matter of Decision. Surgery Annual, pub. Appleton-Century-Croft, N.Y.

LEAPER, D.J., GILL, P.W., STANILAND, J.R., et al. (1973) Clinical diagnostic process: An analysis. Br.Med.J., 3, 569.

deDOMBAL, F.T. (1971) Computer-assisted diagnosis. In Whitby, L. Lutz, W. (eds.) Principles and Practice of Medical Computing, Edinburgh, Churchill-Livingstone p.179.

de DOMBAL, F.T. (1973) Some observations of the procedures used in medical diagnosis in real-life situations and under artificial simulated conditions. In Lange, H.J., Wagner, G. (eds.) Computerunterstutzte arzliche Diagnostic. Stuttgard. Schattauer Verlag.

HORROCKS, J.C., de DOMBAL, F.T. (1975) Diagnosis of dyspepsia using data collected by a non-medically qualified physician's assistant. Brit.Med.J., 3, 421.

de DOMBAL, F.T. (1978) Diagnosis, decision-making and acute appendicitis: How many "errors" are inevitable? Chirurg, in press.

de DOMBAL, F.T. CLAMP, S.E., LEAPER, D.J. et al. (1975) Computer-aided diagnosis of lower gastrointestinal tract disorders. Gastroenterology, 68, 252.

de DOMBAL, F.T., HORROCKS, J.C. STANILAND, J.R., GILL, P.W. (1971) Simulation of clinical diagnosis: A comparative study. Brit.Med.J., 12, 575.

HORROCKS, J.C., McCANN, A.P., STANILAND, J.R., et al. (1972) Computer-aided diagnosis: description of an adaptable system and operational experience with 2,034 cases. Brit.Med.J.,(1), 5.

HORROCKS, J.C. (1974) A computer-aided diagnostic system using a small desk-top computer/calculator. Methods Inf. Med., (13) 83

HORROCKS, J.C., LAMBERT, D.E., McADAM, W.A.F., et al. (1976) Transfer of computer-aided diagnosis of dyspepsia from one geographical area to another. Gut., (17) 640.

HORROCKS, J.C., McADAM, W.A.F., DEVROEDE, G. et al. (1976) Some practical problems in transfering computer-aided diagnostic systems from one geographical area to another. In de Dombal, F.T., Gremy F. (eds.) Decision-making and Medical Care. Can Information Science Help? Amsterdam, North Holland.

HORROCKS, J.C. de DOMBAL, F.T. (1975) Computer-aided diagnosis of dyspepsia. Am.J.Dig.Dis.,20,397.

Documents on File:

de DOMBAL, F.T. Computers and the Surgeon - A Matter of Decision.

KING'S FUND MEDICAL RECORDS PROJECT — Reference Number H1.3

Project Title: Head Injury Data Bank for Prognosis and Audit.

Location: Institute of Neurological Sciences, Glasgow, G51 4TF.

For Further Information Contact: Professor Bryan Jennett, Department of Neurosurgery, Institute of Neurological Sciences, Southern General Hospital, Glasgow, G51 4TF.

Key Topics: Research information system; computer aided decision making/diagnosis.

Summary: Since 1968 using standardized methods of assessing initial severity, progress and outcome a year later. These methods were developed using observer-error techniques and have been adopted in many clinics world wide. Almost 2,000 cases from Glasgow, Netherlands and U.S.A. are now on the Glasgow computer. Statistical models enable outcome at 6 months to be predicted for many patients within 24 hours of injury. These predictions can be used to aid management decisions about which patients justify intensive treatment, and to assess the efficacy of alternative therapies. A parallel study of head injuries of all severities attending or admitted to hospital aims to determine how to audit the care of these cases across the whole hospital system, and to study the epidemiology of head injury. The role of CT scanning and of transfer to regional neurosurgical units is being explored, again with interactive comparisons.

Costs: The research data base involves a number of data collectors and statisticians. However, many of the techniques involve only pencil and paper or minimal calculating facilities.

Transferability: The scales developed for the assessment of coma have been widely used in both the U.K. and abroad.

Selected Publications:

TITTERINGTON, D.M., MURRAY, G.D., MURRAY, L.S., SPIEGELHALTER, G.J., SKENE, A.M., HABBEMA, J.D.F., GELPKE, G.J. (1980) Comparison of discrimination techniques applied to a complex data set of head injured patients. J.Roy.Statist.Soc. (in press)

JENNETT, B., TEASDALE, G., BRAAKMAN, R, MINDERHOUD, J. HEIDEN, J., KURZE, T. (1979) Prognosis of Patients with severe Head Injury. Neurosurg, 4. 283-289.

JENNETT, B., TEASDALE, G., FRY, J., BRAAKMAN, R., MINDERHOUD, J., HEIDEN, J., KURZE, T. (1980) Treatment for severe head injury. J.Neur.Neurosurg. Psychiat., 43, 289.

JENNETT, B., MURRAY, A., McMILLAN, R., MACFARLANE, J., BENTLEY, C., HAWTHORNE, V. (1977) Head injuries in Scottish hospitals. Lancet ii: 696-698.

KING'S FUND MEDICAL RECORDS PROJECT

COMPUTER ASSISTED DECISION MAKING IN BRIEF

Reference Number: H101

Project Title: University of Nottingham Medical Statistics Group

Location: Department of Mathematics, University of Nottingham, University Park, Nottingham.

For Further Information Contact: Professor Adrian Smith or Dr. David Spiegelhalter, Dept. of Mathematics, University of Nottingham; Dr. A. Skene

This group has a major interest in statistical decision making and is involved in a number of projects in Nottingham including work on the prediction of rejection in renal transplant and work with the Nottingham Diabetic Project (see Ref. No. B4.4). It also supplies statistical support to the Royal College of Physicians Computer Workshop and consulting on a wide variety of problems related to statistical aids to diagnosis and decision making.

COMPUTER ASSISTED DOCUMENTATION [illegible]

Reference Number: H101

Project Title: University of Nottingham

Locations Department of Mathematics
University Park, Nottingham

For Further Information: Professors Adrian Smith / [illegible]
Dept. of Mathematics, [illegible]

Contact: Dr. A. Stark

This group has a major interest in statistical computing and is involved in a number of projects in this area including the prediction of rejection to renal transplants. Bishopite Project (see Ref. No. H- [illegible]). Support to the Royal College of Physicians [illegible] a wide variety of problems arising in the analysis of [illegible] data

KING'S FUND MEDICAL RECORDS PROJECT

SELECTED BIBLIOGRAPHY

ABRAMS, M.E. et al. (1968) A computer general practice and health centre information system. J.Roy.Coll.G.P., 16, 415-27.

ABRAMS, M.E. (1971) Computer terminals in a health centre. Comm. Health (Bristol), 3, (2), 81-5. (F2.7)

ACHESON, E.D. (1964) M.R.C. Symposium on Mathematics and Computer Science in Biology and Medicine. The structure, function and cost of a file of linked health data. H.M.S.O.: 1965.

ACHESON, E.D. (1964) The Oxford Record Linkage Study: A central file of morbidity and mortality records for a pilot population. Brit.J.Prev.Soc.Med., 18, 8. (E1.1)

ACHESON, E.D. (1966) Computers: c) medical record linkage - the method and its application. J.Roy.Soc.Hlth.,86, 217. (E1.1)

ACHESON, E.D. (1967) The Oxford Record Linkage Study - the first five years. (In) The Proceedings of the International Symposium on Record Linkage in Medicine held in Oxford, 1967. E. & S. Livingstone, Ltd. (E1.1)

ACHESON, E.D. (1967) "Medical Record Linkage". Published by the Oxford University Press for the Nuffield Provincial Hospitals Trust. (E1.1)

ACHESON, E.D. see WATTS, S.P.

ACHESON, E.D. (1968) Medical Record Linkage. Brit.Med.Bull., 24. 206. (E1.1)

ACHESON, E.D. (1968) Record linkage techniques in studies of the aetiology of cancer. Proc.Roy.Soc.Med., 61, 727 (E1.1)

ACHESON, E.D. (1969) Medical record linkage. Meth.Inf.Med.,Jan., 1-6. (E1.1)

ACHESON, E.D. (1968) Records and File Organisation for Population Screening Procedures in Preventive Medicine. (In) Presymptomatic Detection and Early Diagnosis (Ed. C.L. Sharp). Baltimore: Williams and Wilkins. (E1.1)

ACHESON, E.D. see HOBBS, M.S.T.

ACHESON, E.D. and EVANS, J.G. (1964) The Oxford Record Linkage Study: a review of the method with some preliminary results. Proc.Roy.Soc.Med., 57, 269. (E1.1)

ACHESON, E.D. and FORBES, J.A. (1968) Experiment in the retrieval of Information in General Practice. Brit.J.Prev.Soc.Med., 22, 105-9. (F2.1)

ACHESON, H.W.K. (1972) The clinical record as an aid to continuing education in general practice: a medical self-audit. Brit.J.Med. Ed., 6, 26-8.

ACHESON, H.W.K. (1976) Converting medical records to A4 size in general practice. J.Roy.Coll.G.P., 26, (165), 277-81.

ACHESON, E.D., and RANG, E. (1968) The clinical significance of death after discharge from hospital unrecorded in the hospital notes. Lancet, 2, 908. (E1.1)

AITCHISON, J., MOORE, B., TRUST, P.M. Decision making in anti-hypertensive therapy. In preparation. (B6.3)

ALDERSON, M. (1976) A review of the National Health Service's computing policy in the 1970's. Brit.J.Prev.Soc.Med., 30, (1), 11-6.

ALLEN, A.C. and ALLEN, S. (1973) An immunization reminder system in general practice. Update, 6, 427-9.

ALLEN, L.P. et al (1978) Computer system for recording and display of data from newborn infants with respiratory disease. Arch.Dis. Child., 53, (2), 169-72. (C6)

ANDERSON, A.J.B. (1973) Computer maintenance of patient registers in general practice. Int.J.Biomed.Comput., 4, 61-71.

ANDERSON, G. et al. (1976) Practical application of computer-assisted decision making in an antenatal clinic: a feasibility study. Meth.Inf.Med., 15, (4), 224-9.

AMERICAN ACADEMY OF FAMILY PHYSICIANS, (1975) Automation for the physician's office: proceedings of a conference, Feb.15-16. 1975, Chicago, Illinois. Kansas City: A.A.F.P., 91

ANDERSON, J. (1973) Medical computer records in relation to the definition of disease. Meth.Inf.Med., Suppl. 7, 69-75.

ANDERSON, J. and FORSYSTHE, J.M. (Eds.) MEDINFO-74: Proceedings of the First World Conference on Medical Informatics, Stockholm, Aug.5-10, 1974. Amsterdam: North Holland Pub. Co., 2 vols.

ANDERSON, T.P. (1971) Problem-orientation of medical records: advantages in long-term illness. Postgrad.Med., 50, 274-7.

ANDREWS, H.J. and VICKERS, M. (1974) An assessment of one year of computer-assisted microbiology reporting at Charing Cross Hospital. J.Clin.Pathol., 27, (3), 185-91. (D6)

ASHCROFT, J.M. and BERRY, J.L. (1974) The introduction of a real-time patient data display system into the cardio-thoracic department at Wythenshawe Hospital. MEDINFO-74: North Holland Pub. Co. (C5)

ASHCROFT, J.M. and BERRY, J.L. (1975) The Wythenshawe Hospital Patient Data Display System. Europ.J.Intensive Care Med., 1, 49-52. (C5)

ASHFORD, J.R. and PEARSON, N.G. (1971) A community-based medical computing system. Comm.Hlth.(Bristol), 3, (1), 5-14. (F2.6)

ATKINSON, A.B., KELLETT, V.M. (1974) Value of intravenous urography in investigating hypertension. J.Roy.Coll.Phys.Lond.,8, 175. (B6.3)

BAECKER, R. (1974) Study of automated information processing systems in drug reaction surveillance and prevention. Comp.Biomed.Res.,7, 457-88.

BAIN, D.J.G. (1973) Health centre practice in Livingston New Town. Health Bull.(Edinb.), 31, (6), 290-6. (F2.5)

BAIN, D.J.G. (1973) Annual reports from general practice, 1971: Craigshill Health Centre. Update, April, 1183-200. (F2.5)

BAIN, D.J.G. (1974) The results of developmental screening in general practice. Health Bull.(Edinb.), 32, (5), 189-93 (F2.5)

BAIN, D.J.G. (1976) Doctor-patient communication in general practice consultations. Med.Educ., 10, 125-31.

