

## Chairperson's Foreword

As Chairperson, I am pleased to present the following Report of the Radiography Service Review Group.

This Group, which comprised of both management and staff representatives, was established to conduct a comprehensive review of the Radiography Service on a partnership basis.

Over the past number of years significant changes have occurred in the delivery of radiography services as a result of advances in clinical practice due to scientific and technological developments.

The Service Review Group urges all management and staff to continue to embrace initiatives designed to respond to the challenges being placed upon the radiography service due to the rapid pace of change. The Group has highlighted a number of areas which would benefit from more detailed consideration at the level of the individual hospital.

Kieran Hickey

## Acknowledgements

The Service Review Group wishes to record its acknowledgement of the co-operation and assistance afforded to it by those engaged in the consultative process and to express its thanks to all those who contributed to the completion of this Report.

The Group also wishes to record its appreciation for the valuable assistance provided by Ms Sonia Shortt, HSEA, who acted as Secretary to the Group and wishes to extend its gratitude to Ms Mary Dowling and Ms Luisa Daly, Office for Health Gain, who typed the many drafts of this report.



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## 1 Introduction

### Background

1.1 It was agreed in 1998 between SIPTU, representing Radiographers and the Health Service Employers Agency (HSEA), representing Health Service Management, that a joint Service Review Group would be established in respect of radiography services.

1.2 The following Terms of Reference were agreed at a meeting of the parties.

*Having regard to the terms of the PCW Agreement between Health Service Management and SIPTU, representing Radiographers, to conduct a comprehensive review of the Radiography Service:*

- *To examine the operation of protocols during hours of operation and to make recommendations where appropriate*
- *To take account of patient need (including the ALARA principle)*
- *To examine the out of hours system*
- *With the objective to recommend optimum service quality*
- *To investigate and recommend on the specific issues set out in the Labour Relations Commission's letter 23rd May 1997:*
  - a) *Image Intensifier*
  - b) *Time off in lieu of out-of-hours work*
  - c) *On-call and session rates*
  - d) *Sunday/Bank Holiday session and on-call rates and Emergency Therapy Rates*

1.3 It was also agreed that Mr Kieran Hickey would act as Chairperson of the Service Review Group, the primary role of the Chairperson being one of facilitation rather than adjudicating or making recommendations on issues.

### 1.4 Membership of Service Review Group

The initial membership of the Service Review Group, which reflects the process of partnership between management and unions, was as follows, with subsequent changes in membership as indicated.

## SIPTU

Ms Jane Boushell<sup>1</sup>  
SIPTU

Mr Des Courtney  
SIPTU

Ms Michele Monahan  
James Connolly Memorial Hospital

Ms Maria Murphy  
St Luke's Hospital

Ms Eleanor Russell<sup>2</sup>  
Longford/Westmeath General Hospital

Mr Ken Purdy<sup>3</sup>  
Adelaide & Meath Hospital,  
incorporating the National  
Children's Hospital

## HSEA

Mr Martin McDonald  
HSEA

Mr Robert Martin  
Hume Street Hospital

Ms Jo Coyle  
St James's Hospital

Ms Grainne Connolly  
HSEA

Mr Gerry O'Dwyer  
Cork University Hospital Group

Mr Donal Kelly  
St Luke's Hospital

### 1.5 Meetings and Working Arrangements

The Service Review Group met on a total of 30 occasions.

- 1.6 The approach agreed from the outset was one of developing a partnership with common goals and to leave the adversarial tradition behind.

It was accepted that the implementation of the recommendations of the 1994 Working Party Report on Radiographers in relation to upgrading in specialised areas was a separate but parallel issue. It was agreed that separate meetings of the parties on this issue would be held on the same date as the meetings of the Service Review Group. This process subsequently monitored the introduction of over 100 Clinical Specialist posts (Superintendent 1 Grade) in specialised areas throughout the Irish hospital sector, i.e. in Angiography, CT, MRI, Nuclear Medicine (RNI), Medical Ultrasound and Mammography Departments. Job descriptions for the new Radiographer management roles in these specialised areas were also agreed by the parties in the parallel discussions on the Working Party Report and a new job title of Radiography Service Manager was also agreed.

- 1.7 It was also agreed to deal separately within the Service Review with industrial relations type issues, such as investigating and reviewing the image intensifier allowance; also the examination of the out of hours system might give rise to industrial relations type issues at a later stage.

<sup>1</sup> Replaced Paul O'Sullivan

<sup>2</sup> Replaced Imelda Carney (Mallon)

<sup>3</sup> Replaced May Garvey

## 1.8 Consultation with Other Parties

In the early months of the Radiography Service Review, it was decided to consult with:

- The Faculty of Radiography of the Royal College of Surgeons in Ireland
- The Irish Institute of Radiography

A letter was sent by the Chairman to the Dean of the Faculty of Radiography outlining the Terms of Reference of the Service Review, inviting the views of the Faculty on a number of the key issues and suggesting that following receipt of those views, it might be beneficial to arrange a formal meeting between the Faculty and members of the Service Review Group. In the event, whilst there seemed to be an informal welcome and agreement on the need for a review of radiography practice in the radiotherapy area, the formal view of the Faculty following full consideration of the Chairman's letter was that it had been concluded that the work practices of Radiographers is not a matter on which the Faculty can comment as this concerns a professional grouping which is not under the auspices of the Faculty. It was suggested that the views of the Consultant Radiologists/ Clinical Directors might be sought through their representative organisations in regard to service demands.

A subsequent informal meeting between the Chairman and the Dean was helpful in clarifying matters and in setting the context for further consideration of a number of matters in discussions with the Faculty in due course.

The Irish Institute of Radiography were invited, following correspondence from them, to make a presentation to the Service Review Group on 20th May 1999. The President and Vice-President of the Institute attended and made a verbal presentation, which was followed up subsequently by a detailed written submission. This provided very useful insights from the perspective of the Radiographers' professional body into a number of the issues under consideration in the Service Review.

## 2 The Radiography Service Review

### 2.1 Developing a Partnership Approach

The parties to the Radiography Service Review agreed from the outset that the aim was to create a forum in which organisational issues in the management and delivery of the service can be addressed jointly by management and staff.

A positive partnership approach has subsequently developed within the Radiography Service Review and the National Partnership Initiative '*Working Together for a Better Health Service*' will provide a framework for local initiatives.

### 2.2 Methodology - Information and Research Needs

It was decided in the initial stages that in order to progress the Service Review, the primary information need in relation to Diagnostic Imaging was to establish trends in volumes of workload activity and associated costs and staffing; also the range of services being provided, work activity patterns, normal operating hours, and protocols and other systems in operation. Towards this end a detailed questionnaire was developed, Part I seeking information for the years 1993 and 1998 respectively regarding pay costs (including out of hours costs) non-pay costs, staffing levels, workload analysis, and out of hours service; information was also sought on guidelines/protocols and systems in operation, and on the number of x-ray rooms by use.

Part II of the questionnaire sought on a prospective basis, detailed information on activity during a sample week. Advance briefing sessions in this regard were held with SIPTU Radiographer representatives and with Superintendent Radiographers/Radiographers in Charge, from the various hospitals involved. Back-up support for further queries or difficulties was provided from within the membership of the Review Group.

Radiotherapy is provided in two public hospitals and two private hospitals. For the purpose of the Service Review, the public hospitals were the relevant centres, i.e. St Luke's Hospital, Dublin, and Cork University Hospital. Unlike Diagnostic Imaging, the details of the range of service issues involved was clearer in the case of Therapeutic Radiography because there are only two service providers to consider. As a result, it was not deemed necessary to undertake the same approach to data collection as in the case of Diagnostic Imaging. It was considered that sufficient information was readily available, if required, in relation to such issues as demands on the service, the reasons for, and volume of, after-hours service, etc.

### 2.3 The Irish Society for Quality in Healthcare (ISQH) was retained to undertake an analysis of the information. Following interim discussions and reports a final analysis report was completed for the Review Group at the end of September 2000 and presented at their meeting on 18th October 2000.

A 79% response rate (42/53) was achieved for Part I of the questionnaire, although data in relation to 1993 was, in the majority of cases, either omitted or greatly abridged. Data relating to 1998 received better compliance.

The response rate to Part II (sample week activity) was 68% (36/53).

- 2.4 When the data supplied by hospitals was being collated and analysed, the hospitals were grouped according to the Department of Health and Children's Case Mix Groups 1 and 2 respectively. Hospitals not included in the foregoing were classified into Group 3 or Group 4 hospitals, the latter consisting of specialist, maternity and children's hospitals.

Gaps in data relating to 1993 in particular were further accentuated when the 4-way breakdown of hospitals, as described above, took place. This particular aspect of the questionnaire survey has been disappointing in terms of being able to establish trends with any degree of confidence by comparing 1998 with 1993. Information from Part I of the questionnaire survey will be drawn upon and referred to later where considered appropriate.

Full details of the analysis of the sample work activity data obtained from Part II of the questionnaire are given in Appendix I and will be discussed later.



### 3 Protocols

3.1 The Service Review Group was asked to examine and make recommendations on the operation of protocols for service provision. Protocols and clinical guidelines have been developed with a view to:

- controlling demand on services
- minimising patient radiation doses (ALARA principle)

3.2. The Group decided to include a survey of the current operation of protocols/clinical guidelines in Part I of the questionnaire survey of hospitals. The following two tables from the ISQH analysis show the position as reported by the hospitals:

<b>Table 1: Clinical Guidelines in Operation</b>	<b>Yes</b>	<b>%</b>	<b>No</b>	<b>%</b>
<b>Group 1 Hospitals</b>				
Inpatient	7	100	0	0
Outpatient	6	88	1	14
GP Referral	6	88	1	14
A&E Department	7	100	0	0
<b>Group 2 Hospitals</b>				
Inpatient	14	93	1	7
Outpatient	12	80	3	20
GP Referral	12	92	1	8
A&E Department	11	95	2	15
<b>Group 3 Hospitals</b>				
Inpatient	7	70	3	30
Outpatient	7	70	3	30
GP Referral	6	75	2	25
A&E Department	5	72	2	28
<b>Group 4 Hospitals</b>				
Inpatient	4	0	0	0
Outpatient	2	0	1	33
GP Referral	3	0	0	0
A&E Department	3	0	0	0

It will be seen from the above table that in the Group 1 hospitals in particular, clinical guidelines for requesting examinations are in place in almost all areas.

When asked were the guidelines devised or agreed in the hospitals the response was as shown in Table 2.

<b>Table 2: Source of Guidelines</b>	<b>Yes</b>
<b>Group 1</b>	
RCR Booklet	3
RCR Booklet with local controls	3
In Hospital - Radiology Department	-
Other	-
<b>Group 2</b>	
RCR Booklet	4
RCR Booklet with local controls	4
In Hospital - Radiology Department	1
Other	-
<b>Group 3</b>	
RCR Booklet	1
RCR Booklet with local controls	-
In Hospital - Radiology Department	2
Other	2
<b>Group 4</b>	
RCR Booklet	-
RCR Booklet with local controls	-
In Hospital - Radiology Department	2
Other	-

The responses received show that the guidelines in place are mainly based on the Royal College of Radiologists booklet<sup>4</sup> - the 'Red Book' or on a derivation from this booklet with local controls.

<sup>4</sup> Royal College of Radiologists, *Making the best use of a Department of Clinical Radiology - Guidelines for Doctors* Fourth Edition, London, 1998

3.3 But when asked if the effectiveness of the guidelines is being measured and about the level of adherence to them, hospitals responded as shown below.

<b>Table 3: Effectiveness Measurement</b>	<b>Yes</b>	<b>%</b>	<b>No</b>	<b>%</b>
<b>Group 1 Hospitals</b>	2	29	5	71
<b>Group 2 Hospitals</b>	4	29	10	71
<b>Group 3 Hospitals</b>	1	10	9	90
<b>Group 4 Hospitals</b>	3	75	1	24

<b>Table 4: Guidelines Adherence</b>	<b>Good</b>	<b>%</b>	<b>Moderate</b>	<b>%</b>	<b>Bad</b>	<b>%</b>
<b>Group 1</b>						
Inpatient	3	43	2	28.5	2	28.5
Outpatient	4	57	1	14.5	2	28.5
GP Referral	3	43	2	28.5	2	28.5
A&E Department	1	14.5	1	14.5	5	71
<b>Group 2</b>						
Inpatient	6	43	7	50	1	7
Outpatient	5	36	8	57	1	7
GP Referral	6	55	4	36	1	9
A&E Department	2	17	4	33	6	50
<b>Group 3</b>						
Inpatient	4	57	3	43	0	0
Outpatient	5	71	2	29	0	0
GP Referral	4	67	2	33	0	0
A&E Department	2	50	2	50	0	0
<b>Group 4</b>						
Inpatient	3	75	1	25	0	0
Outpatient	3	100	0	0	0	0
GP Referral	2	67	1	33	0	0
A&E Department	1	33	1	33	1	33

The responses summarised in Tables 3 & 4 point to the need, after guidelines are put in place, to monitor their effectiveness and the level of adherence to them. This needs to be supported by appropriate induction training for those who are required to operate them.

