CASPE
RESEARCH

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Controlling Workload & Costs in Radio-diagnostic Depts.

CASPE Research are exploring Clinical Accountability, Service Planning and Evaluation in the N.H.S.

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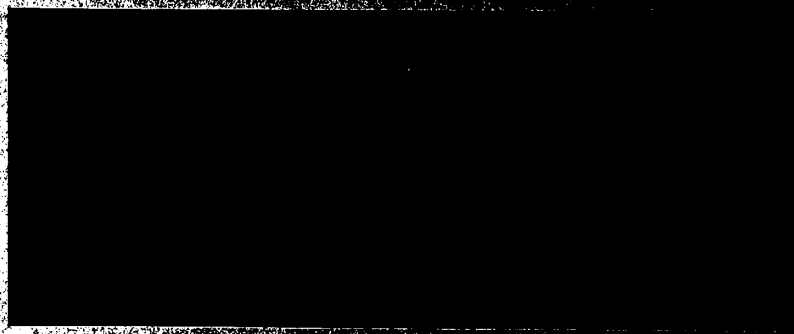
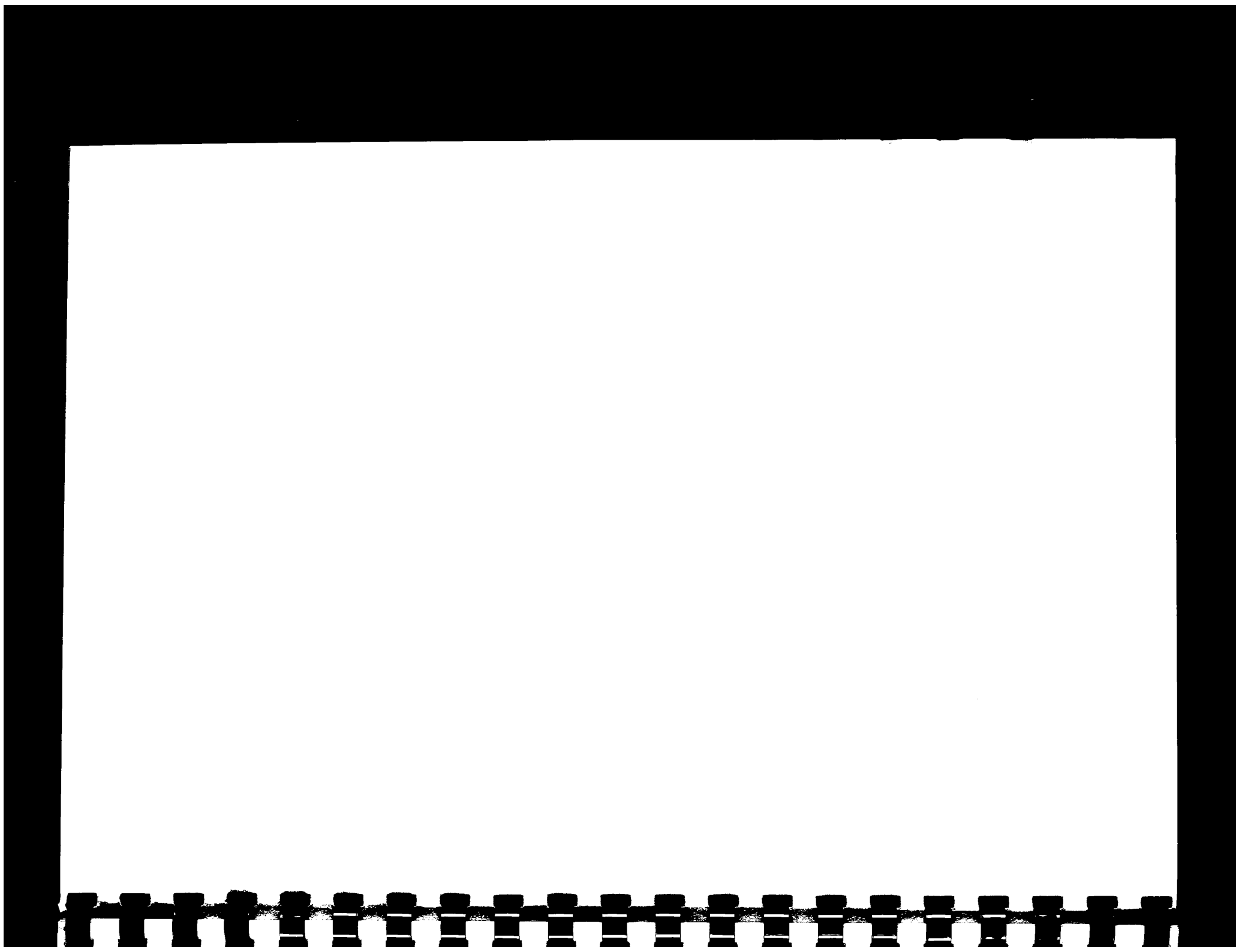


CASPE RESEARCH PROJECT

King's Fund College

Controlling Workload & Costs in Radio-diagnostic Depts.

Report of a Day Seminar held on 4 March 1982



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INTRODUCTION : THE SEMINAR'S OBJECTIVES

Dr. Iden Wickings opened the Seminar and welcomed those present. He explained that the DHSS had established the CASPE Research Project to investigate whether the introduction of new financial information and planning systems could enable the NHS to achieve a better use of resources and thus more value for money. The series of CASPE Seminars[1] was designed to allow those testing new methods to discuss their results with colleagues.

The objectives of this particular seminar were twofold. Firstly to establish whether workloads and costs in X-ray departments could be controlled in ways acceptable to both clinicians and radiologists. If this could be demonstrated, then the second objective would merit consideration. This was to understand what a health authority would need to develop the capacity to choose the appropriate level of workload or costs which would provide the clinical results required and yet be an economical service. It could not be doubted that opportunities for a better use of resources existed in radiology as in other fields, and he gave some examples:

a) Ashley[2] had demonstrated the gross variations between hospitals in their investigative levels for certain diagnoses. 12-fold and 24-fold variations in hospital averages indicated that there was often room for improvement in the selection of investigations.

b) Jones and Jeffreys [3] had shown that there was a need to make careful and calculated judgements about standard practices where the benefits to patients were shown to be very infrequent. Their study of patients admitted for observation following head injuries suggested that a reduction in routine post traumatic skull radiography could lead to average savings of £19,000 per District. This should be considered as an opportunity cost, whereby any potential savings thus achieved should be reviewed to discover if there is an alternative service which would be of greater benefit to patients.

c) A report from the USA[4] had demonstrated that the more selective investigation of patients with injured extremeties could achieve a reduction of X-ray examinations by 12% - 19%.

d) Extraordinary variations existed in costs whereby the cost of 100 work units in one DGH was £17 and in another was £60[5].

e) Dr. Wickings reported on a clinical budgeting experiment in 1973/4 at Westminster Hospital[6]. Ward teams had been given budgets and the power to redeploy savings, together with detailed information on their workload and expenditure. Significant changes in team behaviour had been observed. As far as radiodiagnostic work was concerned, the high costs of mobile X-rays had prompted three Clinical Teams to reduce expenditure on these by 66%, 46% and 14%. In addition two Teams reduced the number of X-rays done on their patients in the CCU by 55% and the ITU by 88%. Their decision to stop routine daily chest X-rays resulted in the policy for both units being changed and this more economical practice was adopted for all patients.

f) Several projects at different times had sought to achieve economies purely by the circulation of 'price lists' (Wickings[7]; Beckenham Hospital[8]). None had achieved any consistent changes in behaviour.

g) The CASPE team had recently experimented in Brent, where individual cost reports providing information on their use of diagnostic services had been presented to clinicians. There had been no budgets for the clinicians. A reduction in radiological workload had been observed in Brent but corresponding reductions did not occur in pathology or other services and it was therefore thought unlikely to have been brought about by the research project.

In the Districts now participating in CASPE Research it was planned to negotiate workload and resource use levels with Clinical Teams who would, if they wished, be able to hold budgets. The negotiations would take the form of using Planning Agreements with Clinical Teams - PACTs[9]. The budgets in the PACT would relate in particular to the variable cost expenditure. Clinical Teams would

be encouraged to achieve economies and be able to use any savings for other purposes in accordance with guidelines issued by the District Management Team. In relation to the diagnostic services, it was envisaged that the variable costs part of the radiology department's expenditure, for example, would initially be included in the budgets of the clinicians. As and when clinical teams made demands on the radiology service, funds would be transferred from their budget to the X-ray department, with the latter, in effect, being income earning for their variable cost elements. He gave this example of one of the current CASPE research projects to show the interest with which he approached this seminar, and he was delighted to see the large and distinguished audience present.

References

(1) CASPE Seminars: Drug Costing - The State of the Art (1980)
The Use of Small Computers in NHS Management (1980)
Capital Costs & Specialty Budgeting (1980)
Reducing the Costs of Pathology Services (1981)
Cost Planning for Nursing Services (1981)

(2) Ashley et al (1972) Lancet, 1, 890

(3) Jones, J.J., Jeffreys, R.V., 'Relative Risk of Alternative Admission Policies for Patients with Head Injuries', Lancet, 1981, II, 850-853.

(4) Brand, D.A., et al, 'A Protocol for Selecting Patients with injured extremeties who need X-rays', N.Engl.J. Med. 1982, 306: 333-337.

(5) Summary of Health Service Cost Statements - North Western RHA, 1980.

(6) Wickings, H.I. et al, 'The effect of presenting management information to clinically accountable teams', 279 pp, Brent Health District, 1975.

(7) Wickings, H.I., 'The management of doctors and health care resources' - PhD Thesis, 1980.

(8) Private correspondence with Sector Administrator, Beckenham Hospital, 1980.

(9) Wickings, H.I., 'Planning Agreements with Clinical Teams' June 1981.

NHS/DHSS STEERING GROUP ON HEALTH SERVICES INFORMATION:

RECOMMENDATIONS FOR RADIOLOGICAL SERVICES

Mr. Mike Dunning, member of the Secretariat for the NHS/DHSS Steering Group on Health Services Information, began his presentation with a brief description of the Steering Group and then outlined the specific recommendations for Radiological Services.

Steering Group

The NHS/DHSS Steering Group on Health Services Information (Körner Committee) was established in February 1980 with Mrs E. Körner as its Chairman. The Group was set up following a lengthy investigation into the information systems currently operating in the NHS, from which it was concluded that the relevance and quality of some systems required considerable improvement. The objective of the Group was to ensure that information systems were more relevant to the needs of NHS managers.

The Steering Group decided to concentrate on the needs of management at District level, where information was needed for service planning; to assist in the assessment of whether the present pattern of activity provides the best value for money, and whether the NHS could match demand with the resources available. This commonality of purpose allowed an approach to standardisation which could not with the same confidence be attributed to departmental managers where individual needs would vary. It was not regarded as feasible to develop a national system to meet such needs; it could well inhibit innovation. To meet the needs of District Managers the Steering Group has adopted the concept of a 'Minimum Data Base': a set of data items which should be collected in a comparable way in each health district. In considering data items for inclusion in the data base it represented a compromise of what is desirable, what is feasible and what is affordable. It was expected that all Districts would collect additional data more directly related to their problems.

Rather than developing one large data system the Steering Group chose to tackle separate segments of the organisation in a series of separate reviews: and to adopt a group of principles (which are set out below) to ensure that the results of the separate reviews were comparable.

Relevance	:	reflects clinical reality
Comparability	:	between districts
Cost	:	justified by the information's value to operational management
Timeliness	:	appropriate to use
Flexibility	:	to cater for different interests
Linkage	:	with manpower and financial data
Confidentiality	:	in accord with agreed principles

Mr Dunning went on to describe briefly the various Working Parties convened to look into, for example, acute services, diagnostic services, para-medical services, manpower etc. before turning to radio-diagnostic services.

Working Group B: Diagnostic Services

Working Group B was set up in April 1980 to examine information concerned with diagnostic services. The Group chose to concentrate on the major services, ie Radiology and Pathology in the belief that a model could be developed that would apply to all diagnostic services.

Within all diagnostic departments two categories of information could be identified ie:-

1) CLINICAL : this related to the care of individual patients

2) MANAGEMENT : this related to the effective running of the department and needed to cover

   a) day to day management
   b) planning the level of services for the future
   c) control and monitoring the effective use of resources.

The Working Group concluded that routine statistics were related to planning and control functions rather than the needs of clinical care or day to day management. To contribute to successful planning and control systems the key factors were the need to identify the users of resources and a measure of the resources that had been used. This information could then be set alongside equivalent information about the resources that were available. The first dimension to the routine statistics should identify the sources of the requests ie the clinical team, GP etc.