BAIN, D.J.G. et al. (1973) Difficulties encountered in classifying illness in general practice. J.Roy.Coll.G.P., 23, (132), 474-9. (F2.5)

BAIN, D.J.G. (1973) A criticism of the use of tricyclic anti-depressant drugs in the treatment of childhood enuresis. J.Roy.Coll.G.P., 23, 222-4. (F2.5)

BAIN, D.J.G. (1976) The continuing care of the handicapped child. Update, 12, 707-20. (F2.5)

BAIN, D.J.G. and HAINES, A.J. (1975) A year's study of drug prescribing in general practice using a computer-assisted record. J.Roy.Coll.G.P., 25, (150), 41-8. (F2.5)

BAKER, C. and SCHILDER, M. (1976) The 'E-Box': an inexpensive modification of diagnostic indexing. J.Fam.Pract., 3, (2) 189-91

BAKER, R.L. and SPENCER, W.A. (1974) Considerations for evaluating transferable automated information systems. Comp.Biomed.Res., 7, 249-65.

BALDWIN, J.A. and FREESTONE, D.S. (1971) Risk of early post-partum pregnancy in context of post-partum vaccination against rubella. Lancet, 2, 366-7. (E1.1)

BALDWIN, J.A. (Ed.) (1972) The master index: a guidebook for medical records officers. Oxford Regional Hospital Board.
BALDWIN, J.A. (1972) The Oxford Record Linkage Study as a medical information system. Proc.Roy.Soc.Med., 65, 237-9. (E1.1)
BALDWIN, J.A. (1972) Linked record health data systems. The Statistician, 21, 325-38. (E1.1)
BALDWIN, J.A. (1973) Linked record medical information systems. Proc.R.Soc.Lond.B., 184, 403-20. (E1.1)
BALDWIN, J.A. (1973) Linked record medical information systems in the Oxford Region: a working paper. (E1.1)
BALDWIN, J.A. (1974) The Oxford Register. D.H.S.S. Statistical and Research Report Series No. 7. London: H.M.S.O: (E1.1)
BALDWIN, J.A. (1974) Medical record linkage. Medicine, 35, 2048-51. (E1.1)
BALDWIN, J.A. (1974) Community health information systems. R.Soc. Hlth.Congress, 1974. (F2.1)
BALDWIN, J.A. and EVANS, J.H. (1970) The Community Health Project: proposal for development of a comprehensive health information system for the new city of Milton Keynes. (F2.1)
BALDWIN, J.A. & Fedrick, J. (1977) Thyroid disease and asthma. Brit.Med.J., 4, 1539. (E1.1)
BALDWIN, J.A. & Gill, L.E. (1972) Computing requirements of the Oxford Record Linkage Study. Unit.of Clinical Epidemiology and Oxford Record Linkage Study. Research Report No. 3, June, 1972.
BALDWIN, J.A. see FEDRICK, Jean (E1.1)
BALDWIN, J.A. see COBB, J.S.
BALDWIN, J.A. see HOBBS, M.S.T. (E1.1)
BARBER, B. (1974) The approach to an evaluation of London Hospital Computer Project. MEDINFO-74, 155-65 (North Holland Pub. Co.) (D3)
BARBER, J.H. (1971) Computer assisted recording in general practice. J.Roy.Coll.G.P., 21, 726-36.
BARBER, S.G. et al (1977) System for long term review of patients at risk of becoming hypothyroid: further experience. Lancet, 2, 967-70. (E3.4)
BARCLAY, R. et al (1976) Towards an integrated medical record. Health Bull., 18, 36-43, (F2.4)
BARKER, D.J.P. see GARDNER, M.J. (E3.4)
BARKER, D.J.P. & BISHOP, J.M. (1970) Computer analysis of symptom patterns as a method of screening patients at special risk of hypothyroidism. Brit.J.Prev.Soc.Med., 24, 193-6. (E3.4)
BARKER, D.J.P. & BISHOP, J.M. (1969) Computer based screening system for patients at risk of hypothyroidism. Lancet, 2, 835-8. (E3.4)
BASDEN, A. & CLARK, E.M. (1979) Errors in a computerized medical records system (Clinics) Medinfo, (4) No.4. 203-208. (F2.7)
BASDEN, A. & CLARK, E.M. In press. Data integrity in a general practice computer system. (Clinics) Int.J.Biomed.Comp. (F2.7)
BASKER, M.A. (1974) A ledger method of morbidity recording. J.Roy.Coll. G.P., 24, (138), 81-2
BEAUVAIS RANDALL, R. (1972) Errors frequently made in using the problem-oriented system. (In) The Problem-Oriented System (Ed: Hurst and Walker). New York: Medcom Press.
BEELEY, L. et al. A real-time system for drug prescribing (in preparation). (D1)
BEEVERS,.D.G., & HAWTHORN, V.M. (1976) Case finding and follow-up of hypertension in the community. Abstracts. 7th European Congress of Cardiology, Amsterdam, 667. (B6.3)
BEGGS-BAKER, S. et al (1974) Individual privacy considerations for computerised health information systems. Health Care, 12, 75-93.

BEILIN, L.J. et al. (1973) Computer-based hypertension clinic records study. Proc.Roy.Soc.Med., 66, (10), 1011-2 (B2.1)
BEILIN, L.J. et al. (1974) Computer-based hypertension clinic records: a co-operative study. Brit.Med.J., 2, 212-6. (B2.1)
BEILIN, L.J. et al. (1980) Long-term antihypertensive drug treatment and blood pressure control in three hospital hypertension clinics. Brit.Heart J., 43, 74-79. (B2.1)
BENNETT, A.E. and RITCHIE, K. (1975) "Questionnaires in Medicine. A guide to their design and use." London: Oxford University Press.
BENTSEN, B.G. (1976) The accuracy of recording patient problems in family practice. J.Med.Educ., 5, 331-6.
BERKELEY, M. et al. (1972) Computer compatible registers for general practice and research. Brit.J.Prev.Soc.Med., 26, (3), 153-8.
BETHELL, H.J.N. (1978) Order out of chaos - how one G.P. solved the problem of records. Mod.Medicine, 23 (6), 81-3. (F1.4)
BEVERIDGE, T. and PETRIE, J.C. (1972) Transfer of information about intake of drugs by patients referred to medical units. Brit.Med.J., 2, 37-9. (A2)
BILLEWICZ, W.Z. et al. (1969) Statistical methods applied to the diagnosis of hypothyroidism. Q.J.Med., 38, p. 255. (E3.3)
BISHOP, J.M. see BARBER, S.
BISHOP, J.M. see BARKER, D.J.P.
BJORN, J.C. and CROSS, H.D. (1970) "The Problem-Oriented Private Practice of Medicine." Chicago: McGraw-Hill Publications Co., Modern Hospital Press.
BODDY, F.A. (1973) The computer experiments. Health Bull.(Edinb.), 31, (3), 167-71. (F200)
BODDY, F.A. (1975) An information system for a Scottish Health Centre. Proc.Public Health Conf. on Records & Statistics, pp.145-8, U.S. Dept.H.E.W., Public Health Service, Rockville, Maryland,(F200)
BODDY, F.A. et al. (1973) Woodside Health Centre Records. Health Bull. (Edinb.), 31, (3), 164-66. (F200)
BOLINGER, R.E. et al. (1973) Experience with automation as an aid in the management of diabetes. Diabetes, 24, 480-4.
BONNER, B.B. (1973) Problem orientated medical records. Hlth.Soc. Serv.J., Feb. 17, 373-4.
BOWDEN, K.F. et al. (1975) A magnetic tape data base for a real-time medical information system. Comput.Biol.Med., 5, (3), 171-8.
BOYLE, C.M. et al. (1973) A new hospital discharge letter for the specialist clinic. Lancet, 3rd Feb. 249-51.
BRADSHAW, E.G. (1975) Computers in anaesthesiology and intensive care. User attitudes to a real-time patient data display system. ACTA ANAES.BELG., 23, Suppl. 191-9.
BRADSHAW-SMITH, J.H. (1976) A computer record-keeping system for general practice. Brit.Med., 1, (6022), 1395-7. (F2.6)
BRADSHAW-SMITH, J.H. (1977) General practice record keeping using a real-time computer. MEDCOMP. 77., p303-14.Uxbridge: On-Line Conferences Ltd., (F2.6)
BRADSHAW-SMITH, J.H. & GRUMMITT, A. (1975) Real time record management in general practice. ICL Computer Users Conference. Harrogate, 1975. (F2.6)
BRADSHAW, E.G. & THOMPSON, G.R. (1975) User attitudes to a real-time patient data display system. ACTA ANAESTH.BELG.,26, suppl. 191-99.
BRANDEJS, J.F.,KASOWSKI, M.A. and DAVIS, M.W.L. (1976) Information Systems. What the computer can do for the primary care physician. CanMed.Ass.J., 114, (2), 170-1.
BRANDEJS, J.F.,KASOWSKI, M.A. and FORTIN, L.J. (1976) Information Systems. Problem-oriented medical records for family practice. Can.Med.Ass.J.,114, 371-7. 384.

BRINNAN, P.J. see MIALL, W.E. (1975)
BROOKE, B.N. (1962) The logic of hospital case notes. Lancet, April, 7, 738-40.
BROWN, J.J. (1973) Computer-based records in the B.P. Clinic. Proc.Roy.Soc.Lond., 184, 399.
BULL, M.J.V. (1973) An IUCD record card. J.Roy.Coll.G.P., 23, (134), 656-7. (F2.3)
BULL, M.J.V. (1976) Oral contraceptive indicator card. Update Rev., 13, 170. (F2.3)
BULPITT, C.J. et al. (1974) A symptom questionnaire for hypertensive patients. J.Chron.Dis., 27, (6), 309-23. (B2.1)
BULPITT, C.J. et al. (1976) Randomised controlled trial of computer-held records in hypertensive patients. Brit.Med.,J., 1, 677-9. (B2.1)
BULPITT, C.J. et al. (1979) Risk factors for death in treated hypertensive patients: report from the D.H.S.S. hypertension care computing project. Lancet, 2, 134-137. (B2.1)
BURCHELL, K. et al. (1975) The use of the problem oriented medical record and feature cards in practice management and research. Health Bull. (Edinb.), 33, (5), 210-3. (F2.5)

CAPSTICK, I. (1974) Medical audit: the need for pilot studies in general practice. Brit.Med.J., 1, 278-9.
CARD, W.I. see GOOD, I.J.
CARTER, N.W. et al. (1974) A graded system for automation of patient registration incorporating data switching facilities. Health Bull. (Edinb.), 32, (1), 19-22.
CASSEL, J.C. (1973) Ambulatory medical health care data. Information for epidemiological and health services research. Med.Care, 11, Suppl., 76-80.
CHRISTOPHER, L.J. et al. (1976) Experience with the Aberdeen and Dundee drug monitoring system. (In) Clinical Pharmacy and Clinical Pharmacology (Ed: W.A. Gouveia) p.165-178. Amsterdam: North Holland Pub.Co. (E4.1)
CLARK, D.E. see SHARPE, T.C. (B6.4)
CLARK, E.M. (1974) Disease coding in a problem orientated general practice. J.Roy.Coll.G.P., 24, (144), 469-75. (F2.7)
CLARK, E.M. & CLIFF, K.S. (1979) Record linkage as a tool for planning. Pub.Hlth.Lond., 93, 242-245. (F2.7)
CLARK & FORBES (1979) Evaluating primary care. Croom Helm. (F2.7)
CLARKE, A.H. et al. (1969) "Practis" Practice recording and computer terminal information system. J.Roy.Coll.G.P., 17, 60-3
CLARKE, A.H. et al. (1971) Automated management of routine medical records in general practice. Meth.Inf.Med., 10, 207-15.
CLARKE, A.H. et al. (1976) Automated summarising of life-long medical histories. Meth.Inf.Med., 15, (3) 144-50.
CLARKE, D.J., FISHER, R.H. & LING, G. (1979) Computer-held patient records: the Exeter Project. Inf.Privacy, 1, (4) March. (F2.6)
CLARKE, D.J. (1978) A Patient Data Base for the N.H.S. Comp.Bull.Sept. (F2.6)
CLAYTON, G.M. (1971) Experinece with an ICL 1905 computer in general practice. J.Roy.Coll.G.P., 21, 620-1 (F2.9)
CLEWS, A.G. (1976) Establishing a data base without tears. Can.Fam. Phys.,22, 667-9.
CLIFTON, J.S. et al. Special purpose computer systems for intensive care applications. (In) "Real-time computing in Patient Management" (Eds: D.W. Hill & J.P. Payne) London: Peregrinus.