In the case of hospital medical staff the level of induction training, especially for casualty/accident and emergency medical staff, who are large users of x-ray services, falls short of the ideal as the following table shows:

<b>Table 5: Staff Induction</b>	<b>Yes</b>	<b>%</b>	<b>No</b>	<b>%</b>
<b>Group 1 Hospitals</b>				
Casualty SHO/Reg	4	67	2	33
Other SHO/Reg	2	40	3	60
Intern	6	100	0	0
Other Staff	1	20	4	80
<b>Group 2 Hospitals</b>				
Casualty SHO/Reg	10	71	4	29
Other SHO/Reg	9	60	6	40
Intern	12	80	3	20
Other Staff	7	47	8	53
<b>Group 3 Hospitals</b>				
Casualty SHO/Reg	2	40	3	60
Other SHO/Reg	3	50	3	50
Intern	0	0	5	100
Other Staff	0	0	5	100
<b>Group 4 Hospitals</b>				
Casualty SHO/Reg	3	100	0	0
Other SHO/Reg	3	75	1	25
Intern	2	67	1	33
Other Staff	1	33	2	67

**The Service Review Group recommends that hospitals should ensure that a formal system of induction training is in place for all staff required to operate clinical guidelines and that such induction training is repeated at half-yearly intervals to coincide with the new intakes of non-consultant medical staff.**

### 3.4 Royal College of Radiologists Guidelines

The fourth edition of the Royal College of Radiologists (RCR) Guidelines, *'Making The Best Use of a Department of Clinical Radiology'* published in 1998, states that the "booklet has been prepared to help referring clinicians make the best use of Department of Clinical Radiology. Continued use of recommendations of this kind leads to a reduction in the number of referrals for investigation and also to a reduction in medical radiation exposure. Nevertheless the primary objective of this booklet is to improve clinical practice". The booklet is intended for use by hospital doctors (all grades) and general practitioners.

The RCR guidelines are evidence based and arrived at after a wide consultation process. They have been recognised as being of great benefit to the delivery of both the clinical and managerial aspects of health care. They have been adopted in other countries and have been converted into an electronic version so that they can be incorporated into Hospital Information Systems. They have been granted official status by the European Commission in connection with EU policies on protection against the dangers of radiation. In Ireland, the RCR Guidelines have been endorsed by the Faculty of Radiologists of the Royal College of Surgeons in Ireland (RCSI) and by the Irish Institute of Radiography.

3.5 According to the RCR Guidelines, a significant number of radiological examinations do not fulfil the criterion of a useful investigation, which is clinically justified, i.e. one in which the result - positive or negative - will alter patient management or add confidence to the clinician's diagnosis. Attention is drawn by the RCR to research showing that unnecessary investigations increase waiting times, waste limited resources<sup>5</sup>, lower standards and may add unnecessarily to patient irradiation<sup>6</sup>. The RCR goes on to state that the chief causes of the wasteful use of radiology are:

1. **Investigation when results are unlikely to affect patient management:** because the anticipated 'positive' finding is usually irrelevant, eg. degenerative spinal disease (as 'normal' as grey hairs from early middle age) or because a positive finding is so unlikely. DO I NEED IT?
2. **Investigating too often:** i.e. before the disease could have progressed or resolved, or before the results could influence treatment. DO I NEED IT NOW?
3. **Repeating investigations which have already been done:** eg. at another hospital, in an Outpatient Department, or in Accident & Emergency. HAS IT BEEN DONE ALREADY? Every attempt should be made to get previous films. Transfer of digital data through electronic links may assist in this respect in future years.
4. **Failing to provide appropriate clinical information and questions that the radiological investigation should answer:** Deficiencies here may lead to the wrong technique being used. (eg the omission of an essential view). HAVE I EXPLAINED THE PROBLEM?
5. **Doing the wrong investigation:** Radiological techniques are developing rapidly. It is often helpful to discuss an investigation with a radiologist before it is requested. IS THIS THE BEST INVESTIGATION?
6. **Over-investigating:** Some clinicians tend to rely on investigations more than others. Some patients take comfort in being investigated. ARE TOO MANY INVESTIGATIONS BEING PERFORMED?

<sup>5</sup> Audit Commission *Improving Your Image: How to Manage Radiology Services More Effectively* (ISBN 01188654149) London: HMSO, 1995.

<sup>6</sup> *The Ionising Radiation (Protection of Persons undergoing Medical Examinations of Treatment - POPUMET) Regulations* (SI 1998/778) London: HMSO, 1988.

- 3.6 Guidelines to help referring clinicians to make the best use of the clinical radiology service should be available not only to all grades of hospital doctors, but also to General Practitioners. The trend of increasing direct access to clinical radiology services by General Practitioners (GPs) is endorsed by the RCR and the RCR Guidelines are therefore intended for use by hospital doctors and general practitioners alike. In the Irish context, a joint initiative by the Irish Institute of Radiography, the Irish College of General Practitioners and the Faculty of Radiologists of the Royal College of Surgeons in Ireland, is to be commended. This initiative is aimed at encouraging and enabling GPs to adopt referral criteria for x-ray examinations based on the recommendations in the RCR Guidelines.

### 3.7 Recommendations regarding Protocols

There is evidence to show that systematic and sustained implementation of the RCR Guidelines produces a number of positive outcomes in both hospital and general practice settings, resulting from reduction in inappropriate referrals for radiological examinations. The primary benefit from this lies in improved clinical practice and quality of service to the patient in terms of receiving the most appropriate examination, reduction in unnecessary radiation exposure, freeing up capacity in radiology departments, thus reducing waiting times, improving access to service and allowing better use of resources. Two examples of such evidence are given in Appendix II.

The first example, included in the submission received by the Service Review Group from the Irish Institute of Radiography, describes how the implementation of the RCR Guidelines led to a reduction in hospital outpatient and inpatient referrals of the order of 17% to 24% respectively in an Irish hospital. This allowed increased access for GP referrals (almost an additional 1000 patients) whilst at the same time achieving a small reduction in the overall number of examinations.

The second example comes from general practice in the UK where a project was undertaken in Liverpool to reduce inappropriate use of radiographic examinations. All GP practices received a copy of the RCR Guidelines followed by a number of educational exercises aimed at both GPs and patients. Reference rates for 4 out of 5 commonly requested radiological investigations showed significant decreases ranging between 24% and 48%. This was attributed to the issue of written feedback to GPs on their practice referral rates, together with written guidelines.

It is noted in the preamble to the RCR Guidelines that their introduction “requires the co-operation of all concerned; their ultimate effectiveness relies on appropriate education and locally agreed implementation”. It is later observed in relation to implementation that “inevitably an enthusiastic drive in their enforcement will be followed by a period of relaxation”. Audit is suggested as one technique of reassessing whether implementation has been effective. In addition to audit, the experience of those in the two examples already quoted shows that effective implementation is also facilitated by protocols within Radiology departments which clearly set out the parameters for reviewing and responding to referrals for examinations and that with continuous adherence to and ‘policing’ of this system, it becomes the ‘norm’ and is relatively easy to administer. Radiographers can have a pivotal role in helping to create this ‘norm’. Education and continuous feedback to doctors regarding their referral rates has been shown to be part of the process of creating this ‘norm’.

The current (4th) edition of the RCR Guidelines booklet was published in 1998 and the next edition is planned for 2002. **The Group recommends that:**

- a copy of the current RCR Guidelines should be available at all times to each referring hospital doctor or GP and that appropriate training be given for their use;
- clear protocols in line with these guidelines should operate in response to referrals for examinations in Radiology Departments. Such protocols should be drawn up in consultation with all concerned and should clearly set out the parameters for reviewing and responding to referrals for radiological examination;
- specific organisational arrangements need to be in place to ensure active and continuous implementation of such guidelines and protocols and for promoting and monitoring adherence to them. Radiographers have a centrally important role to play in such organisational arrangements and should be fully supported in ensuring adherence to agreed protocols and guidelines. These arrangements should include the provision of feedback to referring doctors;
- the joint initiative of the Irish Institute of Radiography, the Irish College of General Practitioners and the Faculty of Radiologists of the RCSI should be universally implemented and supported by all hospitals and health board Primary Care Units;
- education and research, including the dissemination of good practice in this area, are required if the implementation of guidelines and protocols is to be effective. Appropriate support should be made available by employing authorities in this regard;
- The Service Review Group also recommends that as many hospitals as possible should incorporate the electronic version of the RCR Guidelines into their Radiology Systems and Hospital Information Systems.

## 4 Balancing Patient Need Against Radiation Dosage - The ALARA Principle

- 4.1 The ALARA principle is laid down in European Council Directive 97/43 EURATOM of 30th June, 1997 on health protection of individuals against the dangers of ionising radiation in relation to medical exposure. It is a requirement of this Directive that doses of ionising radiation for medical exposures generally '*shall be kept As Low As Reasonably Achievable*' (ALARA). The need to have measures for the radiation protection of people undergoing medical examination or treatment arises from the fact noted in the Directive that medical exposure continues to constitute the major source of exposure to artificial or man-made sources of radiation for citizens. It has been pointed out that even small radiation doses are not entirely without risk and also that diagnostic medical exposures, being the major source of man-made radiation exposure of the population, add about one sixth to the population dose from background radiation<sup>7</sup>. The RCR Guidelines point out that one important way of reducing the radiation dose is to avoid undertaking investigations unnecessarily (especially repeat examinations); also that no investigation should be requested unless it can be clinically justified and its result, normal or abnormal, is likely to influence management of the patient.

Typical effective doses from diagnostic medical exposures as prescribed by the Royal College of Radiologists in its Guidelines.

- 4.2 EC Directive 97/43 EURATOM sets out detailed requirements for the application of justification and optimisation principles in relation to exposure to radiation by persons undergoing medical examination or treatment. It covers:
- responsibilities for administering medical exposure
  - appropriate training for the staff involved
  - the establishment of quality assurance and audit programmes
  - inspections by competent authorities
  - specific provisions as regards special practice, pregnant and breastfeeding females, volunteers in research and helpers involved in procedures with the aim of ensuring that medical exposure is delivered under good radiation protection conditions and that potential exposure is taken into account

### 4.3 Justification

One of the central principles in the Directive is justification, i.e. that medical exposure shall show a sufficient net benefit taking potential benefits and risks into account. It requires that all individual medical exposures shall be justified in advance and that special attention shall be given to the justification of medical exposures where there is no direct health benefit for the individual, especially for exposures on medico-legal grounds.

*The Directive explicitly provides that if an exposure cannot be justified, it should be prohibited.*

<sup>7</sup> Royal College of Radiologists, *Making the best use of a Department of Clinical Radiology - Guidelines for Doctors* Fourth Edition, London, 1998, p12.



#### 4.4 Optimisation

This part of the Directive requires that doses due to medical exposure shall be kept as low as reasonably achievable (ALARA principle). Each member state is required to promote the establishment and use of diagnostic reference levels; also to ensure that special attention be given to keeping the dose for medico-legal exposure as low as reasonably achievable and that dose constraints are established for exposure of helpers supporting/comforting the patient.

#### 4.5 Responsibilities

The Directive defines two individuals who shall be involved in the justification process for administering medical exposure:

*Practitioner*: a medical doctor, dentist, or other health professional who is entitled to take clinical responsibility for an individual medical exposure in accordance with national requirements.

*Prescriber*: a medical doctor, dentist or other health professional who is entitled to refer individuals for medical exposure to a practitioner, in accordance with national requirements.

Under the Directive, the *Prescriber* as well as the *Practitioner* shall be involved in the justification process, as specified by member states.

The Irish Medical Council as the competent authority under the previous 1998 EU Directive has already been issued a Policy Document defining *Qualified Persons* who can determine that medical exposure is justified and that the radiation dose is as low as reasonably achievable.

*Qualified Persons* are Radiologists, Physicians with a degree in Nuclear Medicine and qualified Radiographers who have practised on a full time basis for at least 3 years and who are clinically responsible either to a Radiologist or specialist Physician in Nuclear Medicine.