The more difficult problem was to consider the way that you could reliably measure the resources that had been used. Five options had been considered.

a) A simple count of requests
b) A count of the total number of investigations
c) A comprehensive analysis of investigations
d) An analysis by groups of requests
e) Workload measurement using notional values

The Group had concluded that radiological investigations could be grouped into six different categories which in broad terms would consume similar resources overall. An initial distribution of investigations had been illustrated in the vocabulary contained in the Working Group report. This had been reasonably well received and only few changes were anticipated before a definitive version was issued.

The Group recognised that the analysis suggested was in more detail than that currently produced but in terms of benefit to local management the view was that the investment was worthwhile. It was likely that the cost could be reduced if advantage was taken of economic micro-computer systems to operate as a 'day book'. Such a system could be installed for about £2,000.

The system proposed by the Working Group would limit the routine availability of this data to the individual District. Simple analyses of the number of requests by the separate groups, handled in each District would be supplied to DHSS. Their needs would be supplemented through co-operation with a limited number of departments who used computers.

DISCUSSION

The main points to emerge during the discussion following Mr. Dunning's presentation are summarised below:-

1. Dr. Hartley queried a comment that "the NHS could match the demand to the resources available." He suggested that this was usually expressed the other way round. It was very rare for demand to be significantly curbed when resources were tight. In his experience radiology departments tended to cope with all the demand presented but radiologists, as managers, were required to decide how best to plan the allocation of their resources to meet that demand.

   Dr. Field said that he could not agree with Dr. Hartley's comment. In his view every Radiologist had the power to increase or decrease any aspect of the department's workload to a certain extent. Departmental policies could be adopted to substantially alter the volume or type of work undertaken.

   Dr. Hartley said that he did not disagree that the radiologist has the ability to modify demand, but he suggested it was unrealistic to think that a radiologist in a District General Hospital could substantially affect demand.

2. Dr. Wickings referred to guidelines which he understood had been developed by the Radiologists in the Canterbury District and invited Dr. Field to elaborate on what had been achieved. Dr. Field explained that in 1978 the radiological department at Canterbury Hospital reached a crisis point in that they were unable to cope with the demand. No money had been available to enable the traditional solution to be adopted, i.e. appointing an additional consultant. Having decided that the workload had to be reduced, the four Radiologists in post, with the help of the Superintendent Radiographer undertook an analysis of the work being undertaken. This analysis illustrated, for example, the large percentage of requests for barium meals which were not clinically indicated. Following discussion with the Gastroenterologists and GPs, the Radiologists prepared guidelines for referrals. Similar discussions were held with other specialties and

these guidelines brought about significant changes. For example, in 1976 the Department had performed 1600 barium meals. By 1981 this had been reduced to 700 (endoscopy had been freely available since 1972). Similarly in the Accident and Emergency Department it was found that large numbers of patients were being referred for X-ray with dubious clinical indications. Guidelines were produced and circulated. These are constantly reinforced by the radiologist or radiographer returning any request which does not comply with the guidelines.

It was noted that the guidelines have been distributed to local hospital staff and GPs. Dr. Field believed that every district should undertake a similar exercise in which the radiologists, GPs and clinicians were all involved to determine what should be regarded as an acceptable level of service.

After Dr. Field had briefly talked about the guidelines, the participants agreed that it was of sufficient interest for a detailed description of the Radiologists' experiences in the Canterbury and Thanet Health District to be included in the report of the seminar. This follows on page (9).

In answer to a question from Mr. Dunning, Dr. Field confirmed that to undertake this exercise it had been necessary to obtain data which identified the type of investigation requested by different groups of clinicians.

3. In the light of Dr. Field's results, Dr. Hartley reaffirmed his earlier comment that he would not dispute that a radiologist could modify his practice. However, he pointed out that his own department had also had a reduced requirement for barium meals, by approximately a half. This had not occurred as a result of canvassing clinicians to lessen their requests, but because the use of endoscopy had increased; he wondered whether this had also occurred in Canterbury? He therefore maintained that the basic level of demand either remained the same or increased.

4. It was suggested that a distinction was needed between, for example, contrast examinations, and demands for simple radiography from the Accident & Emergency Department where there was often a medico-legal constraint. These two types of radiology presented very different problems to manage.

The following report was subsequently provided by Dr. Stuart Field:

CONTROLLING RADIO-DIAGNOSTIC WORKLOADS - THE APPROACH USED IN CANTERBURY & THANET HEALTH DISTRICT

1. Introduction

The overall view of the Consultant Radiologists in the Canterbury and Thanet Health District has been that many of the problems experienced by diagnostic departments have been due to the relative ignorance of most trained doctors in the value and limitations of diagnostic facilities. They have therefore placed great emphasis on the need for doctor education and attempted to rectify the lack of knowledge by a combination of tutorials, clinico-radiological meetings and the issue of guidelines.

A summary of the specific ways in which the different grades of medical staff are routinely advised on the use of Radiology services is given below:

Post Graduate (House Officer; SHO; Registrar)

a) Issue of guidelines for the use of X-ray Department.

b) Compulsory visit to a Radiologist who explains these guidelines on commencing their job, and before they are allowed to request X-rays.

c) A comprehensive system of tutorials predominantly aimed at General Medical and General Surgical juniors, including Casualty Officers, emphasising both the value and limitations of radiology.

Established Clinical Consultant

a) Weekly clinico-radiological meetings with most firms.

b) Joint symposium with visiting speakers to try and produce local policies for the diagnostic "work up" of a given clinical problem to ensure the quickest and cheapest method of diagnosis.

c) A genuine agreement with most of them about the desirability to reduce unnecessary requests.

General Practitioners

a) Visits to Health Centres by Radiologists to speak on specific problems.

b) Symposium on "The Value and Limitations of Radiology".

c) Regular contributions by Radiologists at Postgraduate meetings for General Practitioners.

d) Visits organised to the X-ray Department so that modern techniques can be displayed, and departmental problems discussed.

e) Radiologists' involvement in General Practitioners' vocational training course.

f) The issue of guidelines.

2. Guidelines for the referral of patients for X-ray examinations

All the methods described above, with the exception of the issue of guidelines, had been used over a two or three year period without any significant decrease in workload. Following local discussion it was decided to prepare and circulate guidelines on the referral of patients for X-ray examinations. These have been produced in consultation with the clinicians concerned, and where appropriate, with general practitioner representatives.

Examples of the guidelines include:

a) Notes on the use of the Diagnostic Radiology Department for Junior Medical Staff.

b) Notes on referral for radiological examination of the spine and other bone/joints examinations.

c) Guidelines on the referral of patients for X-ray examination from the Accident & Emergency Department (see Figure 1).

d) Notes on referral for barium meal and swallow examinations (see Figure 2).

DIAGNOSTIC RADIOLOGY DEPARTMENT

GUIDELINES ON THE REFERRAL OF PATIENTS FOR X-RAY EXAMINATION FROM THE A & E DEPARTMENT.

1. Outside the hours of 9 am - 5 pm Monday to Friday, the Radiology Department provides an emergency service only. Many patients seen in the A & E Department are not emergencies and such patients when seen at night or the weekends and thought to require X-ray examination should either be referred to the Radiology Department between 9 am - 5 pm Monday to Friday or referred back to their general practitioners for G.P. referral for X-ray examination.

2. All A & E medical staff on commencing duty must contact a Radiologist within twenty-four hours and arrange to visit the Radiology Department to discuss referrals with a Radiologist. Requests for X-ray examinations will not be accepted until this has been done.

3. X-ray examination is not a substitute for clinical examination. Requests for X-ray examination will only be accepted after the patient has been assessed clinically.

The A & E card carrying the request for X-ray examination must contain a clinical assessment and a provisional diagnosis or differential diagnosis must be given, indicating what you anticipate the examination will demonstrate.

4. The request for X-ray examination must be signed by a doctor - requests from clerks, nurses, etc. will not be accepted. If your signature is not legible (most are not) please write your name legibily so tha the Radiology Department knows who to contact if there are any queries about the referral.

5. There will normally be a Radiologist available for consultation in the Radiology Department, Monday to Friday 9 am - 5 pm and on Saturday morning. Do not hesitate to ask for an opinion on the interpretation of films or the indications for X-ray examination. Outside normal working hours, there is always a Radiologist on call.

6. Ten day rule for the avoidance of unnecessary irradiation of the foetus in early pregnancy.

This must always be considered when requesting X-ray examinations of any area from the diaphragm to above the knees in females between the ages of 12 and 50.

Requests will not be accepted by the Radiology Department if the relevant details required to implement the ten day rule are not supplied - no risk of pregnancy, ten day rule not applicable/ten day rule to be ignored on grounds of uregency despite the risk of pregnancy/risk of pregnancy, ten day rule applicable - give date of 1st day of last menstrual period.

7. Is the X-ray examination necessary?

Referrals from the A & E Department account for more than 30% of the patients referred to the Radiology Department. No abnormality is demonstrated in the majority and many are examined unnecessarily or excessively.

An unnecessary examination is one which does not affect the patient's management. Before asking for an X-ray examination, anticipate what it might demonstrate and ask yourself "what will I do if the result is positive and what will I do if it is negative?" - if the answer to the two questions is the same, the examination is not required; e.g. minor fractures of the distal phalanx of a finger will not affect the patient's management and therefore do not require X-ray examination.

Limit the X-ray examination to the parts which have been injured; e.g. if only a finger is injured, do not ask for examination of both hand and wrist.

8. Comparative views

If thought necessary, radiographs of the opposite uninjured side for comparison will only be done after you have seen the films of the injured side and there is no Radiologist available to report on these films.

9. Foot and ankle X-ray examination

(a) Unnecessary films are frequently taken of the foot when only the ankle has been injured, or vice versa. Limit the request to the part or parts injured.

(b) It has been well established that no significant injury of the ankle will be overlooked if radiographs of the ankle are reserved for those patients with swelling and tenderness over one or both malleoli. Far too frequently radiographs of the ankle are requested when there is no soft tissue swelling at all.

10. Rib fractures

Demonstrating a rib fracture does not affect the management of a patient, it is therefore unnecessary to take oblique films of the ribs to demonstrate a possible fracture. In chest trauma the necessary film is the standard PA chest film to exclude intra-thoracic injury or a pneumothorax.

11. Pneumothorax

An expiration film is only required if it is difficult to be certain if there is a small pneumothorax on the standard inspiration film. Lateral films are not indicated.

12. Inhaled foreign bodies

Chest films in inspiration and expiration are required for possible inhaled foreign bodies in a bronchus.

13. Requests for abdomen films

These should be reserved for conditions known to produce plain film abnormalities; e.g. haematemasis/melaena are not indications for abdomen films.

Erect as well as supine abdomen films should only be requested routinely in suspected perforation of a viscus to detect free peritoneal gas. In suspected bowel obstruction, an erect film is not necessary if the supine abdomen film is abnormal. Erect films are not required for renal colic.

14. Foreign bodies

Glass and metal are radio-opaque but most small plastic and wood objects are not and there is, therefore, no point in asking for X-ray examination to demonstrate such non-radio-opaque objects.

15. Acute intervertebral disc disease

Acute back pain is usually due to disc prolapse which can not be diagnosed on plain film radiography. X-ray examination should not be requested to confirm a diagnosis of disc prolapse.

16. Miscellaneous

Minor abrasions, cuts, bee stings, acute torticollis and tenosynovitis are not indications for X-ray examination.

9th December 1980

Figure 1 - 11 -

Figure 2

NOTES ON REFERRAL FOR BARIUM MEAL AND SWALLOW EXAMINATIONS

1. Gastro-oesophageal reflux and hiatus hernia

Many patients are referred for barium examination because of symptoms of gastro-oesophageal reflux - regurgitation and 'heartburn'. The following points should be considered:

a) gastro-oesophageal reflux is seen in patients with no symptoms of reflux;

b) patients with symptoms of reflux may not reflux during a barium examination;

c) in the absence of complications there are rarely radiological signs of reflux oesophagitis;

d) many people have a hiatus hernia without any relevant symptoms.

A barium meal or swallow usually does not help in the assessment of uncomplicated reflux and should be limited to those patients with symptoms of oesophageal obstruction, or difficulty in swallowing, from the complication of reflux oesophagitis stricture.

Most patients with symptoms of reflux/hiatus hernia uncomplicated by stricture formation will respond to the appropriate treatment - correction of obesity, posture and appropriate drug therapy. Problem cases should be assessed endoscopically (in the first instance).

