



*An Evaluation of the HSE Guiding Framework for the
Implementation of Nurse Prescribing of Medical Ionising
Radiation (X-Ray) in Ireland*



by

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FOREWORD

The introduction of Nurse Prescribing of Medical Ionising Radiation (X-ray) in Ireland is a significant initiative in the Irish health service which has positive implications for patients in terms of improved access to radiology services and simplification of their journey.

Up to July 2014 the overall number of students who commenced the x-ray prescribing course was 171 and the number of x-ray prescriptions written by them totalled 92,575.

It gives me great pleasure to publish the national 'Evaluation of the HSE Guiding Framework for the Implementation Nurse Prescribing of Ionising Radiation (X-Ray) in Ireland 2014' which is an extensive independent evaluation of the implementation of nurse prescribing of medical ionising radiation (X-ray) undertaken by researchers from UCD in partnership with UCC led by Professor Jonathan Drennan and which was commissioned by the Office Nursing & Midwifery Services, HSE. The evaluation clearly identifies that the introduction of nurses prescribing of ionising radiation has had a positive impact on patient care. The report highlights that nurses have been well prepared for their professional role and are prescribing ionising radiation effectively and appropriately. The greatest benefit of the initiative has been the impact it has had on facilitating patient access to treatment and care in an equitable and timely manner.

I wish to acknowledge the support, advice and expertise of Professor Jonathan Drennan who expertly led the research team from University College Dublin / University College Cork in partnership with my office and our multi-disciplinary governance and advisory group which is representative off all key stakeholders engaged with assuring the safety and quality of Nurse Prescribing of Medical Ionising Radiation (x-ray) through out the various health services. The results of this report will be used to further develop, expand and support nurse prescribing of medical ionising radiation (x-ray).

Registered nurses in Ireland have a choice about how they practice nursing. As Ellis and Anderson say, "It is only when we take responsibility for our choices that we begin to realise we truly are the masters of our fate." I encourage nurse prescribers of Medical Ionising Radiation (X-ray) to take responsibility for your practice and to make a difference each and every day for our patients. There is no better way to build a foundation for leaving your footprint and your legacy for the future.



Dr Michael Shannon
Nursing and Midwifery Services Director

CONTENTS

		Page No.
	ACKNOWLEDGEMENTS	i
	EXECUTIVE SUMMARY	ii
CHAPTER I	INTRODUCTION	1
1.1	Introduction	1
1.2	Organisation of the Evaluation	2
CHAPTER II	Background and Context	4
2.1	Introduction	4
2.2	Legislation for the Protection of Individuals Receiving Medical Exposures (Patients) in Ireland	4
2.2.1	<i>National Arrangements for Patients' Regulation</i>	5
2.2.2	<i>Legislation for the Protection of Workers and General Public in Ireland</i>	5
2.2.3	<i>National Arrangements for Workers and the General Public Regulation</i>	5
2.2.4	<i>Revised Basic Safety Standard Directive</i>	6
2.3	Nurse Prescribing of Medical Ionising Radiation	6
2.3.1	<i>Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray) (HSE 2009)</i>	7
2.4	Educational Preparation for Nurse Prescribing of Ionising Radiation	9
2.4.1	<i>Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray) (An Bord Altranais 2008)</i>	10
2.5	Local Implementation Group	12
2.6	Educational Preparation and Continuing Professional Development of Nurse Prescribers of Ionising Radiation – A Review of the Literature	13
2.6.1	<i>Entry to Education Programmes for Nurse Prescribing of Ionising Radiation</i>	14
2.6.2	<i>Educational Preparation Programmes for Nurse Prescribing of Ionising Radiation</i>	15
2.6.3	<i>Continuing Professional Development</i>	17
CHAPTER III	DESIGN OF THE EVALUATION	18
3.1	Introduction	18
3.2	Aims of the Evaluation as per the Tender	18
3.3	Design of the Evaluation	19
3.4	Sample	19
3.4.1	<i>Sample of Nurse Prescribers of Ionising Radiation</i>	19
3.4.2	<i>Sample of Patients</i>	20
3.4.3	<i>Sample of Stakeholders</i>	20
3.4.4	<i>Sample of prescriptions written and consultations completed</i>	21
3.5	Phases of the Evaluation	21
3.6	Phase 1 - Evaluation of Prescribing Preparation Programmes	22
3.6.1	<i>Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire (PIRCOEQ)</i>	22
3.6.2	<i>Reliability of the Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire (PIRCOEQ)</i>	24
3.6.3	<i>Prescribing Ionising Radiation Course Evaluation Quality and</i>	25