**The Service Review Group is of the view that a Radiographer, as defined in the Medical Council's Policy Document, should be specified as a *Practitioner* in the forthcoming national regulations under the 1997 Directive, and be entitled to determine that a medical exposure is justified.**

The 1997 Directive is currently being transposed into Statutory Regulations under Irish Law. The Service Review Group has communicated its views to the Department of Health and Children in this regard.

## 5 Patterns of Demand and Service Requirements during Normal Working Hours and Out of Hours

- 5.1 A detailed analysis of the sample week activity in Diagnostic Imaging is given in Appendix I.

The various graphs and tables attached at Appendix I illustrate the key findings as follows:

### ***Examination Type***

Group 1 hospitals accounted for over 59.4% of examinations carried out during the sample week and Group 2 hospitals accounted for a further 27% of the total workload. The majority of examinations were either chest or skeletal examinations, 68% in Group 1 hospitals, 80% in Group 2, 83% in Group 3 and 74% in Group 4. Ultrasound was the next highest category along with CT and nuclear medicine.

### ***Peak/Off-Peak Time***

During the week, 89% of all examinations were carried out Monday to Friday and the remaining 11% were carried out during the weekend - Saturday to Sunday.

Between 80% - 90% of examinations carried out Monday to Friday were during normal working hours and the busiest time for each hospital group was from normal starting time up to 13.00 hours.

During the out-of-hours period, Monday to Friday, the busiest time was up to 20.00 hours.

During the weekends the main workload was spread between 09.00 hours and 24.00 hours.

### ***Patient Source***

The analysis shows that in overall terms the Accident and Emergency Department was the busiest source of referral accounting for approximately 31% of the workload followed closely by Inpatient and Outpatient referrals.

GP examinations accounted for just more than 10% of all referrals.

### ***Patient Classification***

Between 57% and 70% of patients in all hospital groups were classified as ambulatory. In hospital Groups 1 and 2, wheelchair patients accounted for between 15% and 22% of workload.

Between 12% and 14% of all examinations were with difficult/uncooperative patients and between 14% and 16% of examinations required staff to help the patient. This has implications for skill mix and training, which will be referred to later.

### ***Day-to-Day Activity Levels***

The day-to-day activity levels for each hospital group show that the busiest days were early in the week on Mondays and Tuesdays.

### ***Multiple Examinations***

A total of 20.2% of all examinations were instances where a patient received more than one examination. This underlines the necessity of an effective control system for radiation exposure and for the active observance of guidelines such as the Royal College of Radiologists recommendations.

### ***Out of Hours Activity***

The analysis contains four tables relating to out of hours activities.

The first two tables show out of hours activity by type of examination and time of day/night for Monday to Friday and Saturday to Sunday respectively. This highlights that the majority of out of hours examinations were in fact general examinations, chest or skeletal.

The second two tables show the out of hours activity by source of referral and time of day/night for Monday to Friday and Saturday to Sunday respectively. This shows that the vast majority (e.g. ranging between 68% and 91% in Group 1 hospitals during Monday to Friday) of out of hours referrals came from the accident and emergency department. The only other significant source of out of hours referrals related to Inpatients. However, during the period between the end of normal hours up to 20.00 hours on weekdays and on Saturday mornings and afternoons, Outpatient referrals for examinations did occur.

### ***Room Activity***

The final two tables show the total number of examinations carried out in the different examination rooms listed by hospital grouping.

Accident and emergency and general examination rooms, including combined general/accident and emergency rooms had a significantly higher level of activity than other rooms, followed by Ultrasound.

## **5.2 Radiotherapy**

The Group had the benefit of longitudinal data in relation to the overall attendance pattern for radiotherapy treatment and simulation.

Among the underlying factors for this increase are:

- i) the changes in treatment practices, i.e. fractionisation
- ii) the National Cancer Strategy
- iii) the National Breast Screening Programme

The Group welcomed the increase in the number of student radiotherapy places.

## 6 The Service Response

- 6.1. The previous chapter gives a profile of patterns of demand and service requirements during normal hours and out of hours, based on the sample of one week's activity in the various hospital groups.

A total of almost 32,000 examinations were carried out by all hospitals who responded to the questionnaire in respect of the sample week's activity - almost 19,000 of these examinations were in Group 1 hospitals, the average per hospital being 2,371 examinations.

It can be inferred from the workload information given by hospitals in respect of 1993 and 1998 respectively that the workload demands on Group 1 hospitals has been increasing at a rate of about 5.5% per annum. Given the volume and spread of demand in terms of time and type of examination required, the provision of an optimum service response poses a multi-dimensional organisational challenge.

- 6.2. How well is the Radiography service responding to this challenge?

It is difficult to answer this question without deeper study, or some change projects being piloted, at an individual hospital level.

However, a number of inferences can be drawn from the data given in the responses to Parts I and II of the Questionnaire to hospitals.

### 6.3 Pilot Projects

It has already been noted that GP examinations account for approximately 10% of all examinations.

Enquiries by the Service Review Group indicated that there is a significant waiting list for GP referral examinations in a number of hospitals.

The current normal working hours for the Radiography service generally start at 9.00 a.m. and finish at 5.00 p.m. daily, Monday to Friday. In the context of discussions on possible changes to current normal working hours, **the Service Review Group agreed to extend the working day on a pilot basis in some hospitals, especially those with a significant waiting list problem for GP referral examinations. The agreement is that the periods from 8.00am-9.00am and 5.00pm-6.00pm will be regarded as 'normal hours' rather than 'out of hours'. Radiographers participating will be remunerated at an agreed hourly rate for these hours on the basis that they are in excess of the normal weekly working hours.** The first hospital ready to commence such a pilot project is the Adelaide and Meath Hospital (incorporating the National Children's Hospital) at Tallaght. It is hoped in the pilot project to reduce the waiting list for patients referred by GPs for examinations by having 100-125 extra examinations carried out each week.

#### 6.4 Peak Demand

There are several peak demands during the day which may not fit well with current normal working hours of 9.00am-5.00pm. The analysis of the sample week's activity shows that there is a significant volume of demand after normal hours up to 20.00 hours, Monday to Friday. The source of these referrals is primarily Accident & Emergency Departments (69% in Group 1 hospitals) but a significant proportion (25.5%) of referrals relate to Inpatients and to a lesser extent from Outpatients (4.7%).

The Service Review Group has considered this issue at some length with a view to piloting an extension of normal working hours up to 20.00 hours in a Group 1 hospital. It was agreed that all the implications of such an extension should be included in a study to be carried out by a management/Radiographer staff group at Cork University Hospital.

This study group will consider options for change in a number of areas related to service quality and in relation to any agreed recommendations for change they will outline time-scale for introduction of changes having regard to investment, training and cost implications. The areas of service quality to be considered in the study are likely to include:

- organisation and responsiveness of the service system to various sources and patterns of demand
- effectiveness of protocols for
  - demand management and avoidance of inappropriate examinations
  - control of exposure to radiation on the basis of the ALARA principle
- user satisfaction, including effectiveness of communications with
  - prescribing doctors
  - patients
  - wards and outpatient departments
  - referring hospitals
- availability of appropriate manpower with appropriate skills mix, and
- education and training of staff and users of the service

#### 6.5 Hospital Partnership Committees

The Review Group considers that the new Hospital Partnership Committees offer an opportunity to develop agreed responses by management and staff to meet particular demands, for example:

- Peaks in demand which occur during normal working hours and which adversely affect the quality of the service response
- Special clinics (outside normal working hours) to facilitate patient attendance or to reduce waiting lists

- 6.6 The Service Review Group recommends that every opportunity be taken to agree and develop such initiatives on a pilot basis under the new partnership structure in individual hospitals. A procedure will be agreed between SIPTU and HSEA to monitor such initiatives and their implications.**

## 7 Manpower

- 7.1 In the course of its work the Group became aware of what has been a growing difficulty, in certain locations, in filling Radiography posts, which has implications for maintaining service capacity and quality including the feasibility of any changes under consideration. **It was agreed, pending any measures to increase the supply of Radiographers, that an interim arrangement would be piloted in some hospitals under which a Radiography Assistant would be introduced who would work under Radiographer supervision and carry out designated tasks in order to release Radiographers time at present spent on some activities which do not require their professional input. The agreed piloting of a Radiography Assistant will include appropriate in-service training, role definition and development.**

Ultrasound is among the specialised areas of high demand and manpower shortage. The Group considers it to be among the appropriate areas within which to pilot the introduction of Radiography Assistants. The Group has agreed an appropriate job profile for such positions as set out at Appendix III.

**It is recommended that an evaluation of the outcomes of the introduction of these Radiography Assistants should precede a more widespread roll-out.**

The Group endorses the comments and recommendations of the Expert Group on Radiography Grades<sup>8</sup> July 2001, on the problems in relation to the recruitment and retention of Radiographers. The Service Review Group wishes particularly to support an increase in the number of training places at undergraduate level.

The Group supports recruitment initiatives abroad, subject to satisfactory validation procedures for qualifications which should reach a prescribed minimum standard. **It is recommended that such initiatives be processed as speedily as possible.**

<sup>8</sup> Report of the Expert Group on Radiography Grades, July 2001.

## 8 Communications and Reporting

- 8.1 The Group considered the situation regarding communications with prescribing doctors and whether, in consultation with Radiologists, there is scope for development of the current role of Radiographers in this area.

Three of the Group 1 hospitals indicated that a 'hot-reporting' system is in place for Inpatient examinations and only 1 hospital in this Group indicated that such a system is in place for accident and emergency examinations. In relation to Group 2 hospitals 5 out of 16 indicated that 'hot-reporting' is in place for Inpatient and accident and emergency examinations.

'Hot-reporting' is essentially a system of prioritising examinations for urgent reporting by the Radiologist. Radiographers can contribute to this process by identifying films for urgent reporting. **The Group recommend that this contribution should be developed in conjunction with Radiologists.**

As regards the operation of a 'Red Dot' system by Radiographers in relation to emergency examinations only 17% of Group 1 hospitals and 7% of Group 2 hospitals indicated that such a system was in place. This is a system whereby Radiographers identify abnormalities demonstrated on the skeletal films undertaken in the accident and emergency x-ray. The red dot is an informal indication that the Radiographer wishes to draw the attention of the casualty officer to that particular x-ray. It is not a definitive diagnosis. The legal responsibility for interpreting the x-ray remains with the casualty officer. The absence of a red dot does not imply that the x-ray is normal, but rather that the Radiographer has not identified an abnormality. This system is voluntary and is undertaken only after written protocols are drawn up with Radiographers, Radiologists and Consultants in accident and emergency departments. It is undertaken only after suitable training/experience and is subject to audit.

The Service Review Group **recommends that the contribution of Radiographers to improving the quality of service response through the operation of the 'Red Dot' system should be facilitated and fully encouraged by hospital management in consultation with Radiologists.**

### 8.2 Role Development

The Radiography profession is undergoing tremendous change in other countries, including the United Kingdom, with regard to Radiographer role development activities. This requires consultation and agreement between hospital management, Radiologists and Radiographers. A central feature of role development involves the delegation by a Radiologist to a Radiographer of certain tasks with the agreement of hospital management. The delegation of such tasks would only be to suitably trained Radiographers.



Such initiatives involve a change to the professional practice of Radiographers and may result in both qualitative and quantitative change in the way Radiographers contribute to patient management and health care services. Role development demands a high level of skill, training and expertise. It includes:

- injection of intravenous contrast media
- identification of abnormalities on x-rays by Radiographers (red dot system)
- reporting in ultrasound
- involvement in the planning of radiation treatment
- expanded research role
- barium studies
- interventional Radiographers in angiography

Some progress on the implementation of the above has already been made and the Group recommends further initiatives in the area of role development.

All role development activities must be underpinned by appropriate initial and continuing education and training programmes, which incorporate practice and theory.

All Radiographers have a duty to ensure that a safe environment is maintained for staff, patients and visitors to the Department. Radiographers are legally accountable for their actions and for any negligence, whether by act or omission or injury, and regard must be had to these matters in the context of any job enrichment/role development process.

Another aspect of role development for Radiographers is the contribution they can make to providing information and reassurance to patients. Patients are increasingly seeking more information about their diagnostic examinations and treatment. Patient satisfaction and the quality of care given to the patient can be enhanced by a pro-active policy of providing information to meet patient needs. An example of an initiative in this regard by a Senior Radiographer providing a mammography service at St James's Hospital is attached at Appendix IV.

### **8.3 Post-Graduate Training**

It is essential to the continued achievement of a quality Radiography service that post-graduate training opportunities keep pace with changing demands on the service, not least the rapid ongoing changes in technology which have generated a need for Radiographers to develop competencies in various specialist areas.