COBB, J.S. (1976) Improving efficiency.Gen.Pract.Team, 54, 6-8.
COBB, J.S. and BALDWIN, J.A. (1976) Consultation patterns in a general practice. J.Roy.Coll.G.P., 26, 599-609. (F2.1)
COHEN, S.N. et al. (1974) Computer-based monitoring and reporting of drug interactions. MEDINFO-74. 889-94.
COLES, E.C. et al. (1973) Computer-based records in the clinic (a): Proc. Roy.Soc.Lond.(Biol), 184, (77), 387-97. (B2.1)
COLES, E.C. et al. (1976) An approach to computer processing of clinical data. Computer J., 19, (2) 104-109. (B2.1)
COLES, E.C. and SLAVIN, G. (1976) An evaluation of automatic coding of surgical pathology reports. J.Clin.Pathol., 26, 621-5. (B6.2)
COLLEGE OF AMERICAN PATHOLOGISTS (1965) "Systematized Nomenclature of Pathology (SNOP)" (B6.2)
COLLEN, M.F. (1974) "Hospital Computer Systems. "New York: J.W. Wiley & Sons.
CORDLE, F. et al. (1972) The automation of clinical records with an overview with special emphasis on the automation of office records in the primary medical setting. Med.Care, 10, 470-80.
CORMACK, J.J.C. (1970) The medical record envelope - a case for reform. J.Roy.Coll.G.P., 20, 333-53.
CORMACK, J.J.C. (1971) One year's practice: the use of an 'E' book in modified form. Practitioner, 207, 230-5.
CORMACK, J.J.C. (1971) General practitioners' use of medical records. Scottish Health Service Studies, Vol.15, Scottish Home & Health Department.
CORMACK, J.J.C. (1975) Family portraits - a method of recording family history. J.Roy.Coll.G.P., 25, (156), 520-6. (F1.13)
CRICK, R.P. (1974) Chronic glaucoma: a preventable form of blindness. Lancet, 1. (850), 205-7. (B6.8)
CRICK, R.P. (1975) Prevention of blindness from glaucoma using the King's College Hospital computerized problem orientated medical record. Brit.J.Ophthalmol., 59, (4), 236-50. (B6.8)
CROCKETT, D.J. (1975) Diagnostic coding in a plastic surgery unit. Brit.J.Plast.Surg., 28, 286-8.
CROMBIE, D.L. (1973) Research and confidentiality in general practice. J.Roy.Coll.G.P., 23, (137), 863-80.
CROMBIE, D.L. (1975) Monitoring adverse drug reactions. J.Roy.Coll.G.P., 25, (154), 337-43. (F2.10)
CROMBIE, D.L. (1977) Information for and from general practice. Proc.Roy.Soc.Med., 70, (6), 407-10.
CROMBIE, D.L. and PINSENT, R.J.F.H. (1976) The nature of information used in making clinical decisions in general practice. J.Roy.Coll. G.P., 26, (168), 502-6.
CROMBIE, D.L. see FARMER, R.D.T. et al.
CROSS, H.D. (1972) Medical records and health care: the problem orientated medical record. Med.Rec.News, 43, 16-27.
CROSS, H.D. (1974) The case for problem oriented medical records. Brit.J.Hosp.Med., 11, (1), 65-79.
CROSS, H.D. see BJORN, J.C.
CROSS, K.W. et al (undated) Electronic processing of hospital records. Internal publication No. 2 from Dept. of Social Medicine, University of Birmingham.
CROSS, K.W. see FARMER, R.D.T.
CROSS, K.W. see FARMER, R.D.T. et al.
CROSS, K.W. see MARSHALL, T.
CURRAN, W.J. and LASKA, E.M. (1973) Protection of privacy and confidentiality. Science, 182, 797.
CURTIS, P. (1974) Medical audit in general practice. J.Roy.Coll.G.P., 24, 607-11.
CURTIS, P. (1976) New ideas in medical records: problems of implementation. Update, 12, 1311-6.

DALBY, B.C.S. et al. (1974) Casualty Activity Analysis coding and computing. Comp.Prog.in Biomed., 3, 254-66.

DALE, J.W. and ROBERTS, J.L. (undated) The identification of patients and their records in a hospital. Internal pub.No.3., Dept. of Social Medicine, University of Birmingham.

DALE, J.W. and ROBERTS, J.L. (undated) Errors in a hospital record system. Internal Report No.15 from the Dept. of Social Medicine, University of Birmingham.

DAWES, K.S. (1972) Survey of general practice records. Brit.Med.J., 3, (820), 219-23.

DAVIS, R.H. see STOTT, N.C.H.

DAVIS, R.H. see WALLACE, B.B.

de DOMBAL, F.T.(1971) Computer-assisted diagnosis. In: Whitby, L., Lutz, W., (eds.) Principles and Practice of Medical Computing, Edinburgh, Churchill-Livingstone, 179.

de DOMBAL, F.T.(1973) Some observations of the procedures used in medical diagnosis in real life situations and under artificial simulated conditions. In: Lange, H.J., Wagner, G. (eds.) Computer-unterstutzte arzliche Diagnostic. Stuttgart. Schattaner Verlag.

de DOMBAL, F.T.(1979) Computers and the surgeon - a matter of decision. Surgery Annual, pub. Appleton-Century-Croft, New York.

de DOMBAL, F.T. (1978) Diagnosis; decision making and acute appendicitis: How many "errors" are inevitable? Chirurg, in press.

de DOMBAL, F.T., CLAMP, S.E., LEAPER, D.J., et al (1975) Computer-aided diagnosis of lower gastrointestinal tract disorders. Gastroenterology, 68, 252.

de DOMBAL, F.T., HORROCKS, J.C., STANILAND, J.R., GILL, P.W., (1971) Simulation of clinical diagnosis: A comparative study. Brit.Med.J., 12, 575.

DEVINE, B., FIFE, R., TRUST, P.M. (1976) Minoxidil in the management of severe refractory hypertension. In preparation.

DEVINE, C.M. et al. (1971) Pulmonary Tuberculosis - a computer-aided record system in clinical trial. Tubercle, 52, (3), 199-218.

DEVINE, C.M. and TALL, R. (1970) The use of a computer in the organisation of a large-scale co-operative controlled clinical trial of the treatment of pulmonary tuberculosis. Bull.W.H.O., 43, 127-41.

D.H.S.S. (1972) Interim Report of the Joint Working Party on the redesign of medical records in general practice. London: H.M.S.O.

DINSDALE, S.M. et al. (1975) Problem oriented medical records: their impact on staff communication, attitudes and decision-making. Arch.Phys.Med. &Rehab., 56 (6), 269-74.

DINWOODIE, H.P. (1969) An elementary use of a computer for morbidity recording in general practice. Health Bull.(Edinb.), 27, (3), 6-14. (F202)

DINWOODIE, H.P. (1970) Simple computer facilities in general practice. J.Roy.Coll.G.P., 19, 269-81. (F202)

DINWOODIE, H.P. and GRENE, J.D. (1971) Computers in general practice. (In) Principles and Practice of Medical Computing. Chapter 7, 137-55.

DIXON, P.N., and MORRIS, A.F. (1974) A cervical cytology campaign using a computerised age-sex register. J.Roy.Coll.G.P., 24, 418-24.

DOLL, Sir Richard (1973) Monitoring the National Health Service. Nuffield Lecture, Roy.Soc.Med., Vol.66., 729-40.

DOLLERY, C.T. et al. (1977) Initial care of hypertensive patients. Influence of different types of clinical records. Brit.Heart J., 39, (2) 181-5. (B2.1)

DONOVAN, C. et al. (1973) Confidentiality in the setting of general practice. J.Roy.Coll.G.P., 23, (137), 881-6.

DURNO, D. (1973) A method of data collection in a general practice. Update, 7, 1153-60.

EDWARDS, D.N. (1972) Clinical records and electronic data processing. Clin.Radiol., 23, (1), 117-26.
EIMERL, T.S. (1973) The 'E' Book system for record-keeping in general practice. Med.Care., 11, (2) Suppl. 138-44.
EIMERL, T.S. and LAIDLAW, A.J. (Eds.) (1969) A Handbook for Research in General Practice. Edinburgh & London: Livingstone.
ELFORD, R.W. (1975) The 'E' Book turned chronic illness register. Can.Fam.Phys., 21, (7) 35-6.
ELLIOTT, A. et al. (1975) Complete conversion of health centre medical records to A4 size. Brit.Med.J., 3, 773-4. (F2.15)
ELLIOTT, A. et al. (1979) An evaluation of the A4 folder system in general practice. J.Roy.Coll.G.P. (F2.15)
ENELOW, A.J. and SWISHER, S.N. (1972) The problem oriented medical record. (In) Interviewing and Patient Care. p.66-85. Oxford University Press.
ERSKINE, Z.G., MOIR, D.C., JEFFERS, T.A. & PETRIE, J.C. (1978) An Outpatient medication record. Brit.Med.J., 2, 1606-1607. (A2)
EVANS, J.G. (1967) Deliberate self-poisoning in the Oxford area. Brit.J.Prev.Soc.Med., 21, 97-107. (E1.1)
EVANS, J.H.E. and SEMMENCE, A.M. (1975) The Computer. (In) Screening in General Practice. (Ed. Cyril Hart) Chapter 6, p61-70. Churchill Livingstone. (F2.1)
EVANS, J.H.E. see SEMMENCE, A.M. (F2.1)
EZEDUM, S. and KERR, D.N.S. (1977) Collaborative care of hypertensives, using a shared record. Brit.Med.J., 2, 1402-1403.

FABB, W.E. (1972) Why a problem orientated medical record? Med. Pract.Management, 1, (2) 23-4.
FAIRBAIRN, A.S. (1967) Diagnostic differences at successive hospital admissions. In: The Proceedings of the International Symposium on Record Linkage in Medicine: held in Oxford, 1967. E.& S. Livingstone, Ltd.
FAIRBAIRN, A.S. & ACHESON, E.D. (1969) The extent of organ removal in the Oxford area. J.Chron.Dis., 22, 111-22. (E1.1)
FAIRBAIRN, A.S. (1972) Hospital admissions following common surgical operations. Proc.Roy.Soc.Med., 65, 239-40. (E1.1)
FAIRBAIRN, A.S. see HOBBS, M.S.T.
FARMER, R.D.T. and CROSS, K.W. (1972) An automated records system for general practice. Brit.J.Prev.Soc.Med., 26, (3) 148-52.(F2.16)
FARMER, R.D.T. et al. (1974) Executive Council lists and general practitioner files. Brit.J.Prev.Soc.Med., 28, (1) 49-53.
FARMER, R.D.T. see MARSHALL, T.
FEDRICK, Jean (1973) Epilepsy and pregnancy: a report from the Oxford Record Linkage Study. Brit.Med.J., 2, 442. (E1.1)
FEDRICK, Jean (1973) Sudden unexpected death in infants in the Oxford Record Linkage Area. 1. An analysis with respect to time and place. Brit.J.Prev.Soc.Med., 27, 217.
FEDRICK, Jean, SIMMONS, H. and BALDWIN, J.A. (In prep.) Methodological considerations in analysing a file of linked diagnostic data. (E1.1)
FEINSTEIN, A.R. (1970) Quality of data in the medical record. Comput.Biomed.Res., 3,426-35.
FEINSTEIN, A.R. (1973) The problems of problem orientated medical records. Ann.Int.Med., 78, (5), 751-62.
FEINSTEIN, A.R. (1973) An analysis of diagnostic reasoning. I: The domains and disorders of clinical macrobiology. Yale J.Biol.Med., 46, (3) 212-32.
FEINSTEIN, A.R. (1974) "Clinical Judgment" (ISBN 0-88275-141-7). Kreiger.
FELL, P.J. et al. (1977) Longer term effects of live influenza vaccine in patients with chronic pulmonary disease. The Lancet, June, 1282-1284 (F2.24)