2. Dysphagia and Barium Swallow Examination

Patients with true dysphagia (usually due to reflux oesophagitis stricture or oesophageal carcinoma) will require urgent barium swallow examination or endoscopy.

The distinction should be made between obstructive symptoms - food actually 'sticking' when pathology will usually be demonstrated and vague feelings of discomfort attributed to the oesophagus, but not actually related to the act of swallowing or interfering with eating, although loosely referred to as dysphagia, and when abnormalities are rarely found.

3. Chronic Duodenal Ulceration

Deformity of the duodenal cap from chronic duodenal ulceration will persist and once demonstrated does not require further examination. Once the duodenal cap is deformed the presence of active ulceration can not usually be assessed radiologically.

When there is doubt about the diagnosis on previous barium meal examination, the radiologists will be pleased to review the films of previous examinations, if available, and assess the necessity for a further examination to establish the diagnosis of duodenal ulceration.

We will be happy to discuss cases when doubt exists as to the advisability of the radiological examination.

CONSULTANT RADIOLOGISTS
Drs. Cant, Carter, Downes, Field, McNeilly

CONSULTANT GASTRO-ENTEROLOGISTS
Drs. Cocking and Rake

21st February 1980

3. Reduction in Workload and Costs

Since the introduction of the guidelines and constant adherence by continuous monitoring there has been a progressive decrease in the workload (see Figure 3). Between 1978 and 1981 patient attendances in the X-ray Department, excluding Ultrasound, have decreased by 17%. Specific changes brought about by the reduced workload include:

a) the reduction of the waiting list for barium or contrast studies from several months to approximately two weeks;

b) the reporting service, which was beset by a backlog, with many films having to remain unreported, has become a system whereby the reporting is virtually up to date.

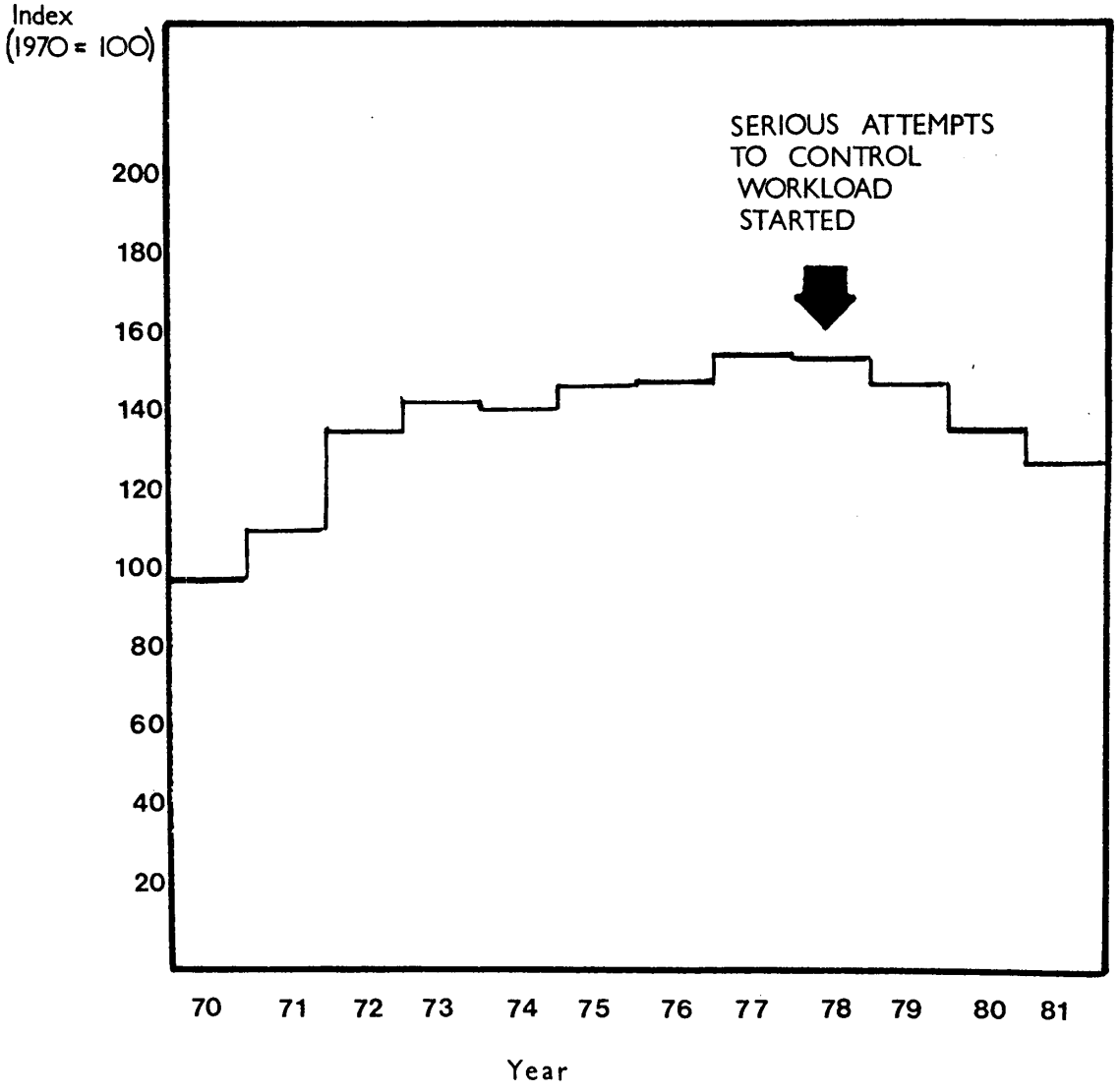
As a separate but parallel exercise substantial savings have also been achieved in relation to the purchase and use of film. A number of factors contributed to these savings and are summarised below:

(i) Reduction of views per examination - many single film only.
(ii) Only repeat an examination if clinical indication has altered.
(iii) Stop unnecessary views, eg. oblique ribs in trauma - routine lateral chests.
(iv) Fewer erect abdomens.
(v) Quality control.
(vi) Analysis of all rejects with radiographers.
(vii) Automatic exposure control.
(viii) Bulk film purchase (when price is low).
(ix) Prudent selling of old film.

((viii) and (ix) resulted in a £20,000 saving one year, by buying one years film prior to massive increase in price and selling the old film after the increase)

As the District operates a functional budgeting system it has been possible to use the savings thus achieved for minor capital developments.

Trends in Patient Attendances* - X-ray Dept. 1971-1981 (1970 = 100)



(* excluding ultrasound)

KENT & CANTERBURY HOSPITAL

This reduction in the workload of the X-ray Department has not resulted from a decrease in the overall number of patients attending the hospital. An analysis of SH3 returns indicates that there has been an increase in the number of inpatients, outpatients and day cases since 1976. Although the number of A & E attendances has dropped slightly, the percentage of A & E patients being X-rayed was, for example, 50% in 1978 and 43% in 1980.

4. Conclusion

The production of guidelines and constant adherence of them by continuous monitoring by radiographers and radiologists has certainly led to the elimination of some routine, unnecessary work, and to a reduction in patient attendances. It should be emphasised, however, that this has only been achieved as a result of the continuing combined effort of the four Consultant Radiologists, together with considerable support from the Radiographers encouraged by their Superintendent. The time thus made available has been taken up by the introduction of modern radiological techniques including percutaneous cholangiography, drainage, angioplasty and percutaneous biopsy, which are of course relatively time consuming for the Radiologists. It should also be noted that teaching and the maintenance of the guidelines takes up part of the Radiologists' time.

Although the guidelines have proved successful in the Canterbury and Thanet District, it is recognised that other Radiologists may not agree with them, and that they would not necessarily be appropriate for application in other Districts.

Department of Diagnostic Radiology
Kent & Canterbury Hospital

Consultant Radiologists: A.R. Carter, MRCP FRCR
M.O. Downes, MBBS FRCR
S. Field, MA FRCR
W.J. McNeilly, MRCP FRCR

Supt. Radiographer: W.H. Grinney, TDCR DCRMU

TRENDS IN RADIOLOGICAL PRACTICE IN THE NHS

Dr. Ronald Wrighton, Senior Medical Officer at the DHSS, explained that he would be attempting to review the trends in demands upon Radiological services, the extent to which demand had been met, and the associated expenditure. He pointed out, however, that the degree of accuracy attributable to the returns from which the trends were identified was questionable.

Workload

Referring to the Radiographic Workload statistics (Figure 1) Dr. Wrighton explained that between 1972 - 1973 the basis on which units were calculated had changed. He drew attention to the percentage increase column which clearly illustrated a considerable increase in radiological workload. It was noted that in the mid to late Seventies the annual increment ranged between 7 - 10%. It remained to be seen whether the lower increase from 1979 to 1980 was indicative of any trend.

Figure 1

RADIOGRAPHIC WORKLOAD

(England)

Year	Total Units (m)	% Increase		
		Over previous year	1968=100	1973=100
1968	29.8	5.3	100	
1969	31.7	6.3	106.4	
1970	32.9	4.0	110.4	
1971	34.7	5.3	116.4	
1972	36.9	6.4	123.8	
1973	199.6	-		100
1974	210.9	5.7		105.7
1975	217.6	3.2		109.0
1976	239.6	10.1		120.0
1977	256.6	7.1		128.6
1978	278.7	8.6		139.6
1979	300.5	7.7		150.6
1980	306.5	2.1		153.6

An examination of the SH3 returns for 1980 (Figure 2) indicated, not surprisingly, that the major sources of demand for radiological services were hospital inpatients and outpatients.

Figure 2

RADIOGRAPHIC WORKLOAD (ENGLAND) 1980

SOURCES

Source	Total Work Units	% Total
Inpatients	112930397	36.8
Outpatients	102262183	33.4
A + E Department	44656331	14.6
Referrals from other hospitals	10246436	3.3
Referrals from GPs	30627170	10.0
Other Sources	5758174	1.8
Total	306480691	100.0

As could be seen from the graph in Figure 3, there had been a gradual relative change in the percentage of total work units for in and outpatients, but those relating to the A + E Department and General Practitioners had remained fairly constant.

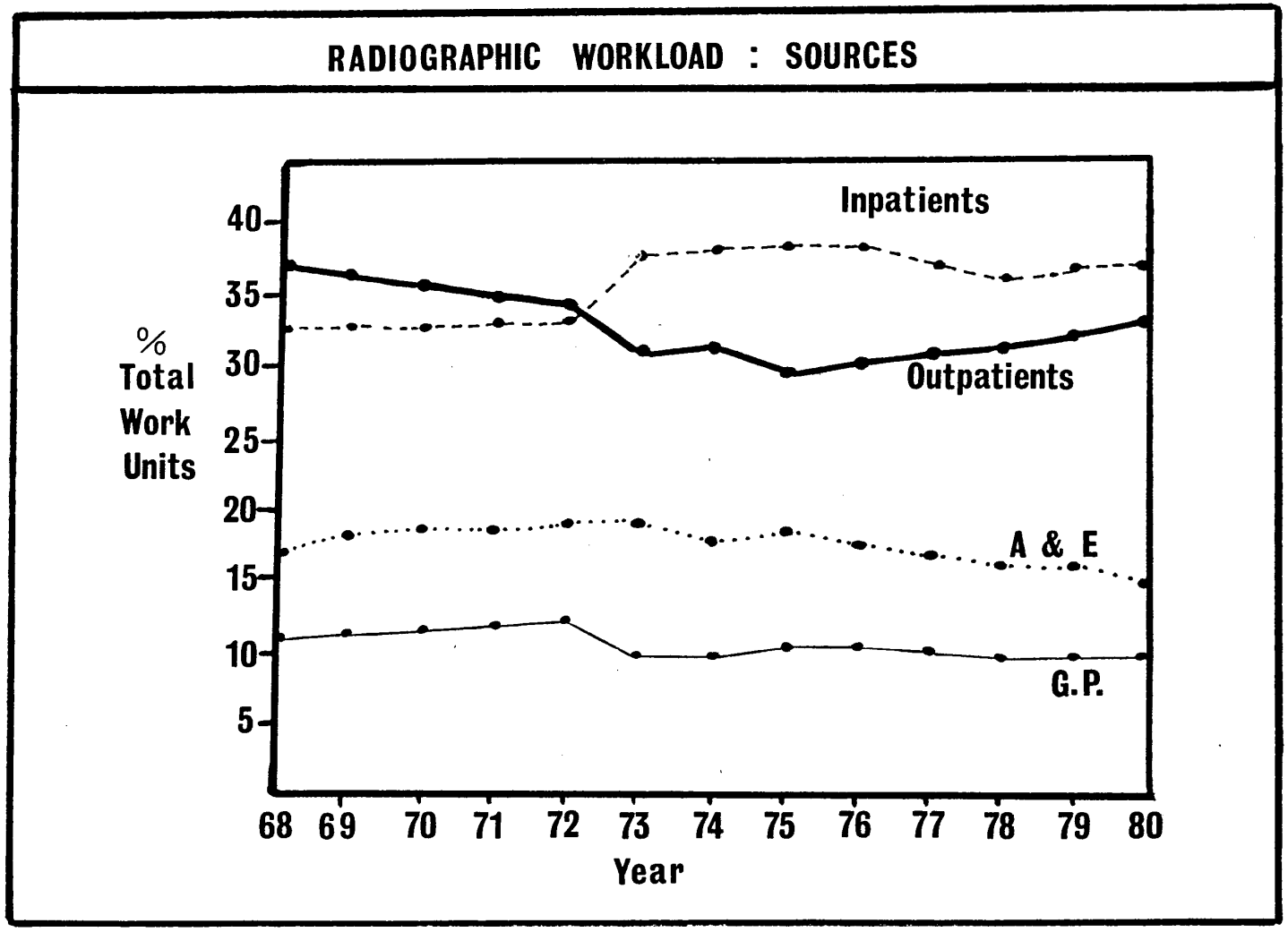

RADIOGRAPHIC WORKLOAD : SOURCES
Inpatients
Outpatients
A & E
G.P.
% Total Work Units
40
35
30
25
20
15
10
5
68 69 70 71 72 73 74 75 76 77 78 79 80
Year

Figure 3

Dr. Wrighton drew attention to the geographical variations in the number of units per 1000 population (Figure 4). He was not convinced that these could be accounted for by the different numbers of teaching hospitals in the Region, though this probably played a part in the variations.