## **9 Implementation of the Report**

**The Group recommends that both management and staff in individual hospitals use the recommendations presented in this Report to address the concerns particular to their own radiography services within the framework outlined.**

## Appendices

I ISQH analysis - Sample Week Activity

II Case studies

III Radiography Assistants - Job Profile

IV Patient information in Mammography

## Appendix I

### SAMPLE WEEK ACTIVITY

#### Examination Type

The following graph illustrates the total number of examinations carried out during the sample week 19th-25th April 1999. Almost 32,000 examinations were carried out. The Group 1 hospitals accounted for over 59.4% of this total workload.

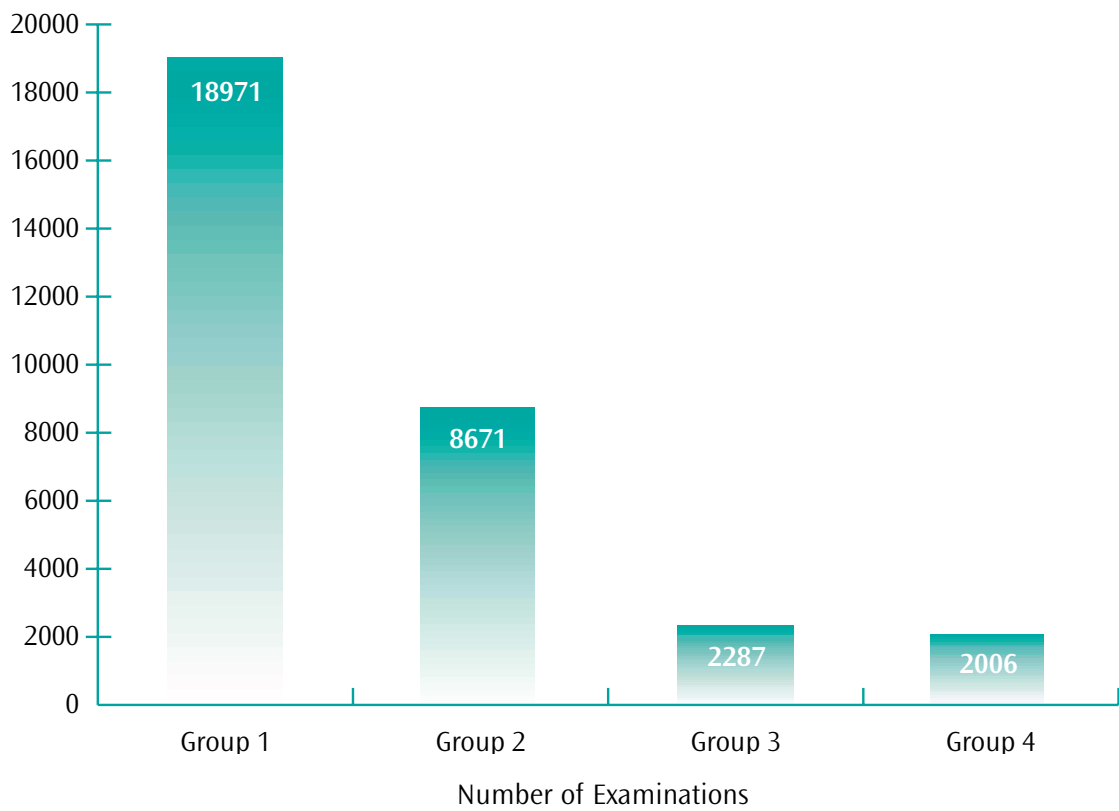


Table 1 illustrates the number of examinations carried out during the sample week period by each examination category. This is broken down into Group 1, 2, 3 and 4. The average number of examinations per hospital in each given group is also presented. From the table, we can see the majority of all examinations are chest and skeletal accounting for over 73% (23,238) of all examinations. These examinations account for over 68% (12,958) of all workload for Group 1 hospitals, 80% (6,894) for Group 2, over 83% (1,904) for Group 3 and over 73% (1,482) of all examinations performed for Group 4 hospitals.

**Table 1:**

**Overall Exams**

	Group 1			Group 2			Group 3			Group 4		
	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean
Chest	5175	27.3%	647	2143	24.9%	214	469	20.6%	52	482	24.0%	121
Skeletal	7783	41.0%	973	4751	55.1%	457	1435	63.0%	159	1000	49.9%	250
Angio Cardiac	442	2.3%	55	26	0.3%	3	0	0.0%	0	8	0.4%	2
Angio Vasc	104	0.5%	13	10	0.1%	1	4	0.2%	0	0	0.0%	0
Angio Neuro	13	0.1%	2	0	0.0%	0	0	0.0%	0	0	0.0%	0
Barium Enema	93	0.5%	12	66	0.8%	7	5	0.2%	1	1	0.0%	0
Barium Meal	179	0.9%	22	59	0.7%	6	8	0.4%	1	14	0.7%	4
CT	1584	8.4%	198	506	5.9%	51	0	0.0%	0	35	1.7%	9
IVP	133	0.7%	17	78	0.9%	8	12	0.5%	1	4	0.2%	1
Mammography	357	1.9%	45	126	1.5%	13	0	0.0%	0	0	0.0%	0
Mobile	216	1.1%	27	59	0.7%	6	8	0.4%	1	14	0.7%	4
MRI	94	0.5%	12	0	0.0%	0	0	0.0%	0	0	0.0%	0
Nuclear Med	966	5.1%	121	129	1.5%	13	0	0.0%	0	199	9.9%	50
Theatre Gen	97	0.5%	12	8	0.1%	1	2	0.1%	0	5	0.2%	1
Theatre Ortho	133	0.7%	17	104	1.2%	10	3	0.1%	0	17	0.8%	4
Ultrasound	1245	6.7%	156	531	6.2%	53	329	14.4%	37	173	8.6%	43
Fluoroscopy	357	1.9%	45	75	0.9%	8	12	0.5%	1	54	27.0%	14
<b>Total</b>	<b>18971</b>	<b>100%</b>	<b>2371</b>	<b>8671</b>	<b>100%</b>	<b>867</b>	<b>2287</b>	<b>100%</b>	<b>254</b>	<b>2006</b>	<b>100%</b>	<b>502</b>

**Peak/Off-Peak Time**

The following graphs illustrate the total number of examinations carried out during various time periods of the day. During Monday-Friday, almost 28,500 examinations were carried out. The busiest time period for all groups was before 13:00, this accounted for 48.8% (13,858) of all weekday examinations. During the weekend, a total of 3,519 examinations were carried out. The busiest time period was between 13:00-17:00, this accounted for 25.9% (910) of weekend workload.

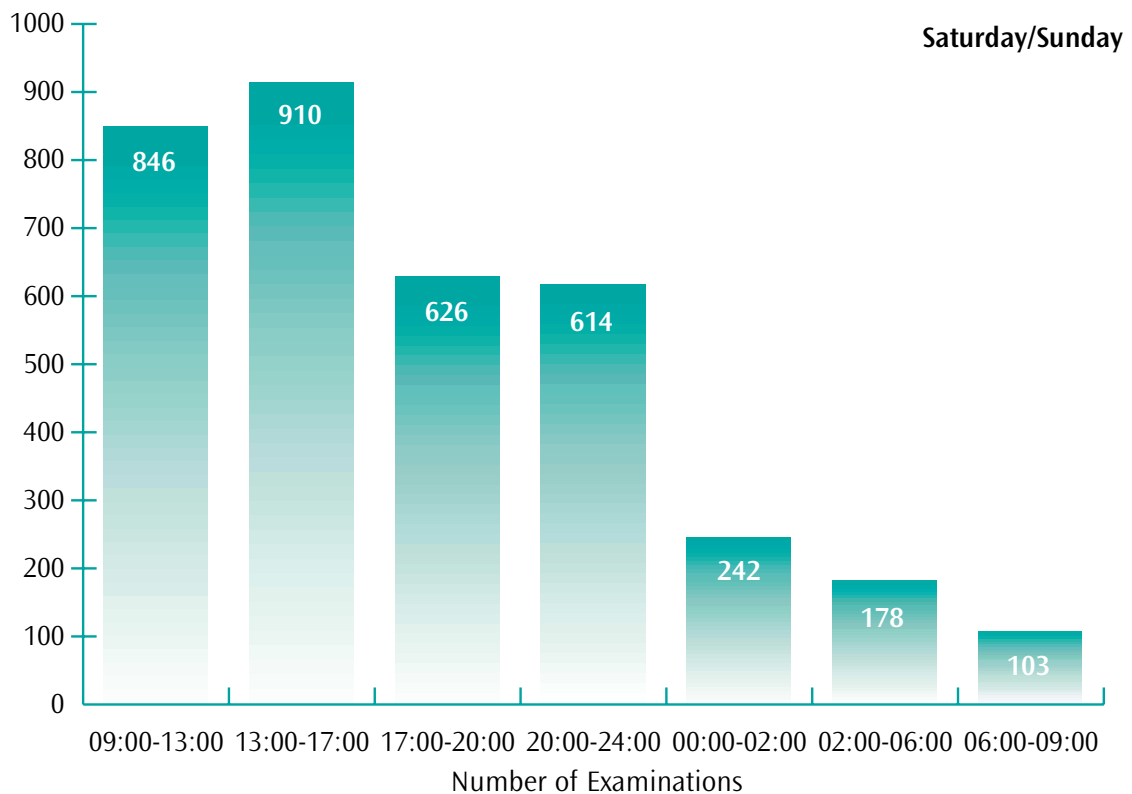
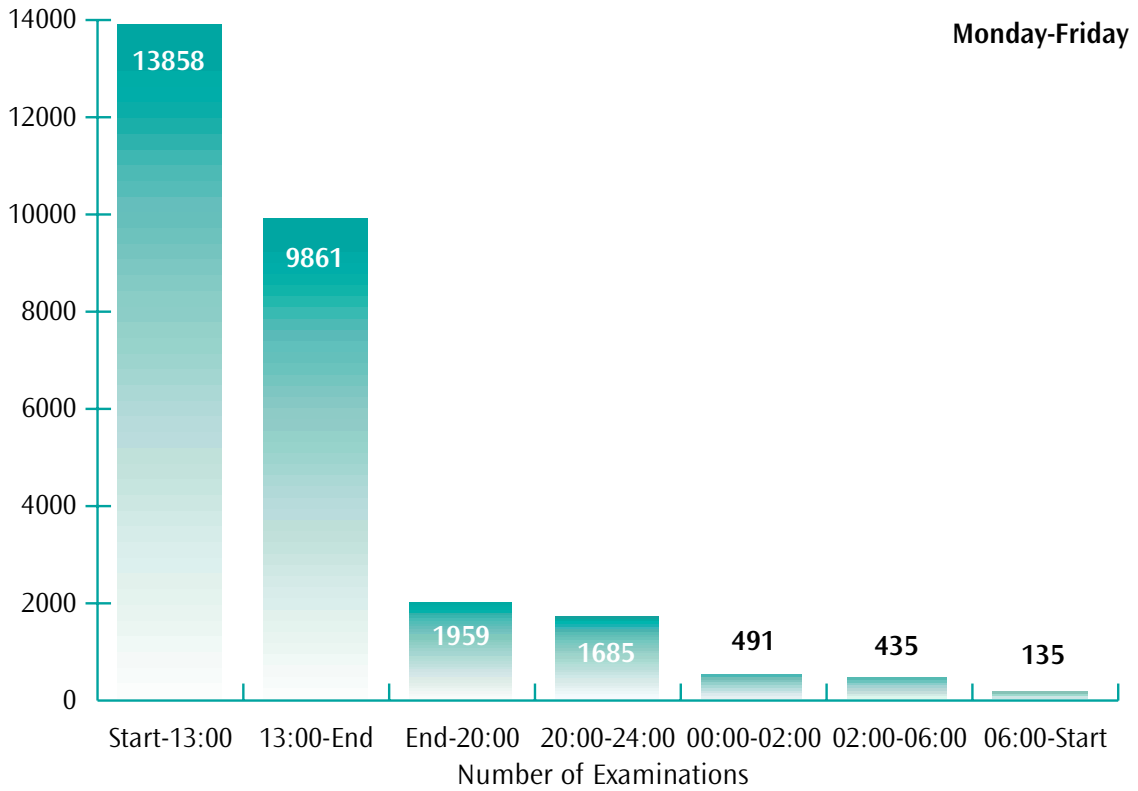


Table 2 illustrates the number of examinations carried out during normal hours and out of hours, and essentially indicates the level of activity and peak times during various times of the day. This is presented by each hospital group, giving the total number of examinations and the average number of examinations within that grouping. The percentage of examinations carried out at any given time is also shown to highlight peak and off-peak times.