FENICHEL, R.R. and BARNETT, G.O. (1976) An application-independent subsystem for free-text analysis. Comp.Biomed.Res., 9, (2) 159-67.
FERNOW, L.C. et al. (1977) An analysis of POMR's by medical and surgical house officers; factors affecting use of this format in a teaching hospital. Med.Educ., ii. (5) 341-6. (A4)
FERNOW, L.C. et al. (1978) The effect of Problem-Oriented Medical Records on Clinical Management Controlled for Patient Risks. Med.Care., 16, (6) 476-87. (A4)
FERNOW, L.C. et al. (1978) Firm, patient, and process variables associated with length of stay in four diseases. Brit.Med.J., 1. 527-596. (A4)
FERNOW, L.C. et al. (1978) The state of British medicine - 11 Medical Audit. Journal of theRoy.Soc.of Med., 71, 787-790. (A4)
FERNOW, L.C. et al. (Publication pending) Predicting the right stay for myocardial infarction gallstones and unilateral inguinal hernia at teaching hospitals. (A4)
FLETCHER, R.H. (1974) Auditing problem-oriented records and traditional records: a controlled comparison of speed, accuracy and identification of errors in medical care. New England J.Med., 290, (15), 829-33.
FORBES, J.A. (1969) Locating the elderly in a general practice. Brit.Med.J., 2, 46-7. (F2.1)
FORBES, J.A. (1971) Record linkage and the community. Comm.Health (Bristol), 3, (1), 25-8. (F2.7)
FOX, J. (1979) Effects of on-line symptom-processing on history-taking and diagnosis - a simulation study. Int.J.Biomed.Comp., 10. 151-163. (H1.1)
FREIMAN, A.H. et al. (1974) The clinical information centre, Part I: concepts and initial planning. Clin.Bull.Mem.Sloan Kettering Centre, 4, (2) 720-3.
FRIES, J.F. (1972) Time oriented patient records and a computer data bank. JAMA, 222, 1536-42.
FRIES, J.F. (1974) Alternatives in medical records. Med.Care, 12, 871-81.
FRIES, J.F. see WEYL, S. et al.
FROGGATT, C. (1977) A contraception card for use in general practice. J.Roy.Coll.G.P., 27, (175) 107-9. (F1.11)
FROOM, J. (1973) Conversion to problem-oriented records in an established practice: a timed study. Ann.Int.Med., 78, 254-7.
FROOM, J. (1974) Family folders. J.Fam.Pract., 1, (2), 49-51.
FROOM, J. (1976) Assessment of quality of care by profiles of physicians' morbidity data. J.Fam.Pract., 3, 301-3.
FROOM, J. (1976) The international classification of health problems for primary care. Med.Care, 14, 450-4.
FROOM, J. (1977) An integrated medical record and data system for primary care. (In 6 parts) J.Fam.Pract., 4 & 5, (5,6,1,2,3, & 4)

GARDNER, M.J. and BARKER, D.J.P. (1975) Biometrics, 31, 931. (E3.4)
GARDNER, M.J. and BARKER, D.J.P. (1975) A case study in techniques of allocation. Biometrics, 31, 931. (E3.4)
GIEBUNK, G.A. and HURST, L.L. (1975) Computer projects in health care. Ann Arbor, Mich.: Health Administration Press, 211,
GILLESPIE, G. et al. (1970 The short term reproducibility of the insulin test in peptic ulcer patients. Gastroenterology, 59, 180.
GILLESPIE, G. et al. (1970) Gastroenterology, 58, 625. (B6.3)
GILLESPIE, I.E. see KENNEDY, F. (B6.3)

GILLINGS, D.B. and PREECE, J.F. (1971) An analysis of the size and content of medical records used during an on-line record maintenance and retrieval system in general practice. Int.J.Biomed. Comput., 2, (2), 151-69. (F2.6)
GLASGOW BLOOD PRESSURE CLINIC, Members of (1972). J.Roy.Coll.Phycns. Lond., 7, 87. (B6.3)
GOOD, I.J. and CARD, W.I. (1971) The application of rationality to medical records. Math.Biosci., 10, 157-76.
GOODMAN, M. (1971) The diagnostic index and the family record card. J.Roy.Coll.G.P., 21, 590-2.
GOODMAN, M. (1975) Using an age-sex register. J.Roy.Coll.G.P., 25, (154), 379-82.
GRAEPEL, P.H. (1976) Automatic indexing of German-language surgical pathology diagnoses. Meth.Inf.Med., 15 (3), 163-8.
GRAHAM, R.C. (1974) The Tayside Master Patient Index - how and why. Hosp.Hlth.Serv.Rev., November, 385-7. (E1.3)
GRAVES, S. (1971) Better records: first step to better quality. Mod.Hosp., 116, 105-8.
GREENFIELD, R.H. et al. (1977) A computerised glaucoma data base. Arch.Ophthalmol, 95., (8) 1365-7.
GREENWOOD, R.M. (1972) Kodiac, a system for disease coding by a medium-sized computer. Int.J.Biomed.Comput., 3, (2), 123-34 (B6.1)
GREENWOOD, R.M. (1972) Statistical distributions of diagnostic phrases of morbidity and mortality. Int.J.Biomed.Comput., 3, (1).
GREENWOOD, R.M. (1978) MIST: A Medical Information Storage System. Int.J.Biomed.Comput., 9, 247-257. (B6.14)
GRENE, J. D. (1976) Use of a patient recall system. Gen.Pract.Team, 54, 8-9.
GRENE, J.D. and HENDERSON, J.M. (1971) Automated recall in general practice. J.Roy.Coll.G.P., 21, 352-5.
GRUER, K.T. (1972) Livingstone New Town - using a computer for general practice records. J.Roy.Coll.G.P., 22, 100-7. (F2.5)
GRUER, K.T. and HEASMAN, M.A. (1970) Livingstone New Town - use of a computer in general practice medical recording. Brit.Med.J., 2, 289-91. (F2.5)
GRUMMITT, A. (1977) Real time record management in general practice. Int.J.Biomed.Comput., 8 (2) 131-50. (F2.6)
GRUMMITT, A. see BRADSHAW-SMITH, J.H. (F2.6)

HAERI, A.D., SOUTH, J. and NALDRETT, J. (1974) A scoring system for identifying pregnant patients with a high risk of perinatal mortality. J.Obs.Gynaec.Brit.Com., 81, 535-8. (B1.1)
HANNAY, D.R. and MADDOX, E.J. (1976) Symptom prevalence and referral behaviour in Glasgow. Soc.Sci. & Med., 10, 185-9.
HARDEN, K.A. and HARDEN, R.McG. (1975) The use of name and address spirit masters in general practice. J.Roy.Coll.G.P., 25, (151), 143-5.
HARDEN, K.A., HARDEN, R.McG., & REEKIE, D. (1974) New approach to information handling in general practice. Brit.Med.J., 2, (911) 162-6. (F2.4)
HARDEN, R.M. et al. (1975) Punched feature card retrieval systems in clinical research. J.Hosp.Med., Feb. 1975. (F2.4)
HARDMAN-LEA, M. (1972) A treatment card for patients. J.Roy.Coll.G.P. 22, 203-4.
HALL, D.G. (1979) Experience of transferring an integrated hospital-administration system from a CODASYL data base to a standard MUMPS file structure. Med.Inform., 4, (2) 93-103. (D4.1)

HART, C.R. (Ed.) "Screening in General Practice." Edinburgh: Churchill Livingstone, 1975.

HARVEY, P.W. and FARRER, J.A. (1974) Investigation of the work of the casualty department by analysis of a sample of the case notes. MEDINFO-74, 523-7. Amsterdam: North Holland Pub. Co.

HAWKEY, J.K. et al. (1968) Brit.Med.J., 2, 699. (F1.12)

HAWKEY, J.K. et al. (1971) New record folder for use in general practice. Brit.Med.J., 4, 667-70. (F1.12)

HEAD, Miss A.E. (1977) Maintaining the nursing record with the aid of a computer. Conference Proceedings of MEDCOMP., 77. (F2.6)

HEALTH CARE MANAGEMENT SYSTEMS, INC. (1975) "Selected bibliography and abstracts for ambulatory care computer applications." Ann Arbor, Mich: Health Admin.Press, 308pp.

HEALTH COMPUTER INFORMATION BUREAU (1975) Health computer applications in Canada: catalogue and descriptions. Vol.11, No.2. Ottawa. 226 pp.

HEALTH EDUCATION COUNCIL (1976) Report on the project investigating the job requirements and training of health workers in special clinics, 1st April, 1974-31st March, 1976. (B6.9)

HEALY, F.M. and HEALY, J.J. (1975) Computers and privacy: the medical records case. J.IrishMed.Ass., 68, (9), 211-6.

HEASMAN, M.A. (1974) Information for the self evaluation of patient care and feedback to physicians, Med.Care, 11, Suppl. 61-71.

HEDLEY, A.J., ALEXANDER, E. and INNES, G. (1977) Patient identification and documentation of causes of deaths in a follow-up register. Health Bull.(Edinb.), 35, (2) 73-7. (E3.1)

HEDLEY, A.J., SCOTT, A.M. and DEBENHAM, G. (1969) A computer-assisted follow-up register. Meth.Inf.Med., 8, 67-77. (E3.1)

HEDLEY, A.J., SCOTT, A.M., WEIR, R.D., and CROOKS, J. (1970) Computer-assisted follow-up register for the North East of Scotland. Brit.Med.J., 1, 556-8. (E3.1)

HENLEY, ... et al. (1975) "An analysis of automated ambulatory medical record systems. Vol. I: Findings (395pp.); Vol.II: Background material (628 pp.). Springfield, Va: Nat.Techn.Inf. Service publications PB254 235/5WW NCHSR 76/411 and 412.

HILBERMAN, M. and PETERS, R.M. (1975) A data collection system for intensive care. Crit.Care Med., 3, (1) 27-30.

HILLS, P.M. (1978) The objectives and design philosophy of the R/T computer project at the Queen Elizabeth Medical Centre. (In) "Medical Informatics, Europe 1978" (Ed.J.Anderson). Cambridge: Proceedings of Conference.

HOBBS, M.S.T., FAIRBAIRN, A.S., ACHESON, E.D. and BALDWIN, J.A.(1976) Study of disease associations from linked records. Brit.J.Prev. Soc.Med., 30, (3), 141-50. (E3.1)

HODGKIN, K. (1973) "Towards Earlier Diagnosis." Edinburgh: Churchill Livingstone. 3rd Edn. (F2.14)

HODGKIN, K. (1976) Establishing a data base without tears (Part 2). Can.Fam.Phys., 22, 832-5.

HOLLOWAY, D.C. et al. (1975) Evaluating an information system for medical care evaluation studies. Health Care, 8, 329.

HORROCKS, J.C. (1974) A computer aided diagnostic system using a small desk-top computer/calculator. Methods Inf.Med., 13, 83. (H1.2)

HORROCKS, J.C., de DOMBAL, F.T. (1975) Diagnosis of dyspepsia using data collected by a non-medically qualified physician's assistant. Brit.Med.J., 3, 421. (H1.2)

HORROCKS, J.C., de DOMBAL, F.T. (1975) Computer-aided diagnosis of dyspepsia. Am.J.Dig.Dis., 20, 397. (H1.2)

HORROCKS, J.C., LAMBERT, D.E., McADAM, W.A.F., et al (1976) Transfer of computer-aided diagnosis of dyspepsia from one geographical area to another. Gut., 17, 640. (H1.2)

HORROCKS, J.C., McCANN, A.P., STANILAND, J.R., et al. (1972) Computer-aided diagnosis: description of an adaptable system and operational experience with 2,034 cases. Brit.Med.J., 1, 5.(H1.2)

HORROCKS, J.C., McADAM, W.A.F., DEVROEDE, G. et al. (1976) Some practical problems in transfering computer-aided diagnostic systems from one geographical area to another. In: de Dombal, Gremy, (eds.) Decision making and medical care. Can Information Science Help? Amsterdam, North Holland Pub. Co.

HORTON, C.L. et al. (1973) Computer applications in clinical medicine: CARE - a practical system for processing clinical data. Comp. Biomed.Res., 6, 286-98.

HOWELL, R.W. (1971) A comparison of diagnostic coding by manual and computerised methods. Brit.J.Prev.Soc.Med., 25, (4), 225-30. (B6.1 &B6.2)

HOWIE, J.G.R, JEFFERS, T.A., MILLAR, H.R. & PETRIE, J.C. (1977) Prevention of drug interactions. Brit.J. of Clin.Pharm., 4, 611-614. (A2 & D2)

HUBBARD, M.R. and FISHER, J. (1967) A computer system for medical record linkage. (In:) Proceedings of the International Symposium on Record Linkage in Medicine held in Oxford, 1967. E. & S. Livingstone, Ltd. (E1.1)

HULL, F.M. (1971) Disease coding. J.Roy.Coll.G.P., 21, 581-5.

HURST, J.W. (1971) How to implement the Weed system. Arch.Intern.Med., 128, 456-62.

HURST, J.W. (1971) Ten reasons why Weed is right. New Engl.J.Med. 284, 1.

HURST, J.W. (1971) The art and science of presenting a patient's problems. Arch.Int.Med., 128, 463-5.

HURST, J.W. (1971) The problem-oriented record and the measurement of excellence. Arch.Int.Med., 128, 818-9.

HURST, J.W. et al. (1972) More reasons why Weed is right. New Engl. J.Med., 288, (12) 629-30.