Satisfaction Questionnaire (PIRCEQS)

3.6.4	<i>Reliability of the Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire (PIRCEQS)</i>	26
3.7	Phase 2 - Audit of Nurse Prescribing of Ionising Radiation	27
3.7.1	<i>Sample Selection</i>	27
3.7.2	<i>Data Collection</i>	28
3.7.3	<i>Piloting the Audit Process</i>	29
3.7.4	<i>Data Analysis</i>	29
3.8	Phase 3 - Evaluation of Patient Satisfaction with Nurse Prescribing of Ionising Radiation	30
3.8.1	<i>Measuring Patients' Attitudes Towards Nurse Prescribing of Ionising Radiation</i>	30
3.8.2	<i>Measuring Patients' Satisfaction with Education and Advice Received</i>	30
3.8.3	<i>Measuring Patients' Satisfaction with the Consultation Process Undertaken by the Nurse Prescriber of Ionising Radiation - Consultation Satisfaction Questionnaire</i>	30
3.8.4	<i>Demographic Data Collected from Patients</i>	31
3.8.5	<i>Procedure for Patient Questionnaire Distribution</i>	31
3.9	Phase 3: Health Professionals' Evaluation of Nurse Prescribing of Ionising Radiation	32
3.10	Phase 4: Nurse Prescribers of Ionising Radiation Evaluation of their Role	32
3.11	Procedure for Postal and Online Surveys	33
3.12	Data Analysis	34
3.13	Ethical considerations	34
CHAPTER IV	EVALUATION OF EDUCATIONAL PREPARATION OF NURSES TO PRESCRIBE IONISING RADIATION	36
4.1	Introduction	36
4.2	Demographic, Professional and Academic Profile of Course Participants	37
4.3	Evaluation of Course Participants' Level of Change as an Outcome from the Educational Preparation Programme	40
4.4	The Quality of the Educational Preparation of Nurse Prescribers of Medical Ionising Radiation	46
4.5	Conclusion	53
4.6	Summary: Key Findings from the Evaluation of the Educational Preparation Programme for Nurse Prescribing of Ionising Radiation (X-Ray)	54
CHAPTER V	AUDIT OF NURSE PRESCRIBING OF IONISING RADIATION	56
5.1	Introduction	56
5.2	Organisations Audited	57
5.3	Nurse Prescribers of Ionising Radiation Audited	57
5.4	Patient Records Audited	58
5.5	Audit of Nurse Prescriber-Patient Consultation	59
5.6	Patient Outcomes	61
5.7	Evaluation of appropriateness and safety of medical ionising radiation prescribing decisions	61
5.7.1	<i>Criterion (i): Was the ionising radiation prescribing decision justified based on the patient's clinical presenting symptoms or condition?</i>	62