Figure 4

RADIOLOGY WORKLOAD 1978
REGIONAL DIFFERENCES

Region	Units/1000 Population	Teaching District Nos:
NORTHERN	5430	1
TRENT	4500	6
NW THAMES	7040	4
SE THAMES	7130	3
S WESTERN	5660	1
MERSEY	6000	1
W MIDLANDS	4810	1
(ENGLAND)	(6050)	(30)

Dr. Wrighton referred to the radiological points system introduced in 1973 as a radiologists' workload measurement. This was in use for a very short period and eventually abandoned because it was believed the quality of the return was poor. He suggested that, nevertheless, the statistics gave some helpful corroborative information about the rate of change.

Figure 5

RADIOLOGISTS WORKLOAD - ENGLAND

Year	Points (m)	% Change
1973	33.8	
1974	33.1	-2.1
1975	35.5	7.3
1976	37.9	6.8
1977	40.2	6.1

Source: SBH65 return

A breakdown of the three categories of examination showed that 89% of the total workload related to Class I type examinations where the involvements of the radiologist is minimal. Classes II and III, where the radiologist is more extensively involved, formed a very small part: 10% and 1% respectively. It could be seen that the number of examinations, whether estimated from Units or Points, had increased steadily during this period.

Figure 6

RADIOLOGICAL EXAMINATIONS

per 1000 Population

(England)

Year	Estimate from Units *	Estimate from Points *
1973	290	400
1974	300	370
1975	310	400
1976	340	410
1977	370	430

* Radiographic work unit = 1 minute of Radiographer time
Radiologist point = 3 minutes of Radiologist time

Dr. Wrighton commented that the DHSS would not have data in this form in future when the Körner proposals for health services information were implemented. It remained to be seen whether the new types of routine records would be more or less useful for detecting national trends; it was, however, likely that some form of data sampling would be employed for more detailed analyses.

Film Use

Another way to identify trends was to look at the use of radiographic film. Figure 7 illustrated the steady increase in use but it was noted that the annual percentage change did not correspond particularly well with the percentage increase in workload included in Figure 1.

Figure 7

RADIOGRAPHIC FILM USE

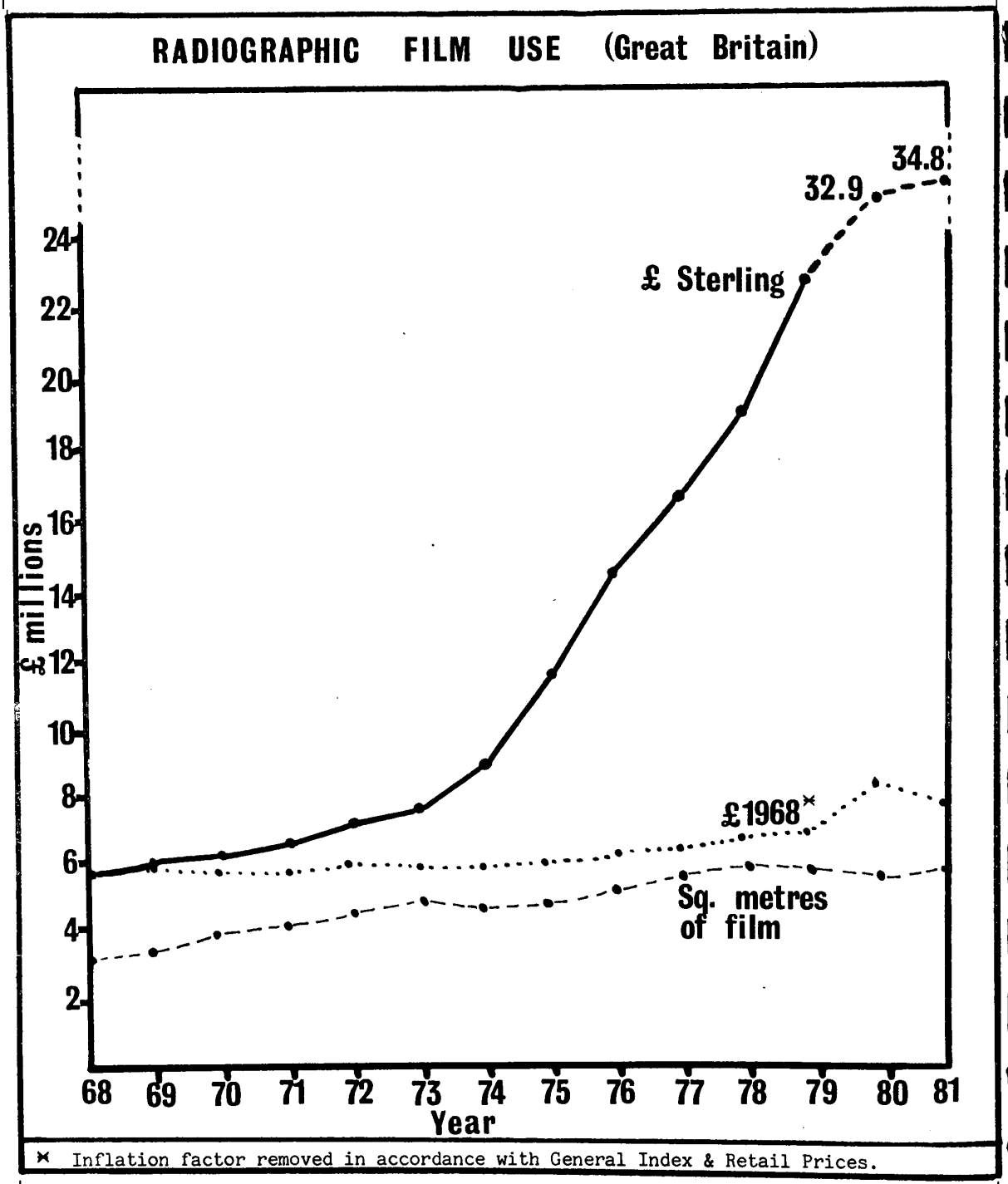
(Great Britain)

Year	Sq m (millions)	% change
1968	3.310	9.5
1969	3.590	8.4
1970	3.766	4.9
1971	3.952	4.9
1972	4.210	6.5
1973	4.603	9.3
1974	4.300	-6.5
1975	4.420	2.8
1976	4.944	11.8
1977	5.108	3.3
1978	5.487	7.4
1979	5.462	-0.5
1980	5.103	-6.6
1981	5.339	4.6

The marked fall in annual increment in 1979 and 1980 was attributable to the rise in the price of silver at that time.

The cost of film had risen steeply since 1975 (Figure 8). In 1981 the value of radiographic film bought on central contract for the NHS was £35,000,000 which represented a 75% increase over the last few years.

Figure 8



× Inflation factor removed in accordance with General Index & Retail Prices.

Equipment

The costs of equipment supplied on central contract could be seen from Figure 9. Dr. Wrighton pointed out that most of the apparent increase in cost was accounted for by inflation. In real terms there had been a slight fall in the value of radiological equipment purchased in recent years.

Figure 9

COST OF EQUIPMENT SUPPLIED ON CENTRAL CONTRACT

(Great Britain)

Financial Year	Equipment (Exc. CT)*		CT*	
	(£m sterling)	(£m 1968)**	(£m sterling)	(£m 1968)**
1968/69	3.6	3.6		
1969/70	4.1	3.9		
1970/71	4.9	4.4		
1971/72	6.8	5.5		
1972/73	7.0	5.3		
1973/74	8.0	5.6		
1974/75	8.7	5.2	0.3	0.2
1975/76	13.3	6.5	2.4	1.2
1976/77	15.5	6.5	1.8	0.8
1977/78	17.0	6.1	2.4	0.9
1978/79	18.3	6.1	3.0	1.0
1979/80	17.5	5.1	2.5	0.7
1980/81	20.1	5.0	3.0	0.7

* CT = Computed tomography scanners

** Inflation factor removed in accordance with Percentage increase in General Index and Retail Prices. Source: Central Statistical Office 1982

It was noted that the DHSS did not maintain statistics concerning equipment bought for the NHS not on central contract, but he understood that this proportion of the total equipment purchased had increased.

Manpower

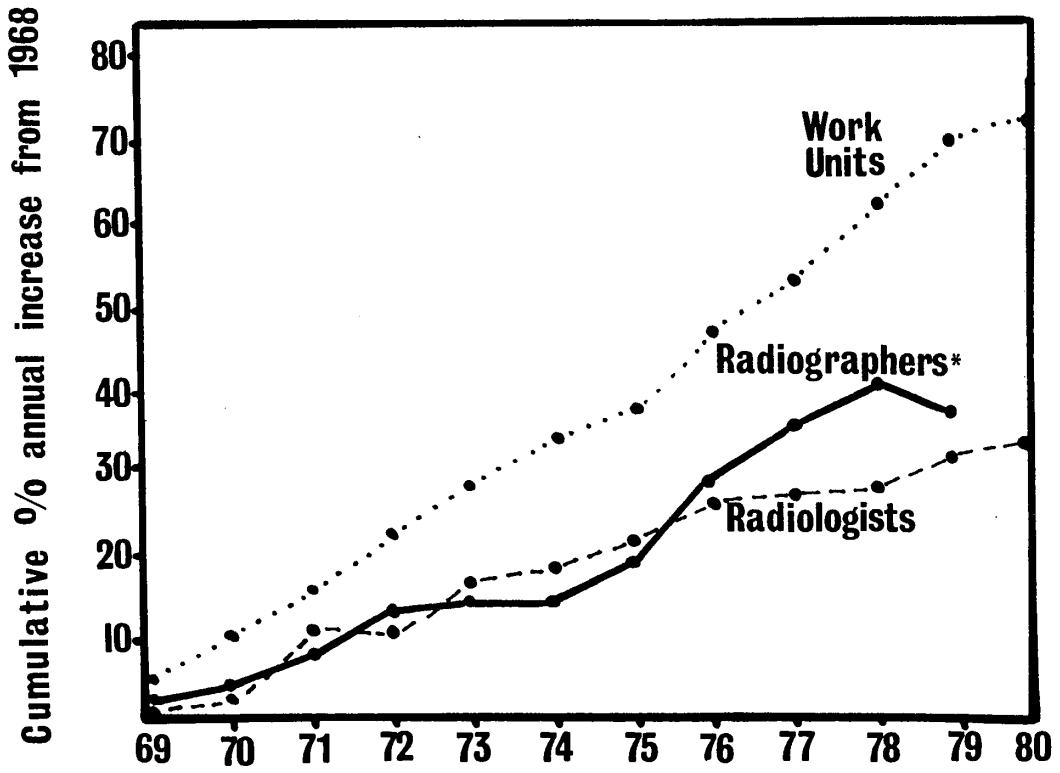
Dr. Wrighton said that it had been apparent for some time that Radiology was a specialty with a shortage of both consultant and training posts. Bearing this in mind the DHSS had allocated 45 additional consultant posts in the current year and it was hoped that health authorities would take up a reasonable proportion of this number. It was also recognised by the DHSS that training posts needed to be increased to meet the demand for staff resulting from the expansion of consultant posts.