HURST, J.W. and WALKER, H.K. (1972) "The Problem-Oriented System". N.Y.:Medcom Press Medical Update Series.

HURST, J.W. see WALKER, H.K.

INNES, G. (1969) Patient identification on a regional basis. (In) Computers in the service of medicine. (Ed: G. McLachlan) Vol. 1 p.65-73. Oxford University Press.

JAMESON, M.J. (1972) The family index. J.Roy.Coll.G.P., 22, 570-2.

JEFFERS, T.A. see HOWIE, J.G.R. (1977) (B6.3)

JEFFRIES, M. (1976) Supplying the demand for screening. Gen.Pract., Jan. 9, 22.

JENNETT, B, et al. (1979) Prognosis of patients with severe head injury. Neurosurg., 4, 283-289. (H1.3)

JENNETT, B, et al. (1980) Treatment for severe head injury. J.Neurol.Neurosurg.Psychiat., 43, 289. (H1.3)

JENNETT, B, et al.(1967) Head injuries in Scottish hospitals. Lancet ii. 696-698. (H1.3)

JOHNSON, R.A. (1972) Computer analysis of the complete medical record, including symptoms and treatment. J.Roy.Coll.G.P., 22, 655-60.
JONES, B.E. and OULD, M.A. (1974) The patient medical record as a data base. Comp.J., 17, (4) 295-302.
JONES, Sir F.A. (1975) Trends in medical records. Com.Hlth.(Bristol), 7, 1, 32-49.
JONES, J.V., DUNN, F.G., FIFE, R. et al. Benzothiadiazine therapy in hypertensive patients and deaths from myocardial infarction. In preparation.
JUTIER, P. et al. (1972) Un essai de realisation de dossier medicale en lange clair sans structure imposee, exploite en mode conversationel. Rev.Inf.Medicale, 3, (1)
KAISER PERMANENTE MEDICAL INFORMATION SYSTEM. (In) Proceedings of a Conference on Medical Information Systems, Jan. 1970. H.E.W., P.H.S., p.88.
KALLSTROM, M.C. and YARNALL, S.R. (Eds.) (1974) Advances in Primary Care. Proceedings of a conference held in Honolulu, Hawaii, Feb.16-22. Seattle: Med.Computer Services Association.
KELLETT, V.M. see ATKINSON, A.B. (1974)
KENNEDY, F. (1970) Scot.Med.J., 15, 391. (B6.3)
KENNEDY, F., GILLESPIE, I.E. and KAY, A.W. (1968) Gut.9, 734.(B6.3)
KENNEDY, F., GILLESPIE, I.E. and KAY, A.W. (1969) Brit.J.Surg. 56, 626. (B6.3)
KENNEDY, F. et al. (1968) (In) Computers in the Service of Medicine. (Ed. G.McLachlan) London: Oxford University Press. (B6.3)
KENNEDY, F. et al. (1968) "SWITCH" A system producing a full hospital case history on computer. Lancet, 2, 1230. (B6.3)
KENNEDY, F. (1970) "SWITCH" Hospital case history on computer. Scot.Med.J., 15, 391. (B6.3)
KENNEDY, F. et al. (1973) Truncal vagotomy and drainage from chronic duodenal ulcer - a controlled trial. Brit.Med.J. ii., 14th April, 71. (B6.3)
KENNEDY, T. (1974) The design of interactive procedures for man-machine communication. Int.J.Man-Machine Studies, 6, 309. (D4)
KENNEDY, T. (1974) A computer-based waiting list system. Medical Data Processing Symposium, Toulouse. (D4)
KENNEDY, T. (1975) Some behavioural factors affecting the training of naive users of an interactive computer system. Int.J.Man-Machine Studies, 7, 817-34. (D4)
KENNEDY, T. (1975) A method of analysing hospital surgical waiting lists. Meth.Inf.Med., 14, (3), (July) (D4)
KENNEDY, T. and FACEY, P.V. (1973) Experience with a mini-computer based hospital administration system. Int.J.Man-Machine Studies, 5, 327. (D4)
KENNEDY, T. and MOSS, N.B. (1974) A computer-assisted clerical system for management of hospital waiting lists. MEDINFO-74. Amsterdam: North Holland Pub. Co. (D4)
KENNEDY, T. and MOSS, N.B. (1977) A man-machine approach to a patient administration system. MEDCOMP-77. Berlin (D4)
KENNEDY, T. and WALLIS, C.C. (1973) An interactive computer-based clerical system. DECUS, European Conference Proceedings. (D4)
KERR, D.N.S. (1980) P.O.M.R. and the Curate's Egg. Update, June, 1569-1576. (A6)
KERRIDGE, J.M. (1976) PATCOSY - a data base system for the N.H.S. Comp.J., 19, (2),98-103.
KIRK, C. and LEE-JONES, M. (1976) Medical records, medical audit and community hospitals. J.Roy.Coll.G.P., 26, (163), 143-6. (E2.2)

KNOX, E.G. (1972) A case for the computer: a history and a projection. Int.J.Hlth.Serv., 2, (4), 531-6.
KNOX, E.G. (undated) Introducing a computer to a hospital: experiences of the experiment at Birmingham. Internal Report No. 1. Department of Social Medicine, University of Birmingham.
KNOX, E.G. et al. (1972) Planning medical information systems in a unified health service. The Lancet, Sept.30, 696-700.
KNOX, E.G. see FARMER, R.D.T. et al.
KNOX, J.D. (1972) Is screening worthwhile? Med.Dig., 17 (4).
KNOX, J.D. and MORRELL, D.C. (1974) Studies in general practice demand, need, quality. Brit.Med.Bull, 30, (3) 209-13. (F.203)
KOHLER, C.O. et al. (1976) Interactive data processing in medicine - man-machine dialogue (bibliography) Meth.Inf.Med., 15, (2) 102-20.
KORAN, L.M. (1975) The reliability of clinical methods, data and judgements (in two parts). New Engl.J.Med., 293, (13), 642-6. (14), 695-701.
KRISMER, J.R. (1974) A computer-based health record. (In) A Manual of Computers in Medical Practice. (M.A. Jenkin, Ed.) p. 128-32. Seattle: Medical Computer Society.
KRISMER, J.R. and CORDES, J.F. (1970) Problem-oriented record begins with patient. Modern Hospital, Nov. 1970.
KUENSSBERG, E.V. (1956) Volume and cost of keeping records in a group practice. Brit.Med.J.Suppl., i, 341-3 (F2.8)
KUENSSBERG, E.V. (1962) Age-sex registers. Between Ourselves, No. 20, June, (F2.8)
KUENSSBERG, E.V. (1962) Are duodenal ulcer and chronic bronchitis family diseases? Proc.Roy.Soc.Med., 55, 299-302. (F2.8)
KUENSSBERG, E.V. (1964) Recording of morbidity of families. 'F' Book. J.Roy.Coll.G.P., 7, 410-22. (F2.8)
KUENSSBERG, E.V. (1966) Medical record research opportunity in a state sponsored health service. Can.J.Publ.Health, 57, 234-7. (F2.8)
KUENSSBERG, E.V. (1968) A new record system for general practice. Report from the Research Committee of Scottish Council of Royal College of General Practitioners. Recorder E.V. Kuenssberg. Brit.Med.J., 2, 420-3. (F2.8)
KUENSSBERG, E.V. (1971) General practice through the looking glass. J.Roy.Coll.G.P., 21, 3-16. Practitioner, 206, 129-45. (James Mackenzie Lecture 1970) (F2.8)
KUENSSBERG, E.V. and SKLAROFF, S.A. (1961) Family follow-up studies into the eugenic aspects of morbidity. Eugenics Rev., 52, 225-8. (F2.8)
KUENSSBERG, E.V. and SKLAROFF, S.A. (1962) Do diseases run in families? Discussion. Practitioner, 188, 253-61 (F2.8)
KUENSSBERG, E.V. and SKLAROFF, S.A. (1963) Family diseases in N.H.S. general practice. Eugenics Rev., 55, 21-7. (F2.8)

LAIDLAW, A.J. (1973) Records in general practice. J.Roy.Coll.G.P., 23, (136), 827-30.
LEA, M.H. (1972) A treatment card for patients. J.Roy.Coll.G.P., 22, 203-4.
LEE-JONES, M. see KIRK, C.
LEFEVER, R. (1973) N.H.S. record cards: their structure and function. Gen.Practice. Sept. 28, 12-3.
LEAPER, D.J., GILL, P.W., STANILAND, J.R. et al (1973) Clinical diagnostic process: An analysis. Brit.Med.J., 3, 569. (H1.2)

LINDSAY, D.C., MEREDITH, A.L. & PETRIE, J.C. (1977) An experimental data base for clinical and administrative use. Med.Com., Berlin, 735-739. (A2 & D2)
LISTER, G.D. (1974) The development of clinical records for plastic surgery and their computer storage. Brit.J.Plast.Surg., 27, (1) 47-58. (B6.12)
LIVESEY, F.H. (1971) The integrated medical record - or what's in store? Comm.Hlth.(Bristol), 3, (2), 63-8.
LOGAN, L. (1975) A family data base punchcard. N.Z. Family Phys., 2, 43-4.
LOGIE, A.R. et al. (1976) Patient evaluation of a computerized questionnaire. Comp.Biomed.Res., 9, (2), 169-76.
LOGIE, A.W., GALLOWAY, D.B. & PETRIE, J.C. (1976) Drug Interactions in long-term antidiabetic therapy. Brit.J. of Clin. Pharm., 3, 1027-1032. (A2 & D2)
LOUDON, I.S.L. (1975) Record keeping in general practice. Update, 10, 259-66.
LUCAS, R.W. et al. (1976) Computer interrogation of patients. Brit.Med.J., ii, 623-5.

McAINSH, et al. (1971) Automated data processing of a radiotherapy case record. Int.J.Biomed.Comput., 2 (2).
McCLATCHIE, G. (1975) A method of updating a cancer-treatment data base system. Comput.Biomed.Res., 8, 222-31.
McCOLL, I. et al. (1976) Communication as a method of medical audit. Lancet, I, (7973), 1341-4. (A4)
McCORMACK, M. (1976) Patient recall system. Update Rev., March, 552.
MacDONALD, A. et al. (1975) The acquisition of patient information using an off-line data collection machine. Health Bull.(Edinb.) 33, (1), 28-34.
McFARLANE, A.H. et al. (1972) A medical care information system. Evaluation of changing patterns of primary care. Med.Care, 10, 481-7.
McINTYRE, N. (1973) The problem orientated medical record. Brit.Med.J., 2, (866), 598-600. (A3)
McINTYRE, N. (1974) Obtaining information from medical records. J.Roy.Coll.Phys., 8, (3).
McINTYRE, N. (1975) The problem orientated medical record. Implications for medical education and clinical care. Acta Clin. Belg., 30. (5) 343-8. (A3)
McINTYRE, N. et al. (1972) An introduction to problem orientated medical records. The Weed approach. Paper: Fifth World Conference on General Practice. Melbourne, 1972. Vol. I. 66-73.
McINTYRE, N. et al. (1972) Can we write better notes? An introduction to POMR (The Weed Approach) Brit.J.Hosp.Med., May, 603-11.
McINTYRE, N. et al. (1976) The problem orientated medical record. and its educational implications. ASME Medical Education Booklet, No. 6, Suppl. to Med. Educ., 10, (2). (A3)
McINTYRE, N. see PETRIE, J.C. (A3)
McINTYRE, N. (1980) Educational Instruments: Medical Record Review Form. Med.Teacher, 2, No. 1. 40-43. (A3)
McLACHLAN, G. (Ed.) (1973) The future and present indicatives. Problems & Progress in Medical Care, Ninth Series. Oxford University Press for Nuffield Provincial Hospitals Trust.

MARSHALL, B. (1976) The computer in the medical record department: 1. Computerisation of a master index. Med.Rec., 17, (1), 77-81 (D9)

MARSHALL, T., FARMER, R.D.T. and CROSS, K.W. (1975) A new method of comparing consulting patterns in general practice. (In) Probes for Health (Ed: G. McLachlan) p.127-49. London: Oxford University Press.

MASON, A.M.S. et al. (1974) A management document for consultants. Hosp.Hlth.Serv.Rev., Feb., 45-50.

MATTE, P.J. (1974) Medicolegal aspects of automated medical records. (In) Legal Medicine Annual: 1974. (Ed: C.A. Wecht) p.325-49. New York: Appleton Century Crofts.

MATTHEWS, G.L. (1973) "The Hospital Information Project". Hull (A) Group H.M.C. and Kingston-on-Hull City Libraries.