5.7.2	<i>Criterion (ii): Was the site accurately identified in the patient's clinical consultation and radiology request form?</i>	63
5.7.3	<i>Criterion (iii): In the case of patients managed by an ANP/CNS, was the post radiograph patient management plan appropriate?</i>	63
5.8	Audit of Radiology Request Forms	65
5.9	Radiographer Review of Radiology Request Forms	65
5.9.1	<i>Radiographer Criteria (i): Was there sufficient information available on the radiology request form for the imaging to be undertaken?</i>	65
5.9.2	<i>Radiographer criterion (ii) was the clinical information on the radiology request form legible?</i>	66
5.9.3	<i>Radiographer criterion (iii) was the urgency/priority of the request indicated?</i>	66
5.9.4	<i>Radiographer criterion (iv): Was previous radiographic imaging radiation exposure indicated?</i>	66
5.9.5	<i>Radiographer criterion (v): Females only: was there an indication of last menstrual period (LMP)?</i>	66
5.9.6	<i>Other Comments from Radiographer Reviewers</i>	66
5.10	Discussion	68
5.11	Conclusion	69
5.12	Summary: Key Findings form the Audit of Nurse Prescribing of Ionising Radiation	70
CHAPTER VI	EVALUATION OF PATIENTS' LEVEL OF SATISFACTION WITH NURSE PRESCRIBING OF IONISING RADIATION	72
6.1	Introduction	72
6.2	Demographic Profile Of Patients Surveyed	72
6.3	Patients' Attitudes Towards Receiving a Prescription for Ionising Radiation from a Nurse	74
6.4	Patients' Evaluation of the Education and Advice Received from a Nurse Prescriber of Ionising Radiation	75
6.5	Information Sought from Patients by the Prescriber of Ionising Radiation	77
6.6	Patient Satisfaction with the Consultation Process	78
6.7	Conclusion	82
6.8	Summary: Key Findings from Patients' Evaluation of Nurse Prescribing Ionising Radiation	82
CHAPTER VII	EVALUATION OF STAKEHOLDERS' PERCEPTIONS OF NURSE PRESCRIBING OF IONISING RADIATION	84
7.1	Introduction	84
7.2	Demographic Profile of Stakeholders	84
7.3	Stakeholders' Attitudes towards the Nurse prescribing of ionising radiation	85
7.3.1	<i>Stakeholders' Attitudes towards the Impact of the Initiative on Patient Care</i>	85
7.3.2	<i>Stakeholders' Attitudes towards the Safety of Nurse Prescribing of Ionising Radiation</i>	87
7.3.3	<i>Stakeholders Attitudes to the Overall Merit of Nurse Prescribing of Ionising Radiation</i>	89
7.4	Perceptions of Clinical Stakeholders with a Nurse Prescriber of Ionising Radiation in their Organisation	93
7.4.1	<i>Impact on Patient Care</i>	94

7.4.2	<i>The Impact of the Prescribing Initiative on the Workload of Nurses and Doctors</i>	96
7.4.3	<i>Clinical Stakeholders' Perceptions of Communication, Support and Collaboration</i>	98
7.5	Perceptions of Key Stakeholders who are members of their Organisation's Local Implementation Group	101
7.6	Conclusion	103
7.7	Summary – Key Findings from Stakeholders' Evaluation of the Nurse Prescribing Initiative	105
CHAPTER VIII	NURSE PRESCRIBERS' EVALUATION OF THEIR ROLE RELATED TO THE PRESCRIBING OF IONISING RADIATION	107
8.1	Introduction	107
8.2	Evaluation of the Prescribing Initiative from the Perspective of Nurses who are Currently Prescribing Ionising radiation	107
8.2.1	<i>Current Prescribing Practices</i>	107
8.2.2	<i>Nurse Prescribers of Ionising Radiation Assessment of the Safety and Ability of their Prescribing Role</i>	110
8.2.3	<i>Impact of Nurse Prescribing of Ionising Radiation on Professional Practice</i>	111
8.2.4	<i>Prescribers' Evaluation of the Impact of their Role on Patient Care</i>	114
8.2.5	<i>Comparison of Prescribers of Ionising Radiation with Key Stakeholders</i>	115
8.2.6	<i>Prescribers' Evaluation of Support Received for their Role</i>	116
8.2.7	<i>Nurse Prescribers Access to, and Experiences of, Continuing Professional Development</i>	117
8.2.8	<i>Limitations to the Role of Prescribing Ionising Radiation</i>	119
8.3	Evaluation of the Prescribing Initiative from the Perspective of Nurses who Completed the Education Preparation Programme but are Currently not Prescribing	122
8.4	Conclusion	124
8.5	Summary - Key Findings from Nurses' Evaluation of their Role Related to the Prescribing of Ionising Radiation	126
CHAPTER IX	DISCUSSION, CONCLUSION AND RECOMMENDATIONS	129
9.1	Introduction	129
9.2	Overall Evaluation of Nurse Prescribing of Ionising Radiation	129
9.3	Profile of Nurses who Prescribe Ionising Radiation	130
9.4	Safety and Competency of Nurses to Prescribe Ionising	130
9.5	Evaluation of the Professional Practice of Prescribers of Ionising Radiation	135
9.6	Limitations to the role of Nurses Prescribing Ionising Radiation	138
9.7	Prescribers of Ionising Radiation Evaluation of their Educational Programme	139
9.8	Patients' Evaluation of Nurse Prescribing of Ionising Radiation	140
9.9	Stakeholders' Evaluation of Nurse Prescribing of Ionising Radiation	141
9.10	Conclusion	144
9.11	Recommendations	147
	REFERENCES	149