The decrease in the number of radiographers in 1979 was noted with concern. Figures for subsequent years were not yet available to determine whether the decrease was a continuing trend.

Finally, Dr. Wrighton drew attention to the cumulative percentage annual increase of radiographic work units compared with radiography and radiology manpower (Figure 10).

Figure 10

RADIOGRAPHIC WORK UNITS SHOWN AGAINST RADIOGRAPHY & RADIOLOGY MANPOWER



(* 1980 figure for Radiographers not available)

DISCUSSION

The following points are a summary of the discussion that took place during and following Dr. Wrighton's presentation:-

1. It was suggested that the increased use of camera film could have contributed to the drop in radiographic film consumption in recent years.

2. In answer to the suggestion that there seemed to be no correlation in some years between workload and film use, Dr. Wrighton commented that the accuracy of film usage figures was likely to be greater than the workload information.

3. One of the Consultant Radiologists present wondered how many departments would have made a conscious effort to reduce the number of examinations during the period of increased prices for silver. He suggested that as most departments now had their own budgets it was quite likely that Radiologists would be scrutinising the costs.

4. It was suggested that ultrasound and small camera work would have affected the workload statistics. Dr. Wrighton agreed but explained that the DHSS had no means of obtaining statistics about such activity.

5. In answer to a question, Dr. Wrighton believed there were approximately 106 vacant consultant posts at present. It was suggested by a number of participants that there was little point in authorising more consultant posts unless additional training posts were approved.

   Attention was drawn to a problem which had become a common experience, whereby funds for additional appointments, which had manpower approval, could not be found from District budgets. It did not help radiologists, in need of additional staff, to know that the DHSS were encouraging Authorities to appoint more consultants, but would not be providing the additional funds required.

6. Brief reference was made to the Short Report on medical education which had recommended an increased number of consultants. It was felt likely that the majority of additional posts would be created in Medicine and Surgery to absorb the existing surplus of Registrars in these specialties.

Concern was expressed that specialties such as Radiology would as a result suffer because of the lack of potential candidates for additional consultant posts. It was generally agreed that the single most urgent need was for more money to be injected into radiological training posts.

7. Considerable criticism was levelled at the DHSS for making recommendations without providing additional funds. Professor Buller, with particular reference to the Short Report, pointed out that if the DHSS officials advised the Secretary of State to support recommendations they were attempting to provide him with the means to argue the case in Cabinet for an increase in the DHSS' budget.

Dr. Wickings suggested that at District level it would often be the practical difficulties of office accommodation, secretarial assistance, etc. and associated costs, that proved to be the problem rather than the marginal costs of the difference between consultants' salaries and the present Registrar posts they would replace.

8. Following Dr. Wrighton's comment about the decreasing number of radiographers, Dr. Wickings pointed out that a drop of nearly one-third in the number of school leavers had been forecast over the next decade. This would reduce the potential staff available for the Health Service as a whole and presumably exacerbate the manpower problem in the radiography service.

THE KING'S LYNN EXPERIENCE

1. Introduction

Dr. Michael Brindle, Consultant Radiologist, King's Lynn Health District, explained that he had spoken twice before on the King's Lynn experience. In Cambridge he had met with the response that whilst the system might work in King's Lynn it would not do so elsewhere. When speaking at Northwick Park Hospital the system had been criticised as "sophisticated", i.e. unnecessarily complicated! On this occasion, therefore, he intended to describe the methods of working developed in King's Lynn, but make no claim as to whether they would be of value in any other Radiodiagnostic Department.

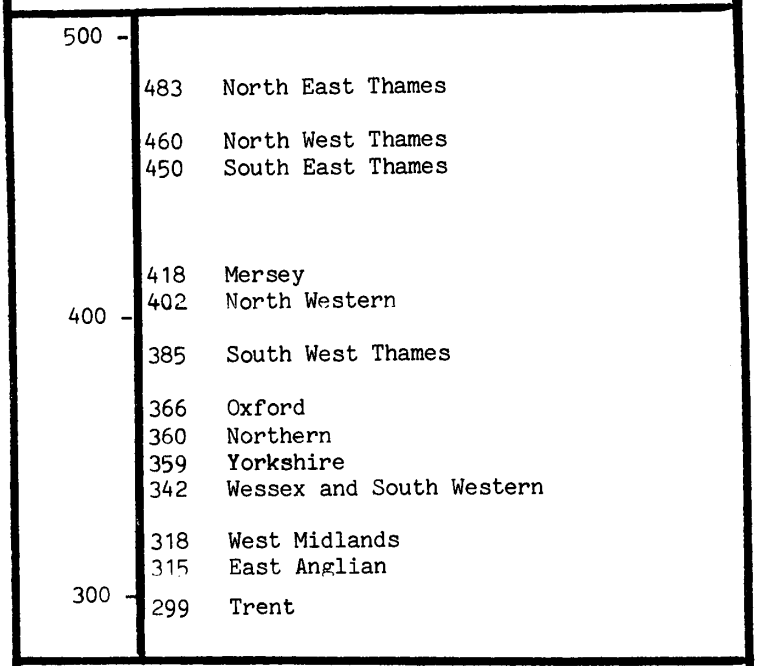
To set the scene Dr. Brindle briefly described King's Lynn Health District which comprised two sectors: one small sector based in the West at Wisbech and the other at King's Lynn. Each had one Consultant Radiologist until Dr. Brindle was appointed as the second Consultant in the King's Lynn sector. This difference in consultant staffing influenced the subsequent development of the Radiology services. The District General Hospital, situated in King's Lynn, opened two years ago.

As could be seen from Figure 1, in 1977 East Anglia was almost bottom of the Regional League Table, showing the number of radiological examinations per 1000 population.

Figure 1

RADIOLOGY IN ENGLAND (1977)

Examinations per 1000 population



Source: Darby, Kendall, Rae, Health Trends 1981

2. Increase in Demand

Dr. Brindle said that when the demand on the X-ray service started to increase it was decided to ask for another Consultant Radiologist. This request was refused. Guidelines for requesting X-rays were then drawn to the clinicians' attention, but the results were disappointing. A reduction in demand would last for between 2 - 4 weeks and then requests returned to their previous level. It was decided that more radical action was required to control the level of work.

3. Planning Demand and Capacity

There were two ways of relating increasing demand to the capacity of the Radiodiagnostic Department concerned.

Method A (i) Increased demand is met by
(ii) Enlarging the available facilities, which
(iii) Generates increased activity, and thus results in
(iv) Increased demand

This was clearly a vicious circle and Dr. Brindle suggested that a more profitable method would be as follows:-

Method B (i) Increased demand is met by
(ii) A consideration of the relative merits of competing demands so that
(iii) Requests are approved or Requests are denied.

This second method necessitates such bodies as the District Medical Committee and Health Authority considering the needs of the community as a whole and deciding whether, for example, more money should be allocated to the Geriatric services or used to fund additional radiology.

If requests for additional funds for radiology are denied there is obviously a need to reduce demand. Dr. Brindle suggested this could be achieved by either a) Education or b) Coercion.

He emphasised that "need" was a relative term and that it should not be regarded as the same as "demand".

Having accepted that there were insufficient funds to meet all the demands it was necessary for clinicians to make judgements so that the money available could be used in such a way as to provide the best value to society as a whole. Dr. Brindle pointed out, however, that "the best value to society does not always allow the best care for the individual". He recognised that this placed clinicians in a dilemma but nevertheless believed it essential that value judgements were made. The value of each radiological examination had to be determined and it was suggested that:-

$$\text{the value of an examination} = \frac{\text{the potential benefit less the potential harm}}{\text{divided by the cost}}$$

Reference was made to the work being undertaken by Dr. Gerald de Lacey which was regarded as being of crucial importance in this context.

4. Guidelines for medical staff

At King's Lynn the education of junior medical staff was deemed to be a step in the right direction in trying to diminish demand. Written guidelines had been prepared by the Radiologists in liaison with their clinical colleagues and circulated to junior medical staff. Examples can be seen in Figure 2. These clearly identified the circumstances in which certain examinations should or need not be requested.

Figure 2:

GUIDELINES FOR JUNIOR MEDICAL STAFF AT KING'S LYNN

1. Pre-op CXR not under 40 unless major surgery or specific indication.

2. Emergency AXR only for:
   a) ? perf. but unsure clinically
   b) ? Obstruction
   c) biliary or renal colic
   d) Registrar advises.

3. Head injuries: X-ray advised if slightest suspicion of loss of consciousness; a laceration which cannot be explored adequately, or clinical suspicion of depressed fracture.

4. Urography not done routinely for:
   a) hypertension
   b) prostatism without infection or blood.

The need to think carefully before referring a patient to the Radiology Department was also stressed to each new junior doctor on appointment. It was impressed upon them that

1. IF IT DOESN'T MATTER, DON'T DO IT.

2. IF YOU DON'T KNOW, ASK

5. Controlling Workloads: the King's Lynn Experiment

Dr. Brindle reminded the participants that Professor Roberts (Cardiff) described three ways of controlling access to any clinical service:-

a) by money
b) by eligibility
c) by waiting lists

He pointed out that clinicians had, for a long time, responded to the constraints of bed numbers, outpatient sessions, staff numbers, etc., by using waiting lists. Patients in urgent need of care were seen as quickly as possible. The residual capacity of the clinical service concerned could then be utilised by the remaining patients being seen on an appointment basis.

It was decided to adopt a similar policy in the Radiology Department at King's Lynn where the capacity of the department was determined by the number of radiology sessions available.

Steps were therefore taken to:

a) Estimate a "reasonable capacity"
b) Examine all priority patients without delay
c) Allocate the remaining capacity as appointments.

A detailed summary of the action required to implement such a system can be seen in Figure 3.

Figure 3

CONTROL OF RADIOLOGICAL WORKLOAD

KING'S LYNN - 1980

1. Each week add: Casualty examinations
   Inpatient examinations
   Urgent Outpatient examinations
   Urgent GP patient examinations
   and subtract: Routine Obstetric Sonar examinations
   Category II and private examinations
2. Subtract this sum from "Capacity"
3. Allocate residue between:
   Non-urgent Outpatient appointments
   GP patient appointments

(assumption: 1.25 examinations per attendance/appointment)

It was noted that the time taken to notify patients by letter did result in a lag between the exhibited demand and consequent appointment level.

Dr. Brindle referred to the number of urgent and non-urgent examinations performed in 1979 (see Figure 4). This illustrated the way in which the use of target figures, based on the department's capacity, had influenced the number of examinations performed from month to month.

Figure 4

DIAGNOSTIC IMAGING: KING'S LYNN 1979

EXAMINATIONS/MONTH (EX. OBST. SONAR)

Month	Urgent	Non-Urgent
January	1901	815
February	1650	750
March	1827	972
April	1936	747
May	1907	823
June	1937	786
July	2026	821
August	1926	723
September	1918	723
October	2301	834
November	2051	752
December	1693	663
Average	1922	784
Target Figure	2000	500

6. Retrieval and Circulation of Information

Dr. Brindle explained that having introduced such a system it was important to publish and distribute throughout the District a regular bulletin which analysed the work generated by the various groups of patients referred and by the doctor referring the patient.

In 1976 a dedicated desk-top computer was installed in the Radiology Department. Since that time an on-line computer had been installed in the hospital with terminals located in the Radiology Department, and information concerning the Department's activity is

thus readily available. An extract from the summary which is circulated each month can be seen in Figure 5.

Figure 5

DIAGNOSTIC IMAGING: KING'S LYNN JANUARY 1982

Section 1: Summary of Examinations

	A+E	IP	OPU	OPA	GPU	GPA	Total
Allocation	750	870	400	620	40	420	3,100
August	782	872	352	437	38	367	2,848
September	1138	1259	478	616	57	541	4,089
October	977	1212	653	579	66	482	3,969
November	878	1201	403	587	58	424	3,601
December	700	1207	447	547	55	530	3,736
January	813	1244	515	642	52	485	3,751

The availability of such data enables steps to be taken immediately an increase in demand has been identified. For example there had been a sudden increase in referrals from the A + E Department in September following the appointment of new junior doctors. The return to a reasonable level of demand reflected the efforts made by the Consultant in charge of the A + E Department to convey the principles of referring patients for X-ray to his junior staff.