MAYNARD, J.S.E. (1975) An information recovery system for the accident and emergency department. Pub. by the Eastern Health and Social Services Board. Available at the Royal Victoria Hospital, Belfast. (B5.1)

MEDICAL RESEARCH COUNCIL. Responsibility in the use of medical information for research. A statement.

MEDINFO-74 see ANDERSON, J. and FORSYTHE, J.M.

MELLORS, et al. (submitted) Cervical cytology in a general practice.(F2.1)

MEREDITH, A.L. see LINDSAY, D.C. (1977) (B6.3)

METCALFE, D.H.H. (1973) Problem orientated medical records. Practice Team, 22, 11-13.

METCALFE, D.H.H. (1976) Problem orientated medical records in general practice. A practical programme. (Series of papers.) Update, 12, 391-5; 523-4; 643-6; 769-72; 926-8; 1011-6; 1146-54.

MIALL, W.E., BRINNAN, P.J. (1975) A pilot trial of treatment of mild hypertension: interim report of the Medical Research Council's trial in Britain. Clin.Sci.Mol. Med., 48, 165. (B6.3)

MILLAR, H.R. see HOWIE, J.G.R. (1977)

MILLER, S.I. and SCHLACHTER, R.H. (1975) A multi-dimensional problem oriented review and evaluation system. Amer.J.Psychiat., 132, (3) 232-5.

MILES, D.P.B. and ROWLEY, A. (1979) Turnover of G.P. lists in a new community. J.Roy.Coll.G.P. (in press) (F2.21)

MORRELL, D.C. (1970) J.Roy.Coll.G.P., 19, 331-42. (E2.3)

MORRELL, D.C. et al. (1971) Symptoms in general practice. J.Roy. Coll.G.P., 21, 32-43. (E2.3)

MORRELL, D. (1978) Integration of general practice and specialist antenatal care. J.Roy.Coll.G.P., 28, 455. (E2.3)

MORRELL, D. (1978) The general practitioner role in obstetrics. J.of Mat. & Child Hlth., 266. (E2.3)

MOURIN, K. (1976) Auditing and evaluation in general practice. J.Roy.Coll.G.P., 26, 726-33.

MUNRO, J.E. and RATOFF, L. (1973) The accuracy of general practice records. J.Roy.Coll.G.P., 23, (136), 821-6.

MUNRO-FAURE, A.D. et al. (1979) Comparison of black and white patients attending hypertension clinics in England. Brit.Med.J., 1, 1044-1047. (B2.1)

MURNAGHAN, J.H. (1973) Ambulatory Medical Care Data. Report of the conference on ambulatory medical care records. Med.Care, 11, Suppl., Mar/Apr.

MURRAY, A. and FERGUSON, J.B. (1972) Standardisation of hospital medical records in Scotland - implementation. J.Ir.Med.Ass., 65, (2) 32-4.

MURRAY, F.A. and TOPLEY, L. (1974) Patients as record holders. Hlth.& Soc.Serv.J., July, 27, 1675. (E2.1)

MURRAY, F.A. and TOPLEY, L. (1974) H.A.A. and S.H.3 information systems - their role in functional management. Hlth.&Soc.Serv.J., Nov. 16, 2652. (E2.1)

MURRAY, M. et al. (1974) A questionnaire as a data base in problem orientated medical records. J.Roy.Coll.G.P., 24, (145), 572-5. (F1.10)

NATIONAL HEALTH SERVICE. Redesign of medical records in general practice: adoption of A4 international paper size. E.C.N. 946 (E.C.L. 39/73) April, 1973. (Recommendation postponed.)
NEWCOMBE, H.B. (1968) Products from the early stages in the development of a system of linked records. (In) Record Linkage in Medicine. (Ed. E.D. Acheson) p. 7. Edinburgh.
NORLANDER, O. (1976) Medical information systems intended especially for intensive care and surgery departments. Stockholm: Caroline Hospital. p. 18.

O'ROURKE, A.F. and SMITH, R.L. (1975) A practical system of computerised medical records for documentation and decision-making in the coronary care ward. Med.J.Aust., 1, (10), 301-4.
OCKENDON, J.M. and BODENHAM, K.E. (1970) "Focus on Medical Computer Development". London: Oxford University Press.
OKUBO, R.S. et al. (1975) Natural language storage and retrieval of medical diagnostic information: experience at the UCLA hospital and clinics over a 10-year period. Comp.Prog.Biomed. (Amsterdam), 5, (2), 105-30.
OTWAY, W. (1974) Problem orientated personal (POP) medical records for general practice.N.Z. Med. J., 79, 724-6.
OXFORD R.H.B. and UNITED OXFORD HOSPITALS (June, 1971) Evaluation of Wantage medical records project.

PEART, W.S. (1973) The organisation of a multi-centre randomised control therapeutic trial for mild to moderate hypertension. Clin.Soc.Mol.Med., 45, 67. (B6.3)
PEARSON, N.G. see ASHFORD, J.R.
PERFECT, D., FORBES, M.V. & MARTIN, L. (1979) West Midland R.H.A. Mumps Project at Walsall - Evaluation Document for the D.H.S.S.; W.M.R.H.A., M.S.D., Birmingham, Jan. (B6.6)
PERFECT, D. FORBES, M.V. & MARTIN, L. (1979) West Midland R.H.A. Mumps Project at Walsall - Final Report; W.M.R.H.A., M.S.D., Birmingham, March. (B6.6)
PERKIN, J.M. (1972) Allergy in general practice. The Practitioner, 208, 776-83. (F2.14)
PERKIN, J.M. (1972) Illness seen in general practice. Med.Dig., 17, (1) 21-32. (F2.14)
PERRY, J. (1972) Medical information systems in general practice: a community health project. Proc.Roy.Soc.Med., 65, 241-2. (F2.1)
PERRY, J. (1972) The Oxford Community Health Project. Symposium on Community Health Information Systems, Oxford, 5th-8th Sept., 1972. (F2.1)
PERRY, J. (1974) Use of the Oxford medical information system in the support of primary medical care. Colloques I.R.I.A., 1, 367-78. (F2.1)
PERRY, J. (preprint) A primary care morbidity code based on the International Classification of Diseases. Medical Data Processing Symposium, Toulouse. (F2.1)
PERRY, J., SKEGG, D. & DOLL, R. (1977) Use of medicines and general practice. Brit.Med.J., 1, 1561 (E103)
PETRIE, J.C. (1979) Systems approach to care in a general medical unit. Proceedings of Annual Scientific Meeting of the Faculty of Community Medicine, 21-22. (A2)
PETRIE, J.C., HOWIE, J.G.R. & DURNO, D. (1975) Drug interactions in general practice. (In) Clinical Effects of Interaction between Drugs. J.C. Petrie, & L.E. Cluff, Eds. A.S.P. Biological & Med. Press, Elsevier, Excerpta Medica, North Holland. (A2)

PETRIE, J.C. & McINTYRE, N. (1979) The Problem Orientated Medical Record - it's use in hospitals, general practice and medical education. Churchill Livingstone, Edinburgh. (D2)
PETRIE, J.C. et al. (1974) Awareness and experience of general practitioners of selected drug interactions. Brit.Med.J., 2, 262-4. (A2)
PETRIE, J.C. see BEVERIDGE, T.
PETRIE, J.C. see HOWIE, J.G.R. (1977) (B6.3)
PETRIE, J.C. see LOGIE, A.W. (1976) (B6.3)
PINSENT, R. (1972) Structured data recording systems. Update, 5. 693-6.
PINSENT, R. (1972) The diagnostic index, Update, 4, 1157-9.
PINSENT, R. (1972) Summary cards. Update, 5, 891-2.
PINSENT, R. (1974) The age-sex register. (In) Hart, C.R. (Ed.) Screening in General Practice. Chap. 5., 51-59. Churchill-Livingstone.
PINSENT, R. (1976) A practice register. Gen.Pract., 7th May, 15. (F2.10)
PINSENT, R. (1976) The diagnostic index in general practice. Gen.Pract. Aug.6, 22.
PREECE, J.F. (1972) Update, 5, 155-66.
PREECE, J.F. and LIPMAN, E.O. (1971) A pilot on-line data system for general practitioners. Comp.Biomed.Res., 4, 390-406.
PREECE, J.F. see GILLINGS, D.B.

RAMSAY, L.E. Liver dysfunction in hypertension. In preparation. (B6.3)
RAMSAY, L.E. Methyldopa and renal stones; a retrospective study. In preparation. (B6.3)
RAMSAY, L.E., BOYLE, P. & RAMSAY, M.H. (1977) Factors influencing serum potassium in treated hypertension. Q.J.Med., 46, 400-410. (B6.3)
RAMSAY, L.E. et al. Standardised data collection in hypertension. In preparation. (B6.3)
RAMSAY, M.H., (1976) Study of slow release oxprenolol in comparison with standard oxprenolol. Paper presented at CIBA symposium, 1976. (B6.3)
RECTOR, A.L. (1980) Medical information and the care of chronic illness. A proposed strategy. In: 8th International Congress on Health records. Vol. 2. 252-261.
RECTOR, A.L. et al. (1978) A survey of developments in medical records and information systems in the United Kingdom. (In) Medical Informatics, Europe, 78: Proceedings, Cambridge, England, 1978. Eds: D.A.B. Lindberg, & P.L. Reichertz. Pub. by Springer-Verlag, Berlin, Heidelberg, New York.
RECTOR, A.L. et al. (1979) Medical records and medical information in the United Kingdom - issues and prospects. Publ.Hlth.,Lond. 93, 290-299.
REEKIE, D. et al. (1975) Handling information in general practice - using feature cards with computers. J.Roy.Coll.G.P., 25, (154), 369-72. (F2.4)
RENDALL, M. (1979) POMR - The case in favour. Med.Teacher, 1, 147-150 (A6)
RENDALL, M. (1975) Problems of implementation of the problem orientated medical record. Acta Clin.Belg., 30, (5) 369-74. (A4)
RENNER, S.H. et al. (1975) A patient family number assignment and chart filing system for family physicians. Med.Care, 8, 346.
RHYS HEARN, C. & YOUNG, D.W. (1975) A problem orientated patient management scheme. Meth.Inf.Med., 14, (1), 13-9. (B2.2)
RICHARDS, I.O.G. and ROBERTS, C.J. (1967) The at-risk infant. Lancet, 2, 711.
RICHARDSON, I.M. & BERKELY, J.S. (1975) General Practitioner opinions on medical record content. Brit.Med.J., 27th Sept. 788.

RICHART, R.H. (1970) Evaluation of a medical data system. Comp.Biomed. Res., 3, 415-25.

RIDSDILL-SMITH, R.M. (1975) The use of stencilled labels in general practice. J.Roy.Coll.G.P., 25, (151), 138-42.

RIDSDILL-SMITH, R.M. (1976) Medical records made simple. In: Practice Supplement, General Practitioner, Sept. 10, 21-32.

ROBERTSON, A.A. (1968) The use of computers in medicine with particular reference to general practice. J.Roy.Coll.G.P., 15, 329-35.

ROBERTSON, J.W.K., SHIMMINS, J.G., THOMAS, A. & SIMPSON, D.L. (1977) Medical information systems incorporating automatic coding of text: In: MEDINFO, 77. D.B. Shires & H. Wolf, Eds. North-Holland Pub.Co. 271-275. (B6.3)

ROBERTSON, N., BALDWIN, J.A. & HALL, D.J. (1971) Methods of record linking. J.Chron.Dis., 24, 159.

ROBINSON, D.W. et al. (1975) Histories obtained by two-stage questionnaire with automated transcript in specialist gynaecological practice. Brit.Med.J., Nov.29th, 510-3.

ROBINSON, E.T. (1973) Woodside Health Centre. Records system. Hlth.Bull.(Edinb), 31, (3), 164-6. (F200)

ROGER, F.H. et al. (1974) An automated medical summary for a co-ordinated inter-hospital system. MEDINFO-74, 419-24.

ROGER, F.H. et al. (1976) An inter-hospital problem orientated and automated discharge summary.Meth.Inf.Med., 15, (3), 141-4.

ROGERS, M.G.H. (1967) The risk register - a critical assessment. Medical Officer, 118, 253-6.

ROSE, J. & MITCHELL, J.H. (Eds.) (1975) Advances in medical computing: proceedings of the Third International Symposium on Computers in Medicine. Edinburgh: Churchill Livingstone. 189.

ROSENBERG, M.& GLUECK, B.C. (1973) First-cause no harm: an early warning system for iatrogenic disease. Prev.Med., 2, (1) 82-7.