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EXECUTIVE SUMMARY

Background to the Evaluation

Nurse prescribing of medical ionising radiation (X-Ray) was introduced in Ireland following the publication of *Statutory Instrument No. 303 European Communities (Medical Ionising Radiation Protection) (Amendment) Regulation 2007*. In addition to legislation, the prescribing of ionising radiation by nurses is guided by the documents *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation* (An Bord Altranais 2008) and the *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray)* (HSE 2009). Nurses are authorised to prescribe ionising radiation following the successful completion of a programme of study and assessment at a designated centre of education or as part of a master's programme offered by a number of higher education institutions.

This report outlines the findings from a national evaluation of nurse prescribing of ionising radiation. A research team from the School of Nursing, Midwifery and Health Systems and the School of Medicine and Medical Science at University College Dublin and a research team from the School of Nursing and Midwifery at University College Cork undertook the evaluation. The evaluation was based on the tender set out by the Office of the Nursing and Midwifery Services Director, Health Service Executive.

Aims of the Evaluation

The aims of the evaluation were informed by the objectives of the Tender set out by the HSE and included:

1. Evaluation of the HSE supported education programme in terms of:
 - a) Adherence to An Bord Altranais Requirements and Standards for Education Programmes for Nurse Prescribing of Ionising Radiation (An Bord Altranais 2008).
 - b) Evaluate programme participants' preparedness for practice as a nurse prescriber of ionising radiation (fit for practice).
2. Evaluation of the implementation of HSE Guiding Framework by Healthcare Providers in terms of:
 - a) Establishment of Governance through Local Implementation Groups.
 - b) Impact of nurse prescribing of ionising radiation in clinical areas as quality improvement from the perspective of quality, access and cost.

c) Evaluation of the monitoring and audit procedures undertaken by healthcare providers and Office of the Nursing and Midwifery Services Director (HSE).

3. Present findings and suggest recommendations through the Project Steering Group for consideration by the National Advisory Committee on the following:
 - a) Effectiveness of education programmes in developing a cohort of nurses competent in the role of nurse prescribers of ionising radiation.
 - b) Utility of the HSE Guiding Framework in supporting the continued implementation of nurse prescribing of ionising radiation in Ireland.
 - c) Expansion of education programme and governance arrangements to support nurse prescribing of ionising radiation in the area of children's services.

Phases of the Evaluation

To ensure that each element of the nurse prescribing of ionising radiation initiative was comprehensively evaluated, five distinct but interlinked phases of research were carried out. The five phases were as follows:

1. Evaluation of educational preparation for prescribing practice.
2. Audit of nurse prescribing of ionising radiation.
3. Evaluation of patient satisfaction with the prescribing and consultation process.
4. Evaluation of health professionals' perceptions of nurse prescribing of ionising radiation.
5. Evaluation of prescribers' perceptions of outcomes of nurse prescribing of ionising radiation.

Key Stakeholders Involved in the Evaluation

Those who are involved in the nurse prescribing of ionising radiation initiative or have contact with prescribers were identified in the evaluation as stakeholders and were central to the evaluation process. Therefore the sample included: nurses (including prescribers and non-prescribers of medical ionising radiation), members of the medical and radiography professions, relevant regulatory bodies, hospital management, educators and patients and service users. In addition, the sample consisted of radiographic examinations requested by nurse prescribers of ionising radiation, the

consultations associated with the request and the radiologists' reports on the imaging requested.