7. The new D.G.H.

Dr. Brindle explained that with the opening of the new D.G.H. all major surgery was now undertaken at the new hospital and this had reduced the workload at Wisbech. Bearing in mind that the waiting time for appointments is related to the number of radiologists available, the District Management Team persuaded the Radiologists to spend more time in the King's Lynn sector. As a result the target figures have been increased and more work has been undertaken.

The new D.G.H. has recently been under pressure to improve its bed occupancy rate and in the past year has considerably increased its throughput which has contributed to the increase in activity of the Radiology Department. However, on examination the figures show that whilst there has been a 25% increase in inpatient imaging examinations,

there has only been 12½% increase in bed occupancy.

Dr. Brindle pointed out that the capacity of the Radiology Service has implications for other departments. For example the unacceptably long waiting list in Orthopaedics could be resolved by the appointment of an additional Orthopaedic Surgeon provided that there was a corresponding increase in the capacity for radiology services. As a result the DMT have had to delay its request for the additional orthopaedic consultant until both consultants can be funded.

8. Conclusion

Dr. Brindle said that he was not convinced that the service required more radiology. He maintained that regardless of their position on the League Table (see Figure 1), the patients of King's Lynn received good value at the present level of radiological activity. The systems adopted, whereby the use of guidelines had been combined with controlling access to the Department, were proving acceptable and encouraged medical staff to appreciate the fact that:

> "Every relatively unnecessary examination
> is one less available to your other patients or
> to the patients of your colleagues."

Dr. Brindle said that it was open to question as to how much, and how reliable, information had to be before a judgement could be made regarding the relative value of an imaging examination.However, his own views were best summarised by the following quotation:

> "It is the mark of the educated man and a proof
> of his culture that in every subject he looks
> for only so much precision as its nature permits
> and its solution requires."
>
> Aristotle, circa 330 BC

DISCUSSION

The main points arising during the discussion that followed Dr. Brindle's presentation are summarised below:-

1. Dr. Brindle confirmed that the acceptable levels of radiological activity had been agreed with the clinicians. There had been an initial lack of interest when he had first approached his colleagues, but the response became more enthusiastic when he had explained the proposals in detail and the ways in which it was intended to use the capacity

available. The monthly bulletin of information was circulated to the Consultant and GP members on the DMT; the District Medical Committee ; to each of the department's major users; his radiological colleagues, and displayed on the junior doctors' notice board.

2. Dr. Kreel suggested that the points he wished to raise probably reflected a difference in philosophy between himself and Dr. Brindle.

Firstly, he took issue with the guidelines being used in relation to Urography. Whilst accepting that most pyelograms on the prostate were of little value, he suggested that a medico-surgical problem remained. He pointed out that 15 - 20% prostatectomies did not relieve symptoms which meant that this percentage of patients were undergoing unnecessary operations. It might be suggested that this group of patients could be distinguished by the use of pressure flow studies and he wondered whether Dr. Brindle was recommending that this examination should be substituted for pyelograms. If so, had this happened in King's Lynn?

Dr. Brindle replied that it had not, but he reminded the participants that the guidelines had been prepared in association with the clinicians. He would certainly amend the guidelines if it could be demonstrated that bad practices were being advocated. However, he emphasised that clinicians were obliged to make choices and to judge the value of a particular examination in a specific context.

Dr. Kreel referred to a film distributed by the Medical Defence Union which illustrated medico-legal reasons which contributed to the demand on radiological services. It included references to the death of a patient following head injury and the criticism of the Coroner concerning the failure to perform a skull X-ray. The second case referred to a fractured tibia and fibula in which the Casualty Officer had missed a fractured neck of the femur. He wondered how many cases with medico-legal implications throughout the country balanced the cost of additional X-rays which were performed at the request of junior staff to prevent such situations occurring.

Dr. Kreel said he did not disassociate his own activities from the rest of the hospital. Junior staff working in Accident + Emergency Departments frequently found themselves with no cover at night and no consultant in charge of the department. He did not think it appropriate

that they should be placed under additional pressure by having to think very hard before an X-ray was requested.

Dr. Brindle said that he thought he agreed with most of Dr. Kreel's comments. However, he wondered just how much any radiologist could be expected to do in the time available.

Dr. de Lacey referred to Dr. Kreel's criticism regarding the assessment of prostatism. He asked whether Dr. Kreel had abolished IVPs and undertook pressure flow studies. Dr. Kreel said he required £20,000 for the relevant equipment before he could, having consulted with his colleagues, adopt such a policy.

Dr. de Lacey suggested that these discussions illustrated the need for information to be obtained about the value of radiological examinations. He believed that considerable misinformation currently existed and the work being undertaken at Northwick Park was trying to establish hard data.

3. A Consultant Radiologist suggested that each Radiologist needed to ask himself two quite different questions:

   (i) Are you satisfied with your allocation?
   Few consultants would be and it was their clear responsibility to seek additional funds.

   (ii) How do you conduct yourself when the amount of money is fixed?
   He believed that many doctors started behaving in a political sense when, in relation to the second question, they should be managing their department.

4. Following several comments, regarding the need for additional radiological time, Dr. Brindle confirmed that he and his colleagues continued to ask for more resources.

5. Dr. Eban suggested that insufficient use was made of radiographer expertise to help cope with the additional demand, particularly from the A + E Department. In his hospital the requests from A + E accounted for 35% of the total demand. He encouraged his radiographers to undertake what he described as "informal reporting" on referrals from Casualty whereby, having looked at the films, they indicated those X-rays they considered to show an abnormality.

In addition, they were trained to query the Casualty Officer's requests if they considered them to be unnecessary or unreasonable. If the Radiographer's advice was questioned, the matter was referred to the Radiologist if this proved necessary.

His own experience demonstrated that where radiographers were trained to take on such responsibility, they did so readily and thus increased the capacity of the department.

Mr Weston, District Superintendent Radiographer, said that he did not think Dr. Eban's colleagues in general would agree with his views about "informal reporting".

6. During the discussion on the value of radiology examinations, Dr. Starer reported on an interesting experiment he had undertaken at the Westminster Hospital. He had decided to stop performing pre-operative chest X-rays on patients under the age of 55. No-one had noticed! He suggested this clearly demonstrated how little the result of such X-rays contributed to patient management.

   He went on to describe a sudden increase in demand currently being experienced in his department concerning scanning. Until the end of 1980 patients had to be referred to BUPA to have scans performed and it was, therefore, necessary to contain costs. Approximately 200 - 250 scans were performed per annum. At the end of 1980 the department obtained its own body scanner and during the first year 1200 scans were performed. The pressure from his clinical colleagues to undertake even more scans had become a considerable problem.

7. Dr. Brindle said as far as he was aware his methods had not been introduced elsewhere. Dr. Laws found this surprising as clinicians operated a waiting list system which was quite acceptable, and its adoption had not prevented Dr. Brindle continuing to seek additional staff. It was noted, however, that the day's discussion had illustrated the different types of problems experienced by different radiology departments. The participants concluded that each department needed to undertake its own analysis of the resources available, and demand presented, to determine the most appropriate solution to its problems.

8. Finally, Dr. Brindle said that he did not believe the introduction of restraints had led to a deterioration in the standard of service provided to patients. It had, however, forced clinicians to regard radiology as a limited resource and thus to use it in a more careful, and possibly more efficient, manner.

COMPUTERISED MONITORING OF DEMAND

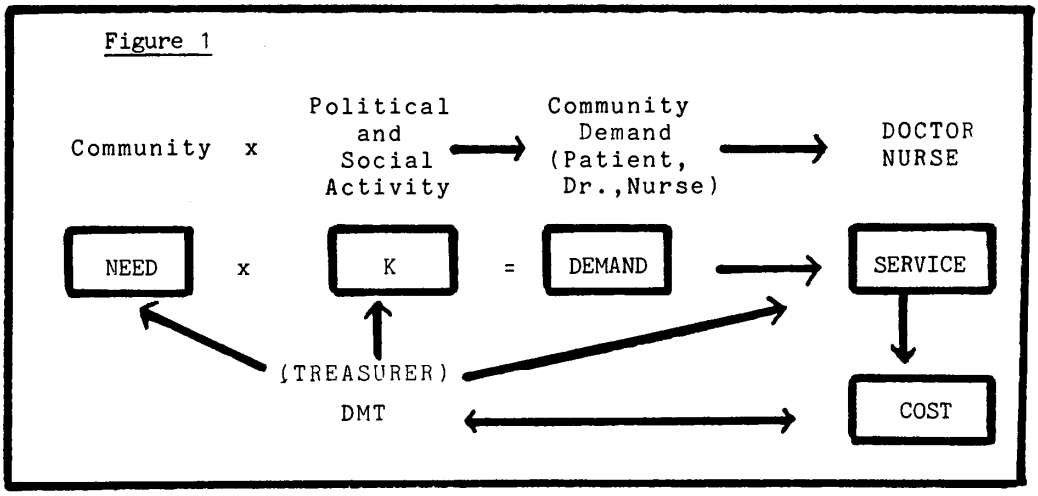
1. Introduction

Dr. Geoffrey Hartley, Consultant Radiologist, Withington Hospital, explained that he was not an expert in computing, but had been closely involved with the introduction of a computer in the Radiodiagnostic Department. He believed that considerable emotion and exaggeration surrounded the debate about demand in the Health Service and that much misinformation existed. He had, therefore, welcomed the opportunity of cooperating with the administration to try to extract more positive information about the service.

2. The Nature of Demand

It was suggested that it would be useful to look more closely at the nature of demand and how it was generated with the use of the following diagram:

Figure 1



The provision of health care was almost entirely a demand service and this was particularly true for radiology. However, the demand for radiology originated predominantly from the doctor, whereas with clinical services it was patient demand. It was therefore more likely that control could be established in the use of a support service, such as radiology, than in the clinical service. Apart from these differences, the effect, particularly in economic terms, was much the same and some form of monitoring of demand was necessary in order to plan the most efficient use of resources.

3. A budget for the Professor of Surgery

The District's Treasurer shared the view that monitoring was required and it had therefore been decided to undertake an experiment in cooperation with the Professor of Surgery in which he agreed to accept a budget. Over a period of three months his use of the radiology service was monitored. This exercise had been an extremely laborious task for the administrative staff as it had to be undertaken manually from the day book and request cards. The Treasurer, meanwhile, organised similar studies in other departments, including pathology, and was able to calculate a realistic budget for the Professor of Surgery. The experiment had proved most successful. The Professor had now held a budget for three years. He had become very much aware both of the true cost of his demands, and of the real clinical value of the various examinations, since this type of audit had promoted discussion between clinicians and radiologists and generally produced a better service.

4. Installation of an "Apple"

This initial exercise, which had illuminated many aspects of clinical practice, some of which were found unnecessary and costly, suggested that it would be worthwhile extending it to other users of the radiology service. It was, however, clearly impossible for this to be undertaken on a manual basis. The opportunity arose to instal a micro-computer - the Apple system - which produced a day book in the form of a printed copy. The hardware, which takes up very little space, had been accommodated in the Radiology Department's reception area and was installed with the minimum of inconvenience. Considerable help had been given by Mr. Ray Burdge, Senior Physicist, when the system was introduced and it was pointed out that the initial problems might have been more difficult without expert assistance readily to hand.

Not all members of staff could use the computer but those who really need access have very readily learned how to use the keyboard. It was noted that the old day book did have the advantage that everyone could use it, but the extraction of information was an onerous task, whereas the micro-computer enabled up-to-date analyses to be prepared whenever required. The Apple system had now been running for ten months with approximately 3,500 patients per month. A description of the functions performed by the system; the analyses that can be obtained together with brief technical details, are summarised in Figure 2.

Figure 2

The Apple System

Functions

1. Produces a day book in the form of printed copy.
2. Calculates 'work units' for up to 16 examinations per patient entry, from a table of 150 possible examinations.
3. Work units are accumulated against Department (possible 32 departments) and against Consultant (possible 70 consultants) on a monthly and yearly basis with running totals available at any time. Break down into:
   a) units, exams, mobile exam, uncooperatives (Departments) or,
   b) units, exams, units or exams "on-call" (Consultants).
4. Monthly or yearly totals of up to 30 types of examination or grouped types of examination (e.g. Ba meal + Ba meal follow through + Ba swallow).

Technical Details

The system is implemented in Applesoft Basic under DOS 3.3 on a Apple II computer 48K memory + 2 Disk II drives and Hitachi monitor, Microline 80 printer + Parallel Interface card.

One disk drive runs the program disk and holds the monthly files, the other disk holds the "day book" entry for about 1000 patients and can be exchanged when full at any time.

The cost = approximately £2100.

The system does not produce a patient index, index patient records or details about film storage. It does, however, provide information for presentation to both radiologists and users of the radiology department to enable certain questions to be answered concerning the demands being met. Examples of the analyses can be seen in Figures 3 and 4.