ROSSITER, W.J.C. (1973) Management and control of medical information systems. HospHlth.Serv.Rev., March, 85-90.

ROUSE, J.D. (1978) Hospital computer registration system with community links. Med.Rec., 19 (1) Feb. (F2.6)

ROWE, R.G. (1973) Taking the measure of health service information. Hosp.Hlth.Serv.Rev., March, 92-5.

ROWLEY, A. (1975) "The future role of Health Centres in the NHS from a medical records point of view." Text of a paper presented at the Annual Conference of the Association of Medical Records Officers, Southport, 15.5.75.

ROWLEY, A. (1973) Hospital size folders in general practice. Hosp.Hlth.Serv.Rev., 375-376. (F2.21)

ROWLEY, A. (1977) Numerical filing of health centre records. Hosp.Hlth.Serv.Rev., 236-240. (F2.21)

ROYAL COLLEGE OF GENERAL PRACTITIONERS, RESEARCH UNIT (1963) The 'E' Book. J.Roy.Coll.G.P., 6, 219.

ROYAL COLLEGE OF GENERAL PRACTITIONERS, RESEARCH UNIT (1966) The S4 personal record card. J.Roy.Coll.G.P., 11, 34.

ROYAL COLLEGE OF GENERAL PRACTITIONERS, RESEARCH UNIT, (1970) A family record card. J.Roy.Coll.G.P., 19, 172-3.

ROYAL COLLEGE OF GENERAL PRACTITIONERS,RESEARCH UNIT, (1971) The diagnostic index. J.Roy.Coll.G.P., 21, 609-12.

ROYAL COLLEGE OF GENERAL PRACTITIONERS, RESEARCH UNIT, (1972) The analysis of summarised data using 'S' cards. J.Roy.Coll.G.P., 27, 377-81.

ROYAL COLLEGE OF GENERAL PRACTITIONERS, RESEARCH UNIT, (1973) The summary (S) card. J.Roy.Coll.G.P., 23, 413-27.

ROYAL COLLEGE OF GENERAL PRACTITIONERS, RESEARCH UNIT, (1973) A general practice glossary, 2nd Ed. Suppl.No.3 to J.Roy.Coll.G.P. 23.

RUTHERFORD, W.H., MAYNARD, J.S.E, (1976) Patients referred from work to a casualty department. Injury, 7, 225-232. (B5.1)
RUTHERFORD, W.H., BOLT, J.S.E, (1976) Comparison of patient populations referred to Accident & Emergency outside working hours by general practitioners and their deputising services. Resuscitation,4, 271-278. (B5.1)
RUTHERFORD, W.H., NELSON, P.G., WESTON, P.A.M., WILSON, D.H. (1980) Communication and records. Accident & Emergency Med., Pitman Med. Pub. Co., Tunbridge Wells. (B5.1)
RYAN, M.P., BUCHAN, I.C., BUCKLEY, E.G. (1979) Medical audit - a preliminary report from general practice. J.Roy.Coll.G.P., 29, 719-722. (F2.5)

SAMPHIER, M.L. (1975) A method of translating binary punched Hollerith cards to computer data files. Int.J.Biomed.Comput., 6, (1), 61-3. (B1.2)
SAMUEL, R. (1975) Physician oriented data processing. JAMA, 234, 83-5.
SARGENT, S.W. (1978) Clinical Laboratory Systems (In) "Medical Informatics, Europe, 1978". (Ed: J. Anderson). Cambridge: Proceedings of Conference.
SATIN, Ann (1977) A record system for contact tracing. Brit.J.Vener. Dis., 53, (2) (B6.9)
SATIN, Ann & MILLS, Angela (1978) Measuring the outcome of contact tracing. Brit.J.Vener.Dis., 54 (3) (B6.9)
SCHMIDT, E.C. et al. (1974) Computerised problem-oriented medical records for ambulatory practice. Med.Care, 12, 316-27.
SCHNEEWEISS, R. et al. (1977) A conversion code from the R.C.G.P. to the I.C.H.P.P.C. classification system. J.Fam.Pract., 5, (3) 415-24
SEDDON, H. (1971) Some reflections on medical records. Brit.Med.J., 4, (779), 103-5.
SEED, R.F. & WELSH, E.A. (1976) Anaesthetic records in Great Britain and Ireland. Anaesthesia, 31, (9) 1199-1210.
SEMMENCE, A.M., EVANS, J.H. & GEARY, J.E. (1972) The construction of a computer held file. The Practitioner: "Economics of General Practice". (F2.1)
SEMMENCE, A.M. see EVANS, J.H.
SHARPE, T.C. and CLARK, D.E. (1975) General purpose information handling techniques for pathological data. Comput.Biol.Med., 5, 221-33. (B6.4)
SHAW, M. Report on communications and relationships between general practitioners and hospital medical staff. King Edward's Hospital Fund for London.
SHELDON, M. (1974) An A4 sized registration sheet for general practice. J.Roy.Coll.G.P., 24, (145) 582-3. (F204)
SHELDON, M. (1974) The uses of a detailed patient questionnaire. Gen.Pract. April, 12: 22. (F204)
SHELDON, M. (1976) The problem of problem orientated records. J.Roy.Coll.G.P.,26,(167) 437-46.
SHELDON, M. (1978) Satisfying the information needs of the general practitioner for improved patient care. (In) Medical Informatics, Europe, 78: Proceedings, Cambridge, England, 1978. Ed: D.A.B. Lindberg, P.L. Reichertz, Pub. by Springer-Verlag, Berlin, Heidelberg, New York.
SHELDON, M. (1979) Self-audit of prescribing habits and clinical care in general practice. J.Roy.Coll.G.P., 29, 703-711.
SHELDON, M. (1979) Patient compliance in collecting background information. In: Allgemeinmedizin: International General Practice. (4) 165-167.
SHELDON, M. & TULLOCH, A.J. (1979) Implementation of POMR in general practice. In: The problem orientated medical record. Ed: Churchill Livingstone, London, J.C. Petrie, & N. McIntrye.

SIEGEL, J.H. et al. (1970) A computer-based clinical assessment, research and evaluation system to facilitate continuing education in the care of the critically ill patient. Surgery, 68, 238-47.

SIMPSON, M.A. (1979) The problem with POMR. Med.Teacher, 1. 195-196. (A6)

SLACK, W. (1966) A computer-based medical history system. New Engl. J.Med., Jan. 27th.

SLACK, W. (1967) A computer-based physical examination system. JAMA, 200, 3.

SLACK, W. (1974) Patient computer dialogue. (In) A manual of computers in medical practice, pp. 67-75. (Ed. M.A. Jenkin). Seattle: Med.Comp. Svcs.Assoc.

SOUTH, J. (1972) A computer summary used as a discharge letter. J.Roy.Coll.G.P., 22, 28. (B1.1)

SOUTH, J. & NALDRETT, J. (1973) The effect of vaginal bleeding in early pregnancy on the infant born after the 28th week of pregnancy. J.Obs.Gynaec.Brit.Com., 80, 236-41. (B1.1)

SOUTH, J. & RHODES, P. (1971) Computer service for obstetric records. Brit.Med.J., 4, (778) 32-5. (B1.1)

SOUTH, J. see HAERI, A.D. (B1.1)

SPARROW, J. (1975) Problem of creating a community health record. Med.Rec., Winter, 1975. (F2.6)

STARK, G.D. et al. (1975) Paediatrics in Livingston New Town: evaluation of a child health service. Brit.Med.J., 4, (5993), 387-90. (F2.5)

STARR, K.J., PETRIE, J.C. (1972) Drug interactions in patients on long-term oral anti-coagulant and antihypertensive adrenergic neuron blocking drugs. Brit.Med.J., 4, 133-135. (A2)

STEVENSON, J.G. et al. (1973) A new hospital discharge letter. Lancet, Apr.28, 928-31.

STEVENSON, J.S.K. (1967) Brit.Med.J., 2, 827: 3, 312.

STORMER, C.F. et al. (1974) Editorial: data bank use in the management of chronic disease. Comp.Biomed.Res., 7, 111-6.

STOTT, N.C.H. & DAVIS, R.H. (1975) Clinical and administrative review in general practice. J.Roy.Coll.G.P., 25, 888-96. (F1.1)

STOTT, N.C.H. & JONES, M. (1973-5) Systematic evaluation of the quality of data stored in a record system for general practice. Unpublished operational studies. (F1.1)

STOTT, N.C.H. et al.,(1973) Simplified data input: an experiment in general practice morbidity recording. Int.J.Biomed.Comput., 4 (1),53-60.

SUTHERLAND, J.K. (1972) Record folders for general practice.Brit. Med.J., 1, (801), 693-4.

TAIT, I. (1974) Medical records - a new look at an old problem. (In:) The Health Team in Action (Ed.: R.Bloomfield & P. Follis) p.74-83. B.B.C. Publications.

TAIT, I. (1977) The clinical record in British general practice. Brit.Med.J., 2, (6088) 683-8. (F1.9)

TAIT, I. & STEVENS, J. (1973) The problem orientated medical record in general practice. J.Roy.Coll.G.P., 23, 311-5. (F1.9)

TATE, G.M.T. (1971) Health centre practice (with special reference to administration, medical records and research). J.Roy.Coll.G.P. 21, 336-45.

TAUSAINT, G.T. et al. (1975) An efficient method for estimating the probability of misclassification applied to a problem in medical diagnosis. Comput.Biol.Med., 4, (3/4), 269-78.

TAYLOR, T.R. (1976) Clinical Decision Analysis. Meth.Inf.Med., 15, (4) 216-24.

TAYSIDE HEALTH BOARD (1976) "The Tayside Master Patient Index." (E4.1)
THOULD, A.K. (1974) Medical audit, necessary but rigidity greatest danger. Brit.Med.J., 1, 275.
TITTERINGTON, D.M., et al. (1980) Comparison of discrimination techniques applied to a complex data set of head injured patients. J.Roy.Statist.Soc. (in press) (H1.3)
TUCK, C.S. et al. (1976) The use of a computer in an obstetric department. Brit.J.Obs.Gynaec., 83, (2), 97-104. (B1.5)
TULLOCH, A.J. A problem orientated record system in primary medical care. Report of a Nuffield Foundation Travelling Fellowship. (F1.3)
TULLOCH, A.J. et al. (1975) Hospital discharge reports: content and design. Brit.Med.J., 4, (5994), 443-6. (F1.3)
TULLOCH, A.J. (1976) (M.D. Thesis) The design and evaluation of a modern medical record system. (F1.3)
TULLOCH, A.J. (In preparation) The evaluation of an A4 problem orientated record system in primary care. (F1.3)
TULLOCH, A.J. (In preparation) A randomised controlled trial of geriatric screening and surveillance in general practice. (F1.3)
TULLOCH, A.J. (In preparation) Integrated patient care. (F1.3)
TUNBRIDGE COMMITTEE (1965) Standardisation of hospital medical records. Report of Subcommittee, Ministry of Health Central Health Services Council.
TURNER-WARWICK, M. (1977) The use of diary cards in asthma. Brit.J.Dis. Chest, 71, (4) 278-30.

UNIT OF CLINICAL EPIDEMIOLOGY AND OXFORD RECORD LINKAGE STUDY. A medical information system for general hospital inpatients: preliminary assessment of a pilot scheme. Research Report No. 1. June, 1971. (E1.1)

VALBONA, C. et al. (1973) Computer support for a neighbourhood health clinic: design and implementation. I.E.E.E.Trans.Biomed.Eng. BME-20, 180-4.
VALBONA, C. et al. (1973) The health-illness profile: an essential component of the ambulatory medical record. Med.Care, 11, Suppl. 117-24.
VALBONA, C. et al. (1975) Meth.Inf.Med., 14, 55-62.
VALBONA, C. see BEGGS-BAKER, S.
VESSEY, M.P. et al. (1970) Post-operative thromboembolism and the use of oral contraceptives. Brit.Med.J., 3, 123-6. (E1.1)
VICKERS, H.E. et al. (1975) An inter-hospital comparison of a computerised patient information system which uses a regional computer. Hosp.Hlth.Serv.Rev., 71, (12), 422-4.

WADE, O.L. and BEELEY, L. (1974) Monitoring adverse reactions to drugs. Int.J.Hlth.Serv., 4 (1), 109-23.
WAKEFIELD, J.S. & YARNALL, S.R. (1975) The history data base: computer-processed and other medical questionnaires, 3rd Edn. Washington: Medical Computer Services Assn. pag. various.
WALFORD, P.A. (1975) Some simple improvements in record keeping in general practice. J.Roy.Coll.G.P., 25, (160), 855-8.