The results shown below indicate that between 80%-90% of examinations carried out during Monday to Friday are in “Normal Time”. The busiest time for each Group appears to be before 13:00. During the “Out of Hour” period, the busiest time is before 20:00. This may reflect outpatient appointments that may have ran over schedule.

**Table 2:**

**Peak Times**

	Group 1			Group 2			Group 3			Group 4		
	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean
<b>Monday-Friday</b>												
Normal Start - 13:00	8433	49.9%	1054	3560	46.9%	356	944	45.5%	105	921	49.8%	230
13:00 - Normal End	5624	33.3%	703	2643	34.8%	264	908	43.7%	101	686	37.1%	172
<b>Normal Hours Total</b>	<b>14057</b>	<b>83.2%</b>	<b>1757</b>	<b>6203</b>	<b>81.7%</b>	<b>620</b>	<b>1852</b>	<b>89.2%</b>	<b>206</b>	<b>1607</b>	<b>86.9%</b>	<b>402</b>
Normal End - 20:00	1094	6.5%	137	646	8.5%	65	101	4.9%	11	118	6.4%	30
20:00 - 24:00	966	5.7%	121	509	6.7%	51	100	4.8%	11	110	5.9%	28
00:00 - 02:00	354	2.1%	44	125	1.6%	13	4	0.2%	0	8	0.4%	2
02:00 - 06:00	320	1.9%	40	87	1.1%	9	20	1.0%	2	8	0.4%	2
06:00 - Normal Start	106	0.6%	13	28	0.4%	3	1	0.0%	0	0	0.0%	0
<b>Out of Hours Total</b>	<b>2840</b>	<b>16.8%</b>	<b>355</b>	<b>1395</b>	<b>18.3%</b>	<b>141</b>	<b>226</b>	<b>10.9%</b>	<b>24</b>	<b>244</b>	<b>13.1%</b>	<b>62</b>
<b>Saturday/Sunday</b>												
09:00 - 13:00	524	25.0%	66	226	21.2%	23	52	26.0%	6	44	27.7%	11
13:00 - 17:00	479	22.9%	60	325	30.5%	33	57	28.5%	6	49	30.8%	12
17:00 - 20:00	350	16.7%	44	210	19.7%	21	38	19.0%	4	28	17.6%	7
20:00 - 24:00	346	16.5%	43	208	19.5%	21	32	16.0%	4	28	17.6%	7
00:00 - 02:00	177	8.4%	22	44	4.1%	4	16	8.0%	2	5	3.1%	1
02:00 - 06:00	141	6.7%	18	31	2.9%	3	4	2.0%	0	2	1.3%	1
06:00 - 09:00	78	3.7%	10	21	2.0%	2	1	0.5%	0	3	1.9%	1
<b>Weekend Total</b>	<b>2095</b>	<b>100%</b>	<b>262</b>	<b>1065</b>	<b>100%</b>	<b>107</b>	<b>200</b>	<b>100%</b>	<b>22</b>	<b>159</b>	<b>100%</b>	<b>40</b>

### Patient Source

The following graph illustrates the source of referral for an examination. This graph indicates the Accident & Emergency Department was the busiest referral source, which accounted for 31.2% (9,940) of workload. Inpatients and the Outpatients Department followed closely accounting for 29.1% (9,240) and 27.4% (8,724) respectively of all workload.

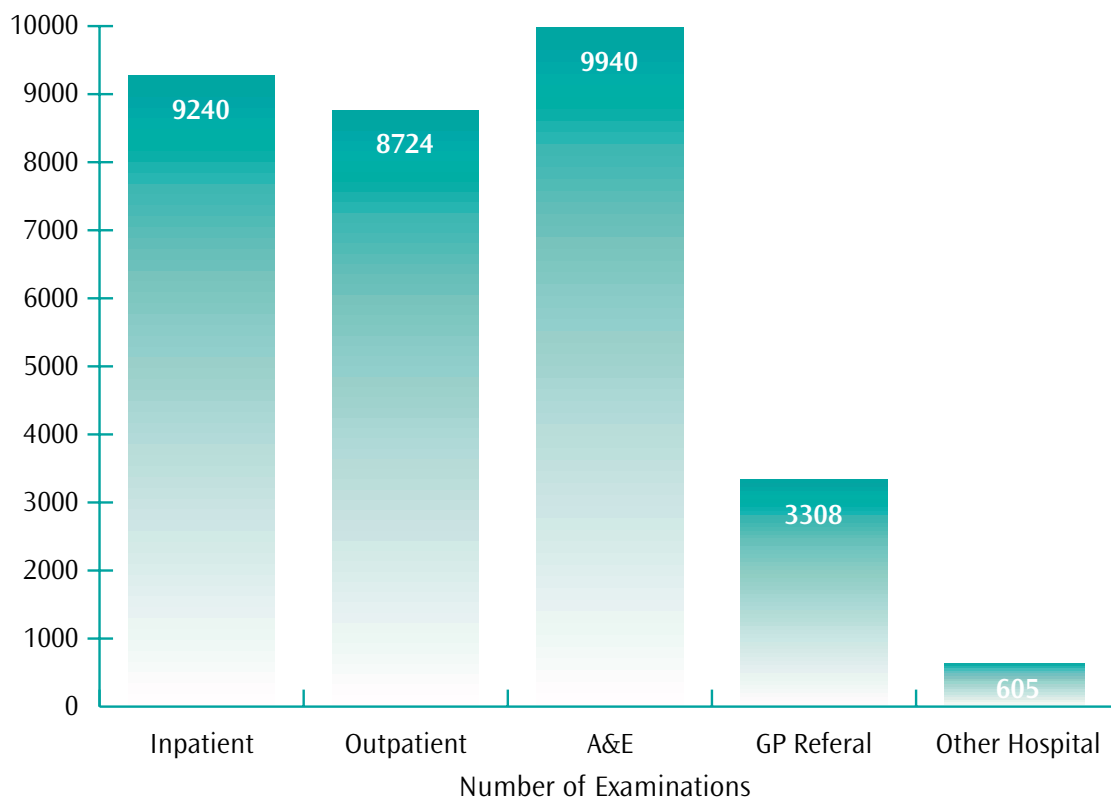


Table 3 illustrates the source of referral for an examination. This is presented by each hospital group, giving the total number of examinations and the average number of examinations within that grouping.

The results shown below indicate that the incidence of referral from other hospitals is a relatively low source for all hospital groups accounting for 2.6%, 1.3%, 0.2% and 0.1% respectively of all workload. The Accident & Emergency Department was the busiest source for Group 1 and Group 2 hospitals, accounting for 30.5% (5,781) and 35.8% (3,079) of workload, while the outpatients department was the busiest source for Group 3 and Group 4 hospitals accounting for 34.6% (785) and 36.9% (738) of workload.

**Table 3:**

#### Referred From

	Group 1			Group 2			Group 3			Group 4		
	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean
Inpatient	5783	30.5%	723	2156	25.1%	216	602	26.5%	67	699	34.9%	175
Outpatient	4995	26.4%	624	2206	25.6%	221	785	34.6%	87	738	36.9%	185
A&E	5781	30.5%	723	3079	35.8%	308	656	28.9%	73	424	21.2%	106
GP Referral	1895	10.0%	237	1052	12.2%	105	222	9.8%	25	139	6.9%	35
Other Hospital	490	2.6%	61	109	1.3%	11	4	0.2%	0.5	2	0.1%	0.5



### Patient Classification

The following graph illustrates the classification of each patient referred for an examination. The majority of these patients were classified as ambulatory, this accounted for over 59.4% (18,820) of all examinations recorded during the sample week.

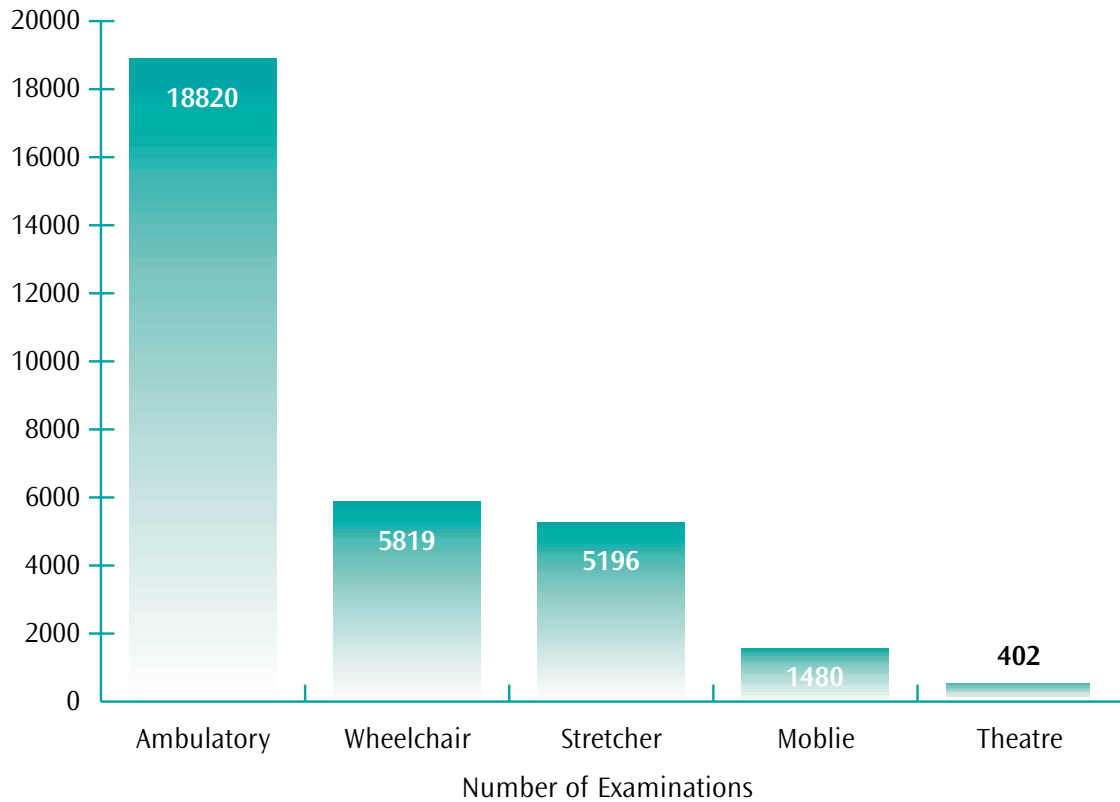


Table 4 illustrates the classification of patients referred for an examination. This is presented by each hospital group, giving the total number of examinations and the average number of examinations within that grouping. These results show that between 57% and 69% of patients were classified as ambulatory.

**Table 4:**

### Patient Classification

	Group 1			Group 2			Group 3			Group 4		
	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean
Ambulatory	10832	57.3%	1354	5075	59.3%	508	1561	69.5%	173	1352	67.9%	338
Wheelchair	3279	17.3%	410	1862	21.8%	186	337	15.0%	37	341	17.1%	85
Stretcher	3670	19.4%	459	1261	14.7%	126	199	8.9%	22	66	3.3%	17
Mobile	975	5.2%	122	209	2.4%	21	106	4.7%	12	190	9.5%	48
Theatre	158	0.8%	20	155	1.8%	16	47	2.1%	5	42	2.1%	11

### Supplementary Information

The following graph illustrates various supplementary information recorded during the sample week. It is interesting to note that 13% (4,188) of all examinations were with difficult/uncooperative patients and a further 15.9% (5,094) of examinations were with patients that required help from staff. This information can indicate where staff may require further training or assistance.