24.2.82

X - RAY NUMBER	PATIENT NAME	REGION X - RAYED	UNITS	DEPT.	CONS.
2312	BROWN FRED	SKULL	6	CAS	DHAR
2313	WHITE ETHEL	CHEST	6	OOP	JMBR
2314	LITTLE DON	BA MEAL & FOLLOW THROUGH	20	GP	
2315	WHITTAKER CHRIS	SPINE - LUMBAR	10	CAS	DRTA
2316	GRAHAM BRIAN	CHEST	6	GP	
2317	BARTLETT PETER	L/R/HAND	12	A1	NROG
2318	LOCKLEY JOAN	SKULL: UNCOOPS	10	CAS:OC	DHAR
2319	ANDREWS DENNIS	CHEST: PORTABLE	36	ITU	MBRY
2320	SUZANNE SHEILA	CHEST	6	MOP	SJLO
2321	LINE HOWARD	CHEST	6	GP	
2322	IDES WILLIAM	CHEST: BA MEAL & SWALLOW	19	A2	SJLO
2323	JAMES COLETTE	CHEST: PORTABLE	36	B2	DMWE
2324	HAMILTON STEVEN	SPINE-THORACIC	10	A1	NROG

Figure 3 - Extract from printout

Ref. No.	Dept Name	Units	Exams	Units		Units	
1.	Geriatric I/P	M. 1290	81	MOB.M	90	UNC.M	72
		Y. 2719	169	MOB.Y	420	UNC.Y	168
2.	Surgery	M. 18030	674	MOB.M	5490	UNC.M	88
		Y. 41925	1392	MOB.Y	13590	UNC.Y	116
3.	Medical	M. 6604	277	MOB.M	960	UNC.M	32
		Y. 12402	566	MOB.Y	1710	UNC.Y	44
4.	Outpatient	M. 14624	490	MOB.M	0	UNC.M	12
		Y. 12402	958	MOB.Y	0	UNC.Y	12

(key: MOB = Mobile X-rays
UNC = Uncooperative patients)

Figure 4 - Extract from printout

A further printout gave details of the monthly and yearly totals for each consultant, separately identifying the number of cases referred, the number referred "on-call" in units and the actual number of "on-call" cases.

5. Detailed Analysis of Data

Withington Hospital was fortunate in having a Nova computer. This had enabled them, by putting the information from the floppy disks into the Nova, to amplify the analysis of the material produced by the Apple computer. Examples can be seen in Figure 5 and 6.

It was noted that for hospitals which did not have a Nova, this detailed information could be provided by the purchase of a further Apple, using a hard disk.

Figure 5 Extract from printout produced by Nova

X-RAY DATA FOR MONTH JANUARY
DIVISION: OBS. & GYNAE

Type of Exam	Units	No. of Exam	No. of On-Call	Total Units
ABDO	8	4	0	32
BA ENEMA	20	5	0	100
CHEST	6	17	2	102
HAND	6	1	0	6
ZZZ				
SALP	20	16	0	320
ZZZ				
THEATRE	90	8	0	720
VIDEO CYSTO-URETHROGRAPHY	60	17	0	1020
TOTAL		187	4	3250

Figure 6 Extract from printout produced by Nova

CONSULTANT: MR X DIVISION: OBS & GYNAE

Type of Exam	Units	No. of Exam	No. of On-call	Total Units	
ABDO	8	1	0	8	25%
BA ENEMA	20	3	0	60	60%
CHEST	6	7	0	42	41.18%
IVP	60	4	0	240	50%

6. Monitoring Demand

Referring back to Figure 1, Dr. Hartley stated that "Need, multiplied by the constant "K" equals the demand which gives rise to the service, which gives rise to the cost."

Whilst it might not be relevant for the seminar to discuss the "need", clinicians were always seeking to satisfy this originator and much of the controversy centred around the value of "K". A radiologist might regard "K" as being a factor greater than 10 in some circumstances, producing an excessive demand on his department and thereby producing unnecessary service and cost. Alternatively if looked at from another point of view, "K" might well be a factor less than one and the demand was in fact less than the need so that the department was not providing the service really required.

However, returning to the question of monitoring demand, the increase in the Withington Hospital Radiology Department was illustrated by the graph in Figure 7. Attention was drawn to the pattern, which it was suggested was a feature of the development of a University Hospital whereby when opened in 1970 the demand was rather steep, but it had levelled off in recent years.

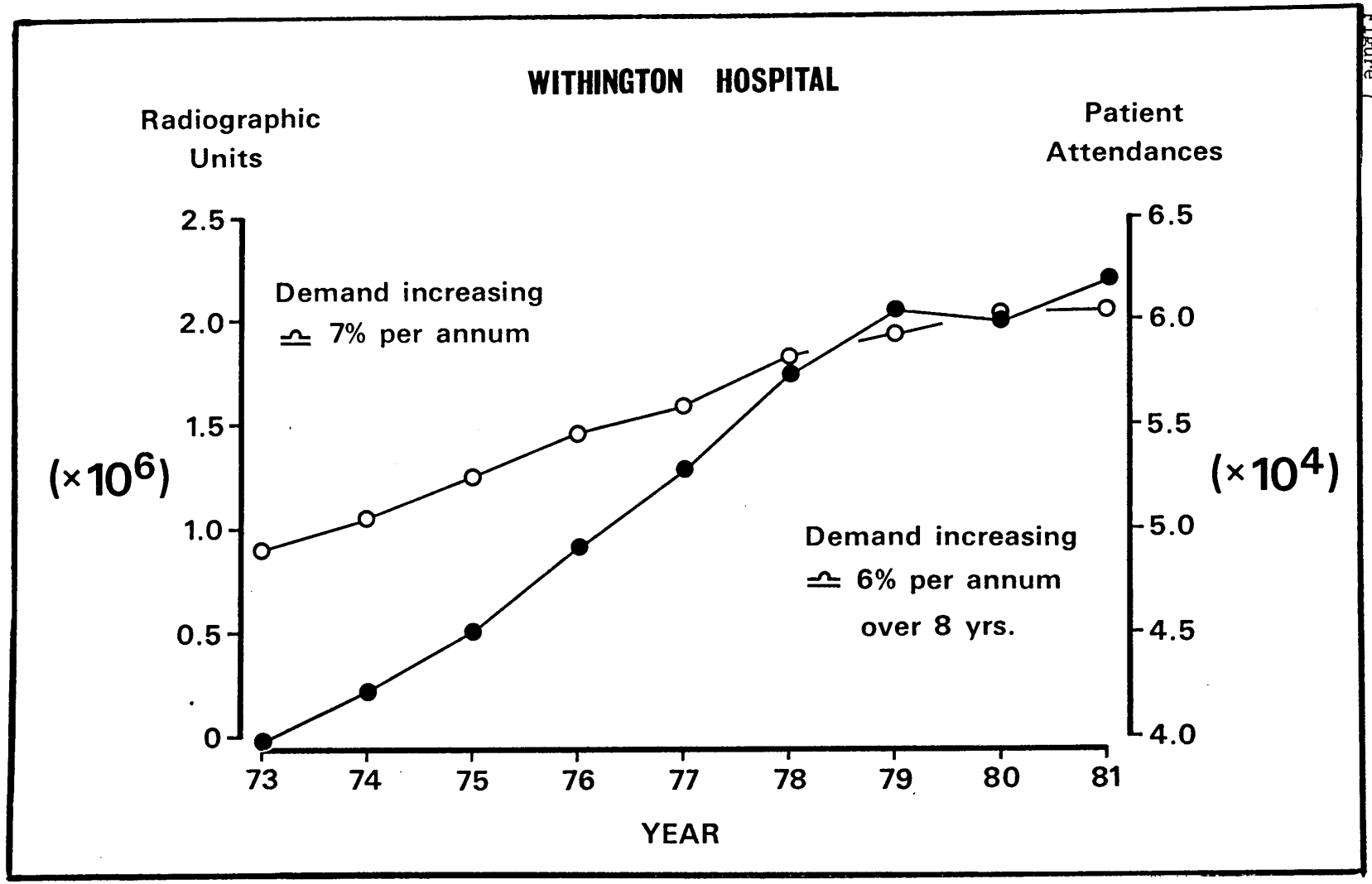

WITHINGTON HOSPITAL
Radiographic Units
Patient Attendances
2.5
2.0
1.5
1.0
0.5
0
(×10⁶)
6.5
6.0
5.5
5.0
4.5
4.0
(×10⁴)
Demand increasing
≏ 7% per annum
Demand increasing
≏ 6% per annum
over 8 yrs.
73
74
75
76
77
78
79
80
81
YEAR

Figure 7

The data analysis produced by the Nova (Figures 5 and 6) enabled the Radiologist to scan quickly the type of investigation that constitutes the demands placed on his department. For example, it could be noted from the monthly analysis for the Division of Obstetrics and Gynaecology that theatre work and video cysto-urethrography comprised more than 50% of the unit value of the total service provided. Bearing in mind the costly nature of this type of work, questions were prompted concerning the need to continue the service in both areas. These had formed the basis of discussions with clinical colleagues. It could be argued that the video cystography was of limited value, but following discussions it had become clear that the clinicians relied considerably on the results of this examination.

Such discussions encouraged a greater understanding of each other's work and the value placed on particular types of investigation. Even where the radiologists' views were not accepted by clinicians, the debate could lead to research to establish the true value of examinations, relate them to clinical practice, and where appropriate, to modify that practice.

However, it was necessary to interpret the information carefully. The DHSS unit values had always been suspect. The Radiologists at Withington Hospital had found them to be erroneous and to bear little relationship to the cost of undertaking particular examinations. For example, a costing exercise carried out on Salpingography would be based on the DHSS unit values as follows:-

Salpingogram	in X-ray Dept	= 20 units
Salpingogram	in Theatre	= 90 units

It would appear, from the X-ray Department's budget point of view, that it would be very much costlier to perform a simple hysterosalpingogram in the theatre than to do so in the X-ray Department. However, this was difficult to accept, since the surgeon in Theatre was able to inject a small amount of contrast and observe it on the image intensifier without recourse to the X-ray Department.

7. Conclusion

The basic departmental data produced by the Apple had thus rendered it possible to provide an easy and constructive method of clinical audit. The printouts were simple to produce and could be despatched to the

appropriate consultant for discussion with his colleagues and the radiologist, and where appropriate, a suitable policy implemented.

Many consultants now accepted the value of clinical audit as a method for improving the quality of service provided. However, this type of information was highly sensitive and should not be circulated, for example, on a committee agenda, until it had been fully discussed with the consultant, his colleagues and the radiologist. Failure to do so was likely to give rise to misunderstanding and ill-feeling.

The value of the mini computer could be summarised as follows:-

(1) It enabled the quick and accurate production of basic departmental statistics

(2) It facilitated sensible clinical audit

(3) It provided these services cheaply

Dr. Hartley concluded by saying there was a great opportunity to use initiative, energy and imagination to investigate the further possibilities of still undiscovered potentialities in the interpretation of simple records. It was necessary to learn how to abstract every shred of evidence and information from the greatest number of records with the least amount of effort, and he was sure the computer would enable this to be achieved.

DISCUSSION

1. In answer to a question, Dr. Hartley explained that the Professor of Surgery was being constrained in relation to the amount of practice he could undertake. He found that, by looking at his budget and carefully assessing the real value of his practice to the patients, he was able to reduce his demands on both X-ray and pathology and liberate funds for other use.

   The following example was quoted to illustrate how demands on the X-ray service had been reduced. Regular clinical/radiological meetings were held with the Unit concerned. The treatment and management of breast cancer had been reviewed and it was found that the Unit had been following a rather ponderous protocol. On examination of the clinical information it was considered that much of the routine radiology was not contributing significantly to the care of these patients. The

physical symptoms, such as low back pain, were a more important factor in determining their management. Following this review, and with the agreement of the surgeon concerned, it was decided to reduce the amount of radiological examinations required for such patients. The savings achieved were used to fund extra services.

2. Brief discussion took place concerning the difficulties which existed with any budgeting system about whether savings should be used by the department achieving economies or redeployed to other services.

3. Dr. Hartley agreed that there was certainly a personality factor that contributed to the ease with which one could persuade colleagues to think about their practice. However, the computerised information gave him the basis upon which to initiate discussion and to answer criticisms.