WALKER, H.K. et al. (Ed.) (1973) "Applying the Problem Oriented System" Medcom Press.
WALKER, H.K. see HURST, J.W.
WALKER, K.S. (1971) Repeat prescription recording in general practice. J.Roy.Coll.G.P., 21, 748-51. (F1.5)
WALKER, K.S. (1976) Update, Feb. p.738. (F1.5)
WALKER, K.S. (1976) TOR robs POMR. Update, 13, (1), 74.
WALLACE, B.B. & DAVIS, R.H. (1970) A record system for general practice. J.Roy.Coll.G.P., 20, 163-70. (F1.1)
WALTERS, E. & NEICHERZ, P.L., (1976) Problem directed interactive transaction management in medical systems. Meth.Inf.Med., 15, (3), 135-41.
WARDLE, A. (1973) Information retrieval in general practice. Int.J. Biomed.Comput., 4, 205-17.
WATKINS, C.J. (1980) "Experimental research into the quality of medical care delivered to patients suffering from chronic disease." Pub. Ph.D. Thesis. University of London. (F1.8)
WARREN, M.D. (1976) Identifying handicapped people in general practice. J.Roy.Coll.G.P., 26, (172) 828-36.
WATSON, N.P., FELL, P.J., O'DONNELL, H.F. (1979) Allergy affecting the head and neck. The Practitioner, vol. 222, June, 811-813 (F2.24)
WATSON, N.P., FELL, P.J. & O'DONNELL, H.F. Drug monitoring in a rural practice.
WATTS, S.P. & ACHESON, E.D. (1967) Computer methods for deriving hospital inpatient morbidity statistics based on the person as a unit. Brit.Med.J., 4, 476-7.
WEED, L.L. (1968) Medical records that guide and teach. New Engl. J.Med., 278, 593-600; 652-7.
WEED, L.L. (1969) "Medical Records, Medical Education and Patient Care." Cleveland, Ohio: Press of Case Western Reserve University.
WEED, L.L. (1971) Quality control and the medical record. Arch.Int. Med., 127, 101-5.
WEST, S.R. (1974) A comprehensive data base in general practice records. N.Z. Med.J., 79, 721-4.
WEYL, S. et al.(1975) A modular self-describing clinical databank system. Comp.Bio.Med., 8, 279-93.
WHITAKER, P.H. (1972) The computer - its value in hospital management. Radiography, 38, (451), 165-8.
WILKINS, D. (1972) General practice records. Brit.Med.J., 3, (824) 476.
WILLIAMSON, J.D. (1973) Quality control, medical audit and the general practitioner. J.Roy.Coll.G.P., 23, 697-706.
WILSON, L.A., PETRIE, J.C.,DAWSON, A.A. & MARRON, A.C. (1978) The new Aberdeen medical record. Brit.Med.J., **2**, 414-416. (A2.)
WINCHESTER, J.F. et al. (1976) Effect of cessation of potassium supplements on potassium status in hypertensive patients treated with oxprenolol and cyclopenthiazide. CIBA Symposium, Basle. (B6.3)
WOOD, M. et al. (1975) A systems approach to patient care. Records curriculum, and research in family practice. J.Med.Educ., 50, (12) 1106-12.
WOODS, J.O. (1974) Improved record keeping in general practice. J.Roy.Coll.G.P., 24, 865-74. (F2.11)

YOUNG, D.W. (1978) A problem orientated information system. Med.Inform. 3, (2), 105-11 (B6.7)
YOUNG, D.W. (1980) Clinical information system for junior doctors. Int.J.Biomed.Comp. 11, 241-246.
YOUNG, D.W. see RHYS HEARN, C.

ZANDER, L.I. (1977) Recording family and social history. J.Roy.Coll.G.P., 27, 518-20. (F1.7)

ZANDER, L.I. et al. (1978) 'Medical Records in General Practice.' Occ. Paper No. 5. Roy.Coll. of G.P. (F1.7)

ZANDER, L.I. see DONOVAN, C.

ZIMMERMAN, Joan (Ed.) (1975) Proc. 1975 MUMPS Users' Group Meeting. MUMPS Users' Group, 208 pp.

ZIMMERMAN, Joan (1976) Preliminary study of physician utilization of medical records. Monograph No. 297. Biomedical Computer Lab., Washington University School of Medicine.

ZIMMERMAN, Joan & RECTOR, A.L. (1978) Computers for the Physician's Office. (Ed.) D.W. Hill. Med.Comp.Series, vol. II. Pub: Research Studies Press, Oregon, U.S.A.

ZUMPEL, Z. (1978) Referral letters - the enclosure of the General Practitioner's Computerized Record. J.Roy.Coll.G.P., 28, 163-167. March. (F2.6)

Problem orientated medical records. Lancet, i, 295-6 (1972)

Screening in Medical Care (1968) Publ. by Oxford University Press for the Nuffield Provincial Hospitals Trust, London.

Report of the Committee on Privacy (1972) Chairman: Rt.Hon.K. Younger. H.M.S.O.

Redesign of medical records in general practice. Brit.Med.J., 2, (864) 483-4; 2, (866), 613-4; 3, (873), 234-5 (1973)

Computer information systems in health care: a series of six lectures based on Swedish and British experience. Sperry Univac, 60 pp.

Supplement to Medical Care, Mar/Apr. 1974 - numerous pertinent articles.

GLOSSARY

Algol or Algol-60	One of the common higher level languages used primarily for scientific applications.
Assembly language	A type of programming language which corresponds very closely to the machine instructions for a particular computer. Also sometimes called a low level language. Each type of computer has its own assembly language, and it is in general not possible to convert from one to another without rewriting the programs.
Aetiology	Cause or process of causation.
Batch Processing	An arrangement whereby all data is prepared in advance and then processed at one time by the computer as a 'batch'. Most smaller applications are organised in this way with the data prepared on punch cards or paper tape (see Real Time and On-Line).
CDCS (Constructive Disease Coding System)	The coding system for problems in primary care first proposed by Hull and since that time expanded and developed by Clark and others.
Cholecystectomy	Operation for removal of the gall bladder.
Cobol	Common Business Oriented Language. A higher level language for commercial and business needs. It is the most widely used language for data handling, and it is now policy that most National Health Service applications be written in Cobol.
Codasyl	A task force of the International Federation for Information Processing (IFIP) which has produced a specification for a method of dealing with large data bases. Also used to refer to the techniques specified or developments based on them.
COM	Computer Output on Microfilm. A system for having the computer output made directly onto microfilm rather than printed. It is very rapid, and the cost per unit printed is very low, but the capital cost of the equipment is high.
Cope Chat Cards	The edge punched cards manufactured by the Copeland Chatterson Company. These are the standard edge-punched cards.
Coral-66	A higher level language used in systems and real time programming.

Data Base	1) (medical) In the problem orientated medical record, the basic data concerning the patient's background and past medical history that are collected on all patients at the time of presentation (also called basic data set).
	2) (computing) A collection of related data, usually held as an integrated structure rather than as a set of files. The term is sometimes used very loosely to refer to any data collection, and at other times used to refer to systems using specific techniques to define and manipulate large sets of data (e.g. relational data base, CODASYL data base).
D.E.C.	Digital Equipment Corporation, manufacturers of the PDP range of computers.
Dialysis	The process used in artificial kidneys to substitute for the normal functioning of the kidney. Dialysis patients are those using artificial kidney machines
Disc	A device for storing computer compatible data on plastic platters resembling stacks of L.P. records. The most important difference between storing data on discs and storing it on magnetic tape is that any data on a disc can be accessed within .1 of a second or less, whereas it may be necessary to wind through the entire length of a tape to find a particular item which can require several minutes.
'E-Book'	A log book developed by the Royal College of General Practitioners in which all patient encounters are recorded under the appropriate diagnosis. See introduction to section F and projects F1.2, F1.10 and F2.10.
EC5/6/7/8	The stationer numbers for the Lloyd George envelope, the 5" x 7" record envelope used in most general practices. (Note: E.C. indicates 'Executive Council'. New stationery since reorganisation is labelled 'F.P.' for 'Family Practitioner Committee'.)
Electroencephalograph	A device for recording the electrical potentials of the brain ('brain waves'). Also the 'tracing' or record produced by such a machine.
'F-Book'	A log book developed by the Royal College of General Practitioners in which each family has a single page on which all diagnoses are recorded. See introduction to section F and project F2.8.
Feature Cards	Punch card systems in which the cards correspond to the features (diagnoses, treatments, etc.) and the positions of the holes in the cards to patient numbers. (See projects B3.1, F2.4, F2.5.)

Floppy Disc — A device for recording computer compatible information on a small flexible plastic platter resembling a 45 rpm record. Floppy discs are slow compared to standard discs and hold a relatively modest amount of data, but are much cheaper. Changing the discs is also very much easier.

Fortran — FORmula TRANslator. The most widely used higher level language for programming scientific applications. It is also widely used for data handling work where other languages are not available.

Hard Copy — Permanent (usually printed) copies of the output from a computer system (as opposed to soft output which is merely displayed on a visual display unit or similar device but not printed).

Hardware — The computer itself and all its associated equipment. (As opposed to software, the programs which are run on the computer.)

Higher Level — Programming languages in which the commands are adapted to the functions to be performed rather than to the precise manner in which a particular machine performs them. The commands in the higher level language are translated into machine language by the computer. Higher level languages are usually intended to be standard on a number of different types of computer, but in practice there are almost always differences in 'dialect' between machines. The most common higher level languages referred to in the Gazetteer are: Fortran, Cobol, Algol (also known as Algol-60), Coral-66 and MUMPS.

ICD8 — International Classification of Diseases, edition 8. Established under the auspices of WHO.

Inverted File — A file which has been reorganised so that some items of the original data are used as keys. Ex. a file of patients organised by number might be inverted so that it was organised according to their diagnoses.

Key entry — An abbreviation used in the index to refer collectively to key-to-disc, key-to-tape, and key-to-cassette systems. In all of these systems the data is typed on a keyboard, but is written onto a disc, tape or cassette directly rather than to punched cards or paper tape. Many terminals of this type are 'intelligent' or 'semi-intelligent', i.e. the terminals can themselves be programmed to allow more convenient input and/or perform the first stage of verification.

'L-Book' — A log book developed by the Royal College of General Practitioners in which each patient encounter along with a minimal amount of additional information is recorded. See introduction to section F.

Mnemonics	Meaningful abbreviations for codes or computer instructions.
Modular	With reference to the construction of a computer system or suite of programs: broken down into logical components which are distinct and may be modified individually.
Modular One computer	Line of computers manufactured by Computer Technology Ltd.
MUMPS	Massachusetts General Hospital Utility Multi-Programming System. A high level language and data handling system developed specially for medical applications.
Natural Language	Any written or spoken language such as English, French or German (as opposed to artificial languages and coding schemes for recording and storing data).
Natural Language Retrieval	The process of retrieving information from data stored in the form of natural language.
Off-line	Not connected directly to the computer. For example a card punch or key-to-cassette system for data collection.
On-line	Connected directly to the computer. E.g. a visual display unit terminal or the sensors in a catheterization laboratory system.
Oxmis Code	The coding system for problem and diagnoses in primary care developed by the Oxford Community Health Project based on the International Classification of Diseases (8).
POMR	Problem Orientated Medical Records.
Problem Orientated Medical Records	A system for maintaining case notes developed by L. Weed involving organisation of the record according to 'problems' to which the information refers rather than the source of the information.
Real Time	Taking place at the same time as the process involved. In medical applications, there are three main groups of real time applications: 1) Hospital information systems in which data originating at many points is entered directly into the system and is then processed immediately or made available elsewhere. 2) Monitoring systems for catheterization laboratories, intensive care units, etc. where physiological signals are collected and processed as they are produced. 3) Laboratory applications where data is collected from equipment directly.

Regression model	A statistical technique for evaluating the contribution of different variables to the prediction of a result (given that all of the variables can be assumed to satisfy the appropriate conditions).
SOAP	Subjective, Objective, Assessment, Plan. The mnemonics for the different sections of a problem orientated note.
Software	All the programs used on a computer including both those needed for its own internal bookkeeping system and scheduling (the 'operating system' and 'system software') and those which perform the functions for a particular project ('the application programs' or 'package'). In many but not all cases, the operating system and system software is provided by the computer manufacturer.
Turn-Around Documents	Documents printed by the computer from the data of one encounter which will be used as the input documents to collect the data at the next encounter.
Turn-Around Time	The time required from submitting data to getting the results back.
'W-Book'	A log book developed by the Royal College of General Practitioners in which each time a new diagnosis is made the patient is entered on the page corresponding to that diagnosis. See introduction to section F and project F.104.