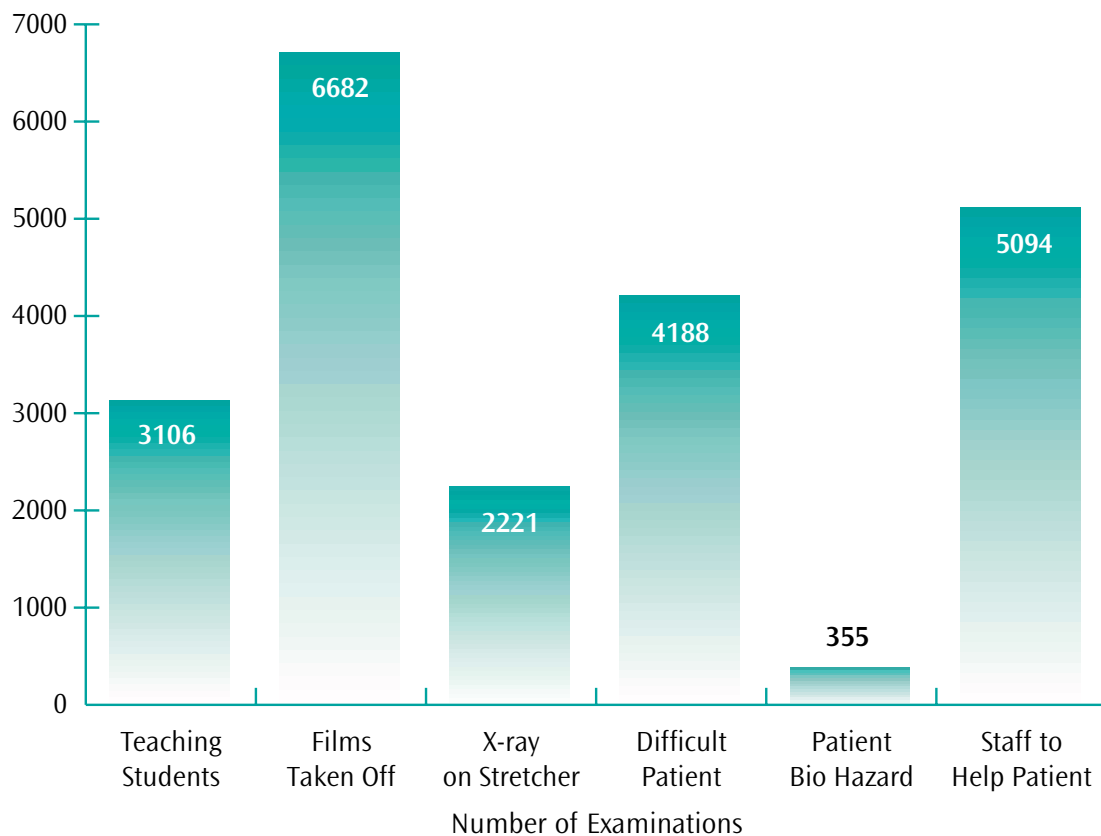


Table 5 illustrates the incidence of the following:

- Teaching students
- Films Taken Off
- On Stretcher
- Difficult Patient
- Patient Biohazard
- Staff to Help Patient

This information is broken down into hospital groups, indicating the total number of responses and the average number of responses.

**Table 5:**  
**Supplementary Information**

	Group 1			Group 2			Group 3			Group 4		
	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean
Students	2728	14.4%	341	147	1.7%	15	222	9.7%	25	9	0.4%	2
Film Taken Off	2226	11.7%	278	2537	29.3%	254	1601	70.0%	78	318	15.8%	80
On Stretcher	1730	9.1%	216	429	5.0%	43	45	2.0%	5	17	0.8%	4
Difficult Patient	2625	13.8%	328	1055	12.2%	160	258	11.3%	29	250	12.4%	63
Pt Bio Hazard	268	1.4%	34	74	0.9%	7	3	0.1%	0.3	10	0.05%	3
Staff to Help Patient	3131	16.5%	391	1311	15.1%	131	370	16.2%	41	282	14.0%	71

### Day-to-Day Activity Levels

This graph illustrates the number of examinations carried out during the sample week. This can indicate the busiest day and ultimately, can assist in planning and resource allocation. From the graph, it is clear that Monday and Tuesday are the busiest days, accounting for 19.3% (6,181) and 19.1% (6,115) of all examinations recorded during the sample week.

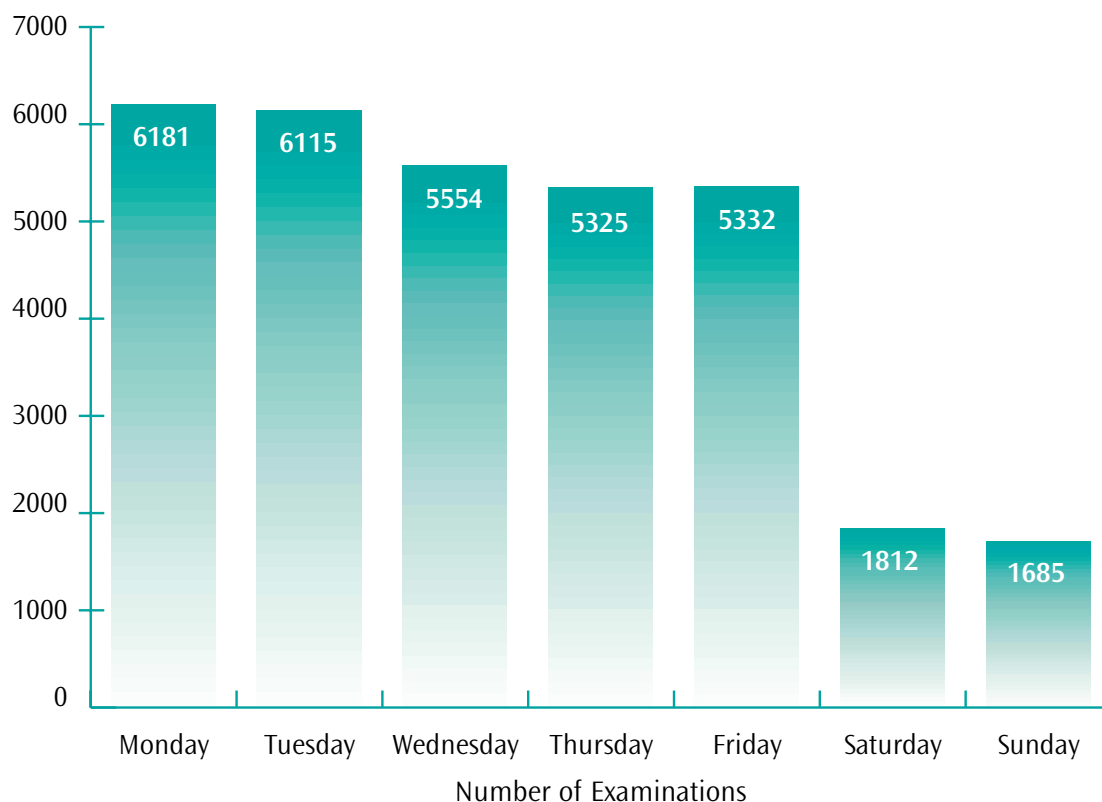


Table 6 illustrates the day-to-day activity levels for each hospital group, giving the total number of examinations and the average number of examinations within that grouping.

**Table 6:**

### Day-to-Day Activity Levels

	Group 1			Group 2			Group 3			Group 4		
	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean
Monday	3451	18.2%	431	1781	20.5%	178	535	23.4%	59	414	20.5%	104
Tuesday	3484	18.3%	436	1871	21.6%	187	387	16.9%	43	373	18.4%	93
Wednesday	3448	18.1%	431	1257	14.5%	126	414	18.1%	46	435	21.5%	109
Thursday	3324	17.5%	416	1297	15.0%	130	399	17.4%	44	305	15.1%	76
Friday	3241	17.1%	405	1399	16.1%	140	355	15.5%	39	337	16.7%	84
Saturday	1072	5.6%	134	561	6.5%	56	79	3.4%	9	100	4.9%	25
Sunday	985	5.2%	123	514	5.9%	51	127	5.5%	14	59	2.9%	15

### Multiple Examinations

Table 7 details information on multiple examinations. During the sample week period a total of 20.2% (6,447) of all examinations were instances whereby a patient received more than one examination. This is broken down into each examination category and, in Table 8, broken down into each day of the sample week.

**Table 7:**

### Multiple Examinations

	Group 1			Group 2			Group 3			Group 4		
	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean
Chest	279	6.9%	35	114	6.8%	11	20	4.7%	2	9	3.3%	2
Skeletal	2244	55.5%	281	1281	75.9%	128	372	87.5%	41	140	51.1%	35
Angio Cardiac	200	4.9%	25	1	0.1%	0	0	0.0%	0	0	0.0%	0
Angio Vasc	21	0.5%	3	0	0.0%	0	2	0.5%	0	0	0.0%	0
Angio Neuro	1	0.02%	0	0	0.0%	0	0	0.0%	0	0	0.0%	0
Barium Enema	10	0.3%	1	3	0.2%	0	0	0.0%	0	0	0.0%	0
Barium Meal	17	0.4%	2	5	0.3%	0	0	0.0%	0	2	0.7%	1
CT	380	9.4%	48	131	7.8%	13	0	0.0%	0	3	1.1%	1
IVP	32	0.8%	4	6	0.4%	1	0	0.0%	0	0	0.0%	0
Mammography	46	1.1%	6	16	0.9%	1	0	0.0%	0	0	0.0%	0
Mobile	8	0.2%	1	3	0.2%	0	0	0.0%	0	1	0.4%	0
MRI	1	0.02%	0	0	0.0%	0	0	0.0%	0	0	0.0%	0
Nuclear Med	460	11.4%	58	4	0.2%	0	0	0.0%	0	105	38.3%	26
Theatre Gen	8	0.2%	1	0	0.0%	0	0	0.0%	0	0	0.0%	0
Theatre Ortho	11	0.3%	1	36	2.1%	4	0	0.0%	0	0	0.0%	0
Ultrasound	231	5.7%	29	79	4.7%	8	27	6.4%	3	12	4.4%	3
Fluoroscopy	94	2.3%	12	8	0.5%	1	4	0.9%	0	2	0.7%	1

**Table 8:**

### Multiple Examinations

	Group 1			Group 2			Group 3			Group 4		
	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean	Total	%Total	Mean
Monday	692	17.1%	87	340	20.0%	34	96	22.6%	11	58	20.9%	15
Tuesday	759	18.8%	95	374	22.1%	37	74	17.4%	8	52	18.8%	13
Wednesday	730	18.0%	91	211	12.4%	23	84	19.8%	9	50	18.1%	13
Thursday	738	18.2%	92	227	13.4%	21	72	16.9%	8	44	15.9%	11
Friday	686	16.9%	86	266	15.7%	27	43	10.1%	5	61	22.0%	15
Saturday	253	6.3%	32	133	7.8%	15	26	6.1%	3	10	3.6%	2
Sunday	191	4.7%	24	145	8.5%	13	30	7.1%	3	2	0.7%	0.5
<b>Total</b>	<b>4049</b>	<b>100%</b>	<b>506</b>	<b>1696</b>	<b>100%</b>	<b>170</b>	<b>425</b>	<b>100%</b>	<b>47</b>	<b>277</b>	<b>100%</b>	<b>69</b>

**Out of Hours**

In order to determine the out of hour requirements, tables 9 and 10 (overleaf) look at the total out of hour activity by each exam type. The results highlight that the majority of “out of hour” examinations are in fact general examinations: chest or skeletal. The incidence of specialised examinations is relatively low.