COSTING CONTROL : AN APPROACH USED IN BRISTOL

1. Introduction

Dr. John Roylance, Consultant Radiologist, Bristol Royal Infirmary, suggested that there were two separate problems relating to cost control: one practical and one philosophical. These were compounded by the fact that each department had its own particular problems. He intended, for the purposes of the seminar, to concentrate on the philosophical aspects of the approach used in Bristol but wished to acknowledge the considerable support he had received from the Administration, Treasurer and Supplies Department with the practical difficulties of implementing a cost control system.

As a centre of excellence the Bristol Royal Infirmary had experienced continued innovatory growth but this had taken place in a District which now found itself, as a result of RAWP, in a no-growth situation. The only budget thought to be uncontrollable was medical expenditure. It was noted that small items of medical and surgical equipment currently accounted for 12% of the District's total budget and for 46% of the non-pay budget. Dr. Roylance explained that he would not be talking about large items of equipment because these could not be obtained without the appropriate authority. He had been more concerned to introduce controls on the purchase of minor items which required no prior approval. These might appear trivial but the cost accumulated into a significant sum.

2. Cost Control by Committee

In an initial attempt to control costs a Medical Expenditure Committee had been established which included representatives of all the Cogwheel Divisions. This went through, as described by Dr. Roylance, the well recognised three stages of all committees:

(i) When new and in its "paediatric" phase the Committee explored options: it was an educational phase when the members established for the first time what resources the hospital was using and their cost.

(ii) In its second and "mature" phase, the Committee controlled expenditure by standardisation. This in effect interfered with clinical freedom by standardisation, for example, on the cheapest satisfactory needle available. However, the scheme achieved substantial savings. Concurrently, a rolling programme for major equipment was developed which now amounts to £200,000 per annum.

(iii) As the Committee moved into its final and "geriatric" stage, Dr. Roylance became its Chairman. The budget for which the Committee was responsible covered three main areas of expenditure:

(a) One third was spent on drugs over which there was not and as far as Dr. Roylance could see, never would be any budgetary control. A drug users committee had, however, been set up to make recommendations on drug usage.

(b) One third was allocated to identifiable departments, such as Radiology. Attempts were made to control this aspect of spending but they usually met with the argument that the budget was not overspent but underfunded.

(c) One third was spent in wards, theatre, and outpatient departments on consumables and disposables and this area of expenditure had largely been ignored.

Dr. Roylance pointed out that from a budget totalling £5,500,000 all the effort of the Committee became directed towards the £211,000 expenditure on major equipment and a small clinical teachers' fund.

3. Cost Control by 'Authorised Officers'

On being appointed Chairman of the Medical Committee and a DMT member, it became apparent to Dr. Roylance that the only way medical expenditure was being controlled was by the use of non-specific remedies. For example, temporary ward closures usually combined with upgrading certainly restricted expenditure. However, the experience gained during a strike by the Area Stores Department

had illustrated that it was possible to constrain consumption within the availability of resources.

Prior to this event there had been no restriction of the generation of requisitions. It was decided to nominate a limited number of Officers to authorise requisitions using suitably designed numbered rubber stamps. The Supplies Department were given responsibility for refusing to process any requisitions which did not have such authorisation. The introduction of this control enabled the District to identify the staff initiating the orders and where the resources were being used. Budgets could thus be prepared and held by those responsible for the ordering. Dr. Roylance explained that it also created a potential sanction for the first time: if an authorised officer overspent, the rubber stamp could be withdrawn!

4. Budgetary Control

Dr. Roylance said that the budgets were summated for a year as accurately as possible and it was suggested that a budget should be allocated on a continuation basis to each Division and department calculated from the information on usage. He had spent considerable time talking to the Divisions during which he had heard many arguments against budgeting. He had remained convinced, however, that it was appropriate for clinicians to be made responsible for the expenditure they incurred. His own arguments were based on the realisation that:

(i) The District had a fixed total budget which was founded on a continuation basis. There was no 'free' money.

(ii) The public did not want to spend more of its money on health services - the pressure for increasing demands originated with the doctors and not the public. For example, no-one in the community initiated the demand for a C.T. Scanner.

(iii) Doctors needed to remind themselves that they should be providing the best service possible within the resources available. They should not simply indicate the level of service they would like to provide and insist that it was someone else's responsibility to find the money.

Dr. Roylance believed consultants should control their own spending because clearly someone had to, and it was his impression that an increasing number of people seemed only too pleased to take on the role of controlling doctors. He believed that whoever held the budget held the power. It was essential for doctors to retain power, but power implied responsibility.

Having introduced the budgeting system, it was important to distribute accurate information on expenditure as quickly as possible. The Regional Computer provided statements two weeks after the end of the month concerned. Dr. Roylance said that information provided in this way should be analagous to a domestic bank statement. He had encouraged all staff authorised to approve requisitions to familiarise themselves with the cost of the articles placed on order. The knowledge which his own staff had acquired about costs had been demonstrated during a recent three months computer blackout during which no statements had been available. They had been able to predict, within £25, the total expenditure incurred during this period.

Following the success of this system the Medical Expenditure Committee had been abandoned and responsibility for medical expenditure transferred to the Medical Executive Committee. At the end of the first year the overall budget was underspent. It had been agreed that any underspending achieved would be made available to the budget holder concerned. Dr. Roylance stressed the fundamental importance of retaining funds created by real economies for use by those responsible for the economies. This incentive was an essential prerequisite to the successful introduction of such budgeting schemes. It was noted that in the second year an expected overspending was likely to occur. However, this was largely due to the fact that when the budget was prepared, full provision for inflation was anticipated but this had not been funded.

(In the final months of this second year, the active co-operation of the authorised requisitioning officers had enabled this overspending to be corrected and the final expenditure was now within the target figure.)

5. Controlling Radiology Costs

Dr. Roylance referred to an earlier comment made by Dr. Wickings in which he suggested that variable costs could be allocated to clinicians and money transferred from their budget to the X-ray Department as and when the clinicians made demands on the radiology service. Dr. Roylance did not think this was appropriate. He believed that the Radiologist should have total control over access to his department and that there were sound economic reasons why the Radiologist should retain the whole budget.

He pointed out that in a Radiology Department there was a very high level of sunk and fixed costs and a level of throughput which was efficient. The Radiologist, and not the clinicians, was best able to tell whether his department was working at that efficient level. The knowledge he had should enable him to identify whether the demand made by a clinician was unreasonable and thereby taking away the opportunity for another clinician to use those resources more profitably.

DISCUSSION

The main points to emerge during the discussion that followed Dr. Roylance's presentation are summarised below:

1. One of the participants said he had been interested to hear Dr. Roylance's comment concerning Computed Tomography Scanners. He agreed that doctors were responsible for much of the expansion in high technology but pointed out that considerable fund-raising had been initiated by local communities.

2. It was suggested that budgets should be determined following some assessment of alternative outcomes and not on the basis of historical usage. The case for cost effectiveness did not have to be linked with the size of the original budget.

3. When questioned about having total control of access to the Radiology Department, Dr. Roylance said that it was

the Radiologist's responsibility to assess whether or not every X-ray requested should be undertaken. He had the task of allocating the resources available for the maximum benefit of the whole District.

Dr. Roylance also confirmed that in his own District, no out-of-hours service could be provided without the prior approval of the duty Registrar.

A participant asked whether it was practical for every examination to be vetted by the Radiologist, and suggested that educating clinicians to monitor their demands should be the approach used. Dr. Roylance said that each Radiologist had regular conferences with a number of clinical firms, during which agreement was reached concerning what would be the right practice for the management of their patients.

GENERAL DISCUSSION

1. Participants discussed the difficulty of assessing whether a Radiological Department was being run on a cost effective basis. The use of work units in trying to assess relative cost effectiveness was regarded as inappropriate. This had been demonstrated by the example quoted by Dr. Hartley in relation to salpingography. Dr. Brindle commented that the Körner Group's recommendations, which included methods for allocating values for examinations, could be similarly criticised. The cost of an examination was dependent upon the specific circumstances pertaining in each X-ray Department at a particular time.

   The participants did not think that cost effectivness could be determined. It was generally agreed that the effectiveness of any particular unit was a matter of judgement between the clinicians and the radiology department. The only practical solution was to give each radiodiagnostic department a certain sum of money to fund its services and allow the staff at local level to determine how to use it to the best advantage within the constraints of the facilities available. It was emphasised, however, that more work needed to be undertaken to provide guidelines on how to use the resources.

2. It was suggested that staffing would need to be controlled before any significant reduction in costs could be achieved. It was pointed out that observation of different departments with the same level of staffing would indicate that whilst one was under pressure, the other was under-employed. It was agreed that when the opportunity arose, e.g. a consultant radiologist retired, more consideration should be given to assess whether a replacement was required or whether the money could be better used for a different purpose. The Royal College of Radiologists had begun to look at vacant consultant posts to see whether the available staffing was distributed correctly. Attempts to redistribute staff in other specialties had always met with considerable resistance, but the College was trying to see if

funds from vacant consultant posts could be transferred to create additional registrar appointments.

Dr. Hartley commented that he was currently under pressure to appoint two additional shorthand typists to cope with the increasing clerical work. He hoped to avoid this by further developing the use of the computer whereby the Department could have their X-ray reports produced in addition to the routine statistics.

3. Varying views were expressed concerning the use of comparable statistics to measure the efficiency of radiology departments. One radiologist believed it was a meaningless exercise. He suggested that if sufficient time and effort was spent on evaluating the differences between departments, satisfactory explanations could usually be found. Another participant disagreed and said it was possible to compare size, staffing and output but noted that comparisons of cost might not be so easy to make. In general participants accepted the need to treat such statistics with caution but believed they could prove useful provided that comparisons were being made on a similar basis throughout, e.g. that of ensuring that minimum standards were achieved.

CONCLUSIONS

1. Dr. Wickings summarised the day's proceedings as follows:

   (a) The Körner Working Group 'B' had recommended the maintenance of information systems which could identify the users of resources. In most departments it would be possible to implement these recording systems manually or computerised facilities could be introduced.

   (b) Dr. Field had described the guidelines prepared by the Radiologists in Canterbury & Thanet District in close association with their clinical colleagues, and designed to contain workload through a greater awareness of the value of radiological examinations.

   (c) Dr. Wrighton had illustrated the growth rates of both workload and costs in detail.

   (d) CASPE Research had previously demonstrated that clinical budgeting could influence demand in the short-term, but that the provision of information on its own did not. In the current research projects specific agreements would be negotiated on workload and resource use levels with clinical teams, who would also have budgets relating to variable cost expenditure.

   (e) Dr. Brindle advocated the use of guidelines combined with controlling access to the Radio-diagnostic Department. The guidelines had been prepared with the appropriate clinicians and circulated to staff. The capacity of the department had been assessed to enable all priority patients to be examined without delay and for the residual capacity to be utilised by patients seen on an appointment basis.

   (f) Dr. Hartley had demonstrated the ease with which information about demand could be produced with the aid of an Apple computer. This information had proved most useful in discussion with clinical colleagues to ensure that the Radiology Department resources were being used

to best effect.

(g) Dr. Roylance placed emphasis on the need to control expenditure at source and had described the approach used in Bristol whereby all requisitions had to be approved by an authorised member of staff. This enabled expenditure to be curtailed easily when overspending seemed imminent.

(h) During the general discussion it had been suggested that having decided on the level of sunk and fixed costs available for radio-diagnostic services, it should be left to the consultant staff to determine how to use the facilities most efficiently.

2. Little progress had been made during the day's discussion concerning the way to judge cost effectiveness. Perhaps this was not surprising. Cost was hard to calculate and comparisons were difficult to make effectively. Indeed some participants believed comparisons should not be made using the information currently available. Effectiveness was deemed to be a matter of judgement.

   Dr. Wickings suggested that the District Management Team did have a responsibility for assessing the cost effectiveness of its services. This was the only way to determine whether there were opportunities to fund alternative services which were of greater value to patient care.

3. Many problems in radio-diagnostic departments were a result of the high expectations and beliefs of clinicians coming into a District General Hospital after working in a teaching hospital. Initially there was often a lack of insight concerning the capabilities of the radiology department.

4. In trying to control workload and costs the difficulties caused by advanced technology should not be underestimated. Whilst this resulted in desirable improvements in patient care it also incurred considerable expenditure. Examples quoted included routine ultrasound in early obstetrics and the use of isotopes. The results justified their use and radiologists

have had to accept these developments as additional services which must be provided.

5. Educating clinicians in the use of radio-diagnostic facilities was an important aspect of the Radiologist's role in ensuring that his department worked efficiently. The Royal College of Radiology and teaching hospitals had a major responsibility in providing clinical guidelines. It was also essential that appropriate prospective studies were undertaken into radiological practice to provide evidence upon which to base the guidelines.

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