Data Collection

Evaluation data was collected from a number of sources including surveys, audit of prescriptions for ionising radiation, patient notes and consultations. A number of survey instruments were developed or modified specifically for this evaluation. These included instruments that measured outcomes associated with the prescribing of ionising radiation preparation educational programmes and a questionnaire that measured the quality of the course completed by prescribers. A structured questionnaire measuring patients' level of satisfaction with nurse prescribing of ionising radiation was also developed. The patient satisfaction survey measured a number of domains in relation to patients' experience of being prescribed ionising radiation from a nurse including: attitudes towards nurse prescribing of ionising radiation, satisfaction with education and advice received during the consultation process, and, overall satisfaction with the consultation process. Survey instruments were also developed that measured key stakeholders' perceptions of nurse prescribing of ionising radiation including respondents' perceptions of regulation and guidance, educational preparation, factors facilitating and inhibiting prescribing of ionising radiation by nurses, monitoring processes, patient safety, teamwork and communication, impact on the work of other health professionals, quality of care and overall merit of nurses prescribing ionising radiation. Furthermore, key clinical stakeholders who had day-to-day contact with nurse prescribers of ionising radiation evaluated the impact that the initiative had on patient care. Nurses who had completed the prescribing of ionising radiation educational programme were evaluated in relation to their prescribing practice following completion of the programme. For the purpose of this phase of the evaluation, two questionnaires were developed, one for those who had completed the education preparation programme and were currently prescribing and one for those who had completed the education preparation programme but were not currently prescribing. Those who were prescribing ionising radiation at the time of the evaluation were surveyed in relation to their current prescribing practices, their perceptions of the safety of prescribing practice, the impact of the role on their professional practice, their perceptions of the impact of the role on patient care, the support received by nurses and from other healthcare professionals and the extent to which they engaged in continuing professional development. A separate survey was administered to nurses who had

completed the prescribing of ionising radiation preparation programme but were not prescribing at the time of the evaluation. The aim of this phase of the evaluation was to identify reasons why this cohort had not yet commenced prescribing ionising radiation and to identify their future plans in relation to developing their prescribing practice. Data was also collected from a national audit of prescribing practice. The audit of nurse prescribing of ionising radiation was a retrospective multi-site audit and entailed a documentary analysis of patient records, radiological request forms and associated radiological reports.

Results

Profile of Nurse Prescribers of Ionising Radiation

The majority of nurses who had completed the nurse prescribing of ionising radiation education programme had extensive clinical experience and were at advanced nurse practitioner grades. Practically all respondents held a third-level qualification, with approximately a half educated to master's degree level. The majority of prescribers of ionising radiation who took part in the survey were practising in the area of emergency or urgent care.

There was variation in the anatomical sites for which nurses were permitted to prescribe radiographic images. The highest proportion of respondents were approved to prescribe radiographic imaging of the lower and upper limbs. Just under half were approved to prescribe chest radiographs. Respondents, but to a lesser extent than other anatomical sites, were also approved to prescribe radiographic examinations of the pelvis, abdomen and facial bones. A number of respondents reported that they were only permitted to prescribe particular radiographic images in specific clinical situations.

Key Findings from the Evaluation of the Educational Preparation Programme for Nurse Prescribing of Ionising Radiation

Educational programmes were evaluated positively in terms of their adherence to An Bord Altranais *Requirements and Standards for Education Programmes for Nurse Prescribing Ionising Radiation (X-Ray)* (2008) and in terms of participants' overall ability to prescribe ionising radiation. Nurses who completed the education programmes reported they positively changed in a number of key areas including: understanding of the principles of ionising radiation, understanding of legislation related to the prescribing of ionising radiation, ability to practice within the scope of practice of a nurse prescriber for ionising radiation and overall self-confidence in ability to prescribe

ionising radiation. Respondents' overall experience of the quality of the education programme was also positively rated