**Table 9:**

**Out of Hour Requirements: Monday - Friday**

	<b>End- 20:00</b>	<b>%</b>	<b>20:00- 24:00</b>	<b>%</b>	<b>00:00- 02:00</b>	<b>%</b>	<b>02:00- 06:00</b>	<b>%</b>	<b>06:00- Start</b>	<b>%</b>
<b>Group 1 (n=8)</b>										
Chest	379	34.8%	325	33.7%	122	34.5%	104	32.6%	27	25.5%
Skeletal	542	49.8%	585	60.7%	221	62.4%	199	62.4%	73	68.9%
Angio Cardiac	7	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Vasc	1	0.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Neuro	0	0.0%	1	0.1%	0	0.0%	0	0.0%	0	0.0%
Barium Enema	0	0.0%	1	0.1%	0	0.0%	0	0.0%	0	0.0%
Barium Meal	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT	83	7.6%	24	2.5%	5	1.4%	8	2.5%	3	2.8%
IVP	6	0.6%	0	0.0%	2	0.6%	0	0.0%	0	0.0%
Mammography	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mobile	18	1.7%	14	1.5%	4	1.1%	4	1.3%	0	0.0%
MRI	22	2.0%	2	0.2%	0	0.0%	0	0.0%	2	1.9%
Nuclear Med	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Gen	5	0.5%	2	0.2%	0	0.0%	2	0.6%	0	0.0%
Theatre Ortho	11	1.0%	7	0.7%	0	0.0%	2	0.6%	1	0.9%
Ultrasound	5	0.5%	3	0.3%	0	0.0%	0	0.0%	0	0.0%
Fluoroscopy	9	0.8%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Group 2 (n=10)</b>										
Chest	195	29.9%	159	31.2%	48	38.4%	33	37.9%	13	48.1%
Skeletal	408	62.6%	334	65.6%	75	60.0%	52	59.8%	13	48.1%
Angio Cardiac	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Vasc	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Neuro	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Enema	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Meal	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT	21	3.2%	1	0.2%	0	0.0%	0	0.0%	0	0.0%
IVP	1	0.2%	4	0.8%	0	0.0%	0	0.0%	0	0.0%
Mammography	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mobile	11	1.7%	5	1.0%	2	1.6%	2	2.3%	0	0.0%
MRI	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nuclear Med	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Gen	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Ortho	14	2.1%	6	1.2%	0	0.0%	0	0.0%	1	3.7%
Ultrasound	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Fluoroscopy	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

	End- 20:00	%	20:00- 24:00	%	00:00- 02:00	%	02:00- 06:00	%	06:00- Start	%
<b>Group 3 (n=9)</b>										
Chest	25	25.3%	26	26.0%	0	0.0%	7	35.0%	1	100%
Skeletal	74	74.7%	74	74.0%	4	100%	13	65.0%	0	%
Angio Cardiac	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Vasc	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Neuro	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Enema	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Meal	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
IVP	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mammography	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mobile	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
MRI	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nuclear Med	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Gen	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Ortho	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Ultrasound	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Fluoroscopy	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Group 4 (n=4)</b>										
Chest	38	32.2%	29	26.6%	4	50.0%	8	100%	0	0.0%
Skeletal	78	66.1%	79	72.5%	4	50.0%	0	0.0%	0	0.0%
Angio Cardiac	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Vasc	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Neuro	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Enema	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Meal	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
IVP	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mammography	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mobile	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
MRI	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nuclear Med	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Gen	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Ortho	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Ultrasound	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Fluoroscopy	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Table 10:

Out of Hour Requirements: Saturday/Sunday

	09:00- 13:00	%	13:00- 17:00	%	17:00- 20:00	%	20:00- 24:00	%	00:00- 02:00	%	02:00- 06:00	%	06:00- 09:00	%
<b>Group 1 (n=8)</b>														
Chest	184	35.2%	151	31.6%	90	25.7%	101	29.2%	59	33.3%	38	27.0%	41	52.6%
Skeletal	214	40.9%	277	57.9%	239	68.3%	219	63.3%	113	63.8%	99	70.2%	32	41.0%
Angio Cardiac	0	0.0%	5	1.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Vasc	2	0.4%	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Neuro	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Enema	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Meal	0	0.0%	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT	14	2.7%	16	3.3%	10	2.9%	14	2.3%	4	2.3%	2	1.4%	5	6.4%
IVP	1	0.2%	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mammography	2	0.4%	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mobile	73	14.0%	11	2.3%	5	1.4%	7	0.6%	1	0.0%	0	0.0%	0	0.0%
MRI	6	1.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nuclear Med	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Gen	5	1.0%	1	0.2%	1	0.3%	3	0.0%	0	0.0%	1	0.7%	0	0.0%
Theatre Ortho	6	1.1%	10	2.1%	4	1.1%	1	0.0%	0	0.0%	1	0.7%	0	0.0%
Ultrasound	6	1.1%	0	0.0%	1	0.3%	1	0.0%	0	0.0%	0	0.0%	0	0.0%
Fluoroscopy	9	1.7%	3	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Group 2 (n=10)</b>														
Chest	58	25.9%	65	20.1%	55	26.2%	61	29.5%	20	45.5%	14	45.2%	6	28.6%
Skeletal	140	62.5%	240	74.3%	154	73.3%	145	70.0%	23	52.3%	17	54.8%	15	71.4%
Angio Cardiac	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Vasc	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Neuro	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Enema	0	0.0%	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Meal	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT	10	4.5%	4	1.2%	1	0.5%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
IVP	1	0.4%	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mammography	1	0.4%	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mobile	3	1.3%	2	0.6%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
MRI	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nuclear Med	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Gen	0	0.0%	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Ortho	8	3.6%	7	2.2%	0	0.0%	1	0.5%	1	2.3%	0	0.0%	0	0.0%
Ultrasound	3	1.3%	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Fluoroscopy	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%



	09:00- 13:00	%	13:00- 17:00	%	17:00- 20:00	%	20:00- 24:00	%	00:00- 02:00	%	02:00- 06:00	%	06:00- 09:00	%
<b>Group 3 (n=9)</b>														
Chest	16	30.8%	15	26.3%	10	26.3%	8	26.7%	5	31.2%	4	100%	1	100%
Skeletal	36	69.2%	42	73.7%	28	73.7%	22	73.3%	11	68.8%	0	0.0%	0	0.0%
Angio Cardiac	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Vasc	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Neuro	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Enema	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Meal	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
IVP	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mammography	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mobile	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
MRI	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nuclear Med	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Gen	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Ortho	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Ultrasound	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Fluoroscopy	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Group 4 (n=4)</b>														
Chest	17	38.6%	9	18.4%	2	7.1%	8	30.8%	3	60.0%	2	100%	3	100%
Skeletal	27	61.4%	40	81.6%	25	89.3%	16	61.5%	2	40.0%	0	0.0%	0	0.0%
Angio Cardiac	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Vasc	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Angio Neuro	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Enema	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Barium Meal	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
CT	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
IVP	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mammography	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Mobile	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
MRI	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Nuclear Med	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Gen	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Theatre Ortho	0	0.0%	0	0.0%	1	3.6%	2	7.7%	0	0.0%	0	0.0%	0	0.0%
Ultrasound	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Fluoroscopy	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

### Out of Hours

In order to further determine the out of hour requirements, Tables 11 and 12 below look at the total out of hour activity by source of referral. These results together with those in Tables 9 and 10, can indicate the type and the number of examination room/s that should be used during the out of hour period. It can also give an indication as to the number of Radiologists/ Radiographers that should be on-call, detail the amount of workload that can be controlled and planned for more effectively (ie: OPD) and ultimately, result in more effective planning and resource allocation.

**Table 11:**

#### Out of Hour Requirements: Monday - Friday

	End- 20:00	%	20:00- 24:00	%	00:00- 02:00	%	02:00- 06:00	%	06:00- Start	%
<b>Group 1 (n=8)</b>										
Inpatient	278	25.5%	189	19.6%	36	10.2%	28	8.8%	2	1.9%
Outpatient	51	4.7%	2	0.2%	0	0.0%	0	0.0%	3	2.8%
A&E	748	68.6%	772	79.9%	318	89.8%	288	90.3%	93	87.7%
GP Referral	1	0.1%	0	0.0%	0	0.0%	1	0.3%	4	3.8%
Other Hospital	13	1.2%	3	0.3%	0	0.0%	2	0.6%	4	3.8%
<b>Group 2 (n=10)</b>										
Inpatient	115	17.9%	80	15.8%	14	11.4%	8	9.2%	3	11.1%
Outpatient	52	8.1%	0	0.0%	0	0.0%	0	0.0%	1	3.7%
A&E	470	73.1%	418	82.5%	109	88.6%	79	90.8%	22	81.5%
GP Referral	4	0.6%	7	1.4%	0	0.0%	0	0.0%	1	3.7%
Other Hospital	2	0.3%	2	0.4%	0	0.0%	0	0.0%	0	0.0%
<b>Group 3 (n=9)</b>										
Inpatient	18	17.8%	18	18.0%	2	50.0%	0	0.0%	4	22.2%
Outpatient	8	7.9%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
A&E	74	73.0%	82	82.0%	2	50.0%	1	100%	14	77.8%
GP Referral	1	1.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other Hospital	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Group 4 (n=4)</b>										
Inpatient	28	23.7%	23	21.3%	2	25.0%	7	87.5%	0	0.0%
Outpatient	10	8.5%	4	3.7%	0	0.0%	0	0.0%	0	0.0%
A&E	80	67.8%	81	75.0%	6	75.0%	1	12.5%	0	0.0%
GP Referral	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other Hospital	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

Table 12:

Out of Hour Requirements: Saturday/Sunday

	09:00- 13:00	%	13:00- 17:00	%	17:00- 20:00	%	20:00- 24:00	%	00:00- 02:00	%	02:00- 06:00	%	06:00- 09:00	%
<b>Group 1 (n=8)</b>														
Inpatient	250	47.7%	114	23.8%	51	14.6%	57	16.5%	13	7.4%	12	8.6%	22	28.6%
Outpatient	21	4.0%	2	0.4%	0	0.0%	0	0.0%	1	0.6%	0	0.0%	0	0.0%
A&E	250	47.7%	357	74.7%	298	85.1%	289	83.5%	162	92.0%	127	91.4%	55	71.4%
GP Referral	2	0.4%	1	0.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other Hospital	1	0.2%	4	0.8%	1	0.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Group 2 (n=10)</b>														
Inpatient	75	33.6%	66	20.3%	39	18.7%	34	16.4%	14	31.8%	5	16.8%	1	4.8%
Outpatient	5	2.4%	7	2.2%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
A&E	143	64.1%	252	77.5%	170	81.3%	172	83.1%	30	68.2%	25	83.3%	20	95.2%
GP Referral	0	0.0%	0	0.0%	0	0.0%	1	0.5%	0	0.0%	0	0.0%	0	0.0%
Other Hospital	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Group 3 (n=9)</b>														
Inpatient	22	42.3%	10	17.9%	5	13.2%	0	0.0%	2	12.5%	3	75.0%	1	100%
Outpatient	0	0%	4	7.1%	2	5.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
A&E	30	57.7%	42	75.0%	31	81.6%	32	100%	14	87.5%	1	25.0%	0	0.0%
GP Referral	0	0.0%	0	0.0%	0	%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other Hospital	0	0.0%	0	0.0%	0	%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
<b>Group 4 (n=4)</b>														
Inpatient	31	70.5%	10	20.4%	5	17.9%	8	28.6%	2	40.0%	2	100%	3	100%
Outpatient	0	0.0%	3	6.12%	13	46.4%	12	42.9%	3	60.0%	0	0.0%	0	0.0%
A&E	13	29.6%	36	73.5%	10	35.7%	8	28.6%	0	0.0%	0	0.0%	0	0.0%
GP Referral	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other Hospital	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%

### Room Activity

Table 13 illustrates the total number of examinations carried out in various examination rooms mentioned by each hospital. The A&E rooms and General rooms, and Ultrasound appear to be three of the busiest rooms for these hospital Groups.

**Table 13:**

### Room Activity

Group 1			Group 2		
Examination Room	Total	%	Examination Room	Total	%
A&E	3816	23.75%	A&E	866	9.99%
Angiography	46	0.29%	Angiography	10	0.12%
Barium	53	0.33%	Cardiac Cath-Lab	24	0.28%
Cardiac Cath-Lab	88	0.55%	Cat Scan	436	5.03%
Cat Scan	1495	9.30%	Chest Room	105	1.21%
Chest Room	1288	8.02%	CT Inj	77	0.89%
CT Ant	68	0.42%	Darkroom Processor	54	0.62%
CT Spinal	128	0.80%	Dental	74	0.85%
Fluoroscopy/Angio	32	0.20%	General	4300	49.60%
Fluoroscopy Room	43	0.27%	General/A&E	450	5.19%
General Room	3268	20.34%	General/IVP	240	2.77%
General/IVP	191	1.19%	General/Portables	1	0.01%
General/A&E	959	5.97%	General/Screening	56	0.65%
General/Screening	55	0.34%	General/Chest	181	2.09%
General/Skull	135	0.84%	IVP	76	0.88%
General/Vascular	40	0.25%	Mammomgraphy	143	1.65%
H1 Paediatrics	136	0.85%	Mobiles	95	1.10%
H2 Paediatrics	256	1.59%	Nuclear Medicine	126	1.45%
Screening	15	0.09%	Orth. Theatre	3	0.03%
House-call	131	0.82%	Portables	26	0.30%
Inpatient	95	0.59%	Portables/Theatre	9	0.10%
IVP	17	0.11%	Room 1	22	0.25%
Littotripter	309	1.92%	Room 2	40	0.46%
Mammography	292	1.82%	Room 3	27	0.31%
Mobile	93	0.58%	Room 4	89	1.03%
MRI	6	0.04%	Room 5	75	0.87%
Neuro Angiography	16	0.10%	Screening Room	138	1.59%
Neuro Vascular	771	4.80%	Theatre	149	1.72%
Nuclear Medicine	11	0.07%	Thoromat	155	1.79%
OPG	3	0.02%	Ultrasound	575	6.63%
Paediatrics Theatre	295	1.84%	Urology	48	0.55%
Portables	58	0.36%			
Room 1	67	0.42%			
Room 2	38	0.24%			
Room 3	47	0.29%			
Room 4	6	0.04%			
Room 9	191	1.19%			
Screening Room	26	0.16%			
Specials	136	0.85%			
Theatre	230	1.43%			
Thoromat	1068	6.65%			
Ultrasound	49	0.30%			
Use					

Group 3			Group 4		
Examination Room	Total	%	Examination Room	Total	%
General	12069	54.85%	Ultra Sound	460	20.09%
CT	36	1.63%	General	1378	60.17%
Screening Room	42	1.91%	Theatre	28	1.22%
Ultra Sound	174	7.89%	Mobile	22	0.96%
Mobiles	124	5.63%	General/Screening	168	7.34%
Nuclear Medicine	208	9.44%	General/Theatre	30	1.31%
A&E	100	4.54%	Dental Hospital	204	8.91%
Cardiac	8	0.36%			
Orthopaedics	71	3.22%			
General/Fluoroscopy	32	1.45%			
Theatre	5	0.23%			
Fluoroscopy	8	0.36%			
General/Mobile	7	0.32%			

## Appendix II

### CASE STUDIES

#### 1. Control of Access to X-Ray Examination<sup>9</sup>

The first example, from the Irish Institute of Radiography, describes how the implementation of the RCR Guidelines led to a reduction in hospital outpatient and inpatient referrals of the order of 17% to 24% respectively in an Irish hospital. This allowed increased access for GP referrals (almost an additional 1000 patients) whilst at the same time achieving a small reduction in the overall number of examinations.

Source	1/4/1995 to 31/3/1996		1/4/1998 to 31/3/1999		Difference
	Patients	Examinations	Patients	Examinations	
A&E	8353	11527	8895	11191	6.5%/-0.5%
IP	4782	6540	3634	4947	-24%/-24.3%
OPD	2890	4314	2431	3563	-16%/-17.4%
GP	4172	5451	6209	7986	48.8%/46.5%
<b>Total</b>	<b>20197</b>	<b>27832</b>	<b>21169</b>	<b>27687</b>	<b>4.8%/-0.53%</b>

#### 2. Reduction in inappropriate use of radiographic investigations amongst GPs by an education initiative<sup>10</sup>

##### Purpose

An interface audit project was undertaken to reduce inappropriate use of radiographic investigations (especially those involving high dose radiation) amongst General Practitioners (GPs).

##### Methods

Data regarding referral rate by GPs for 5 commonly requested radiological investigations (lumbar spine, hip, pelvis, knee and chest radiographs) were collected prior to the audit. Subsequently, all GP practices within the Liverpool region received a copy of the RCR guidelines 'Making Best Use of a Department of Clinical Radiology'. This was followed by a number of educational exercises aimed at both GPs and patients. Requests from GPs received by the 3 provider units were then collected on a 6 month basis, beginning with the period of January-June 1997 and ending July-August 1998. Referral rate for the above mentioned radiographic investigations was then calculated for each practice. The resultant data, comparing referral rates of practices with each other and the city as a whole, were regularly fed back to the GPs involved.

<sup>9</sup> Murray, Liam, *Control of Access to X-Ray Examination*; Irish Institute of Radiography submission to the Service Review.

<sup>10</sup> Eyes, B., et al; 'Reduction in inappropriate use of Radiographic investigations amongst GPs by an education initiative', in *Radiology* 2000 - Imaging, Oncology & Science.

## Results

Over the time period of this audit, significant decreases in referral rates ( $p < 0.01$ ) were observed in 4 of the 5 investigations under review: lumbar spine radiograph, 48%; knee radiograph, 38%; hip radiograph, 30%; pelvic radiograph, 24%. The referral rate for chest radiograph did not show any significant change during the studied time period.

## Conclusions

The use of written feedback to GPs on their practice referral rates for commonly requested, frequently inappropriate and high dose radiation investigations, together with written guidelines, was highly effective in the reduction of patients' radiation exposure.

## Appendix III

### RADIOGRAPHY ASSISTANTS - JOB PROFILE

#### Ultrasound Technical Assistant, Department of Radiology

Reporting to the Radiography Services Manager or designated supervisor and functioning in accordance with the general policies and procedures for (*insert relevant Hospital/Health Board name*), the duties of the Ultrasound Technical Assistant are as follows:

##### Patient Care

Assist patients change appropriately for the relevant ultrasound examination and instruct patients on the proper care of personal belongings.

Escort patient to ultrasound room and prepare patient for ultrasound examination.

Enter relevant data into ultrasound machine and check the patient details.

Have respect for the patient at all times and be aware that any information discussed with the patient during the examination is private and confidential.

Escort patient back to change room after examination, giving assistance when necessary.

When examinations are delayed, reassure patients and give a reasonable estimate of when they will be taken.

Monitor patients who have been scheduled for pelvic examinations and make sure to inform the sonographer of any difficulties immediately.

Chaperone the sonographer for all examinations.

Do not leave the room during transvaginal, scrotal and breast ultrasound examinations.

Flexibility with regard to taking lunch breaks and finishing work at the end of the day to accommodate delays in patient scheduling.

##### Patient Information

Collect patient documentation and charts from reception and ensure that all paperwork is correct for each individual patient.

Ensure technical data reports and charts are properly processed in accordance with instructions.

##### Stocks and Room Supplies

Assist in the monitoring and replenishing of stocks as required.

Assist sonographer in maintaining relevant supplies from Pharmacy, Stores and Laboratory.

Ensure the timely transfer/delivery of specimens to the laboratory as required.

Send required instruments for sterilisation and collect these instruments when ready.

Maintain a constant supply of warm gel in clean gel bottles.

##### Routine Maintenance of Equipment

Ensure that ultrasound examination rooms are kept clean and tidy at all times.

Assist the radiographer with the sterilisation and disinfection procedures carried out in the area as required.

Help sonographer to clean room after each patient and prepare for next patient.

Carry out any necessary requirements in relation to room or equipment prior to or after the clinic.

##### General

Perform such other duties appropriate to the post as may be assigned from time to time.



## Appendix IV

### PATIENT INFORMATION IN MAMMOGRAPHY - ITS EXTENT AND EFFICIENCY<sup>11</sup>

#### Introduction

There have been many studies demonstrating the need for more information to be given to patients. It is not only desirable from the view point of the patients' satisfaction with their treatment, but also, in regard to the quality of care given to the patient.

Almost all of the research undertaken regarding information provision states clearly the benefits of providing information but fails to identify the nature or amount of the information the patient requires. I set out to discover the amount of knowledge patients have when presenting for mammography and to investigate the accuracy of such information thus enabling me to identify areas which can be improved upon.

The main objectives of this study were to discover the extent of pre-examination information given to patients who present for mammography (x-ray of the breasts):

- Identify the sources of information
- Ascertain the perceived accuracy of that pre-examination information to patients measured against their actual experience of mammography
- Identify areas whereby patient information in mammography can be improved
- Assess the costs and benefits of providing such information

My anticipation about the results of such a study were that women presenting for mammography would know very little about the examination and would welcome any information given to them. I expected their own perceived emotional state (nervousness/anxiousness) to be somewhat reduced if provided with knowledge prior to the examination.

A questionnaire based study was carried out to ascertain the extent of prior information given to patients and an initial pilot study resulted in modification of the first questionnaire given to patients presenting for mammography. A sample of these patients was also interviewed in order to find out exactly what the women would like to be informed about, thus helping me to draw up an adequate information leaflet for them.

A second questionnaire was then distributed to patients who, prior to arriving in the Imaging Department, had received the new information leaflet. This allowed me to test the accuracy of the information leaflet. Again, a portion of those canvassed were interviewed to monitor the usefulness and quality of the information.

The limitations of the study included the small number of patients studied (40 patients), the problem with questionnaires insofar as the patients canvassed may answer as to what they profess to believe, rather than what they actually believe (Bell, J., 1987) and also the lack of previous research undertaken with regard to patient information and mammography.

<sup>11</sup> Elaine McCormack, Senior Radiographer, St. James's Hospital - This article is based on a study in part-fulfilment of the requirements for the Diploma in Health Services Management of the Irish Health Services Management Institute, 1995 and published in the Office for Health Gain Journal.

From a cost-benefit point of view, if patients are more satisfied on reception of information regarding their examinations, then the additional cost to provide this information can be significantly outweighed by this benefit. I believe that patients should be catered for in this area, remembering that knowledge-seeking by the general public has increased to a 'situation where patients no longer accept health care without question' (Gamotis P.B., 1982).

## Results

### Questionnaire One: Pre-Information

The results demonstrated that 68% of G.P. referred patients and 66% of O.P.D. patients had received some information pertaining to their mammograms. Of the G.P. referrals, only 48% responded that the information had subsequently proved to be accurate or almost accurate. Thus it follows that 52% of G.P. referred patients had received either no information or inaccurate information. Only 50% of O.P.D. referrals who had received some knowledge responded that the information was perceived to be accurate or almost accurate.

Analysis of the data revealed that only 30% of both groups had received their information from their doctor. It would be difficult to educate, moderate and monitor the various sources of information to ensure reliable, accurate information is given to patients. Therefore, it would be appropriate for the Imaging Department to extend the quantity and quality of information given to women prior to mammography, so that it can be evaluated and regulated.

When asked to comment on their subjective emotional state, 64% of G.P. referred patients and 47% of O.P.D. patients stated that they were adversely emotionally affected, i.e. nervous/very nervous by the prospect of the mammogram. Knowing this allows comparison through the post- information questionnaire, to identify if the use of additional information has any subjective emotional benefits for the patient.

When asked to assess their subjective emotional state, if they had received prior knowledge of the requirements of the examination, 41% of both groups thought they would be less nervous. This reinforces the need for pre-examination information. The percentage of patients who indicated that they would feel no different should they be given prior information (52% G.P., 55% O.P.D.) reflects the fear of a positive result from the mammogram rather than a fear of the mammogram itself, as indicated in the interviews.

Over half of G.P. referred patients did not know when they would receive their results and 28% did not know where they would receive such results. Amazingly, 60% of O.P.D. patients did not know when they would receive their results, considering that most of these would be follow-up patients or patients presenting with clinical indications of breast disease; 27% of them did not know where they would receive their results.

The semi-structured interviews undertaken in conjunction with the first questionnaire were intended to aid the preparation of the information leaflet by highlighting problem areas. Such problems areas included delays in getting appointments, knowledge of radiation doses involved, knowledge of who would perform the examination, examination result delays, fears and misunderstandings.

### **Questionnaire Two: Post-Information**

All patients responded that they had read and understood the contents of the draft explanatory information leaflet, indicating that the language and medical terminology used in the leaflet was targeted at the right level. When asked to comment on their subjective emotional state, 30% felt that they were adversely emotionally affected by the prospect of the mammograms; 87% of respondents indicated that they found the information to be accurate, whilst 13% replied that it was almost accurate.

These results indicate on the whole that the information included was targeted at the right level; 90% of those canvassed considered that there was just enough information included, indicating that the explanatory information leaflet can be considered to be successful at informing patients about mammography.

### **Comparison of results**

Analysis of the two sets of results for the emotional state of patients undergoing mammography revealed significant differences between the responses of patients who had received the new explanatory information leaflet and those who had not. Of the latter, 64% of G.P. referred patients and 47% of O.P.D. patients had felt nervous/very nervous, while only 30% of those in receipt of the explanatory information leaflet had felt nervous/very nervous.

Where the relevance of the information to mammography was concerned, analysis revealed a highly significant difference between responses of the patients who had received information leaflets and those who had not. This demonstrates that the information in the explanatory leaflet must have been clear, easy to understand and be an accurate or fairly accurate reflection of the examination.

### **Cost**

The total number of appointments for mammography per year in the Diagnostic Imaging Department is approximately 700. An explanatory information leaflet sent out with the patient appointment card would incur an approximate yearly cost of £105 to the Department. With this cost in mind, the new explanatory information leaflet has to be deemed a justifiable expenditure when the significant benefit to patients is taken into account.

### **Conclusion**

The results of the study show:

- There exists a large deficit in doctor-patient communications at this stage of treatment. It is appropriate that the Imaging Department should be responsible for giving pre-examination information on mammography to O.P.D. patients and G.P. referred patients with their appointments.
- The explanatory information leaflet produced appeared to be an understandable and accurate account of the mammogram as experienced by the respondents.
- Patients found that the information leaflet had a significant effect on their subjective emotional state, prior to mammography. From discussions with them, it was clear that such letters were appreciated even in cases where anxiety/nervousness was not reduced. The patients were grateful for just being informed.

A minimal increased cost has been identified, but this cost has been deemed justifiable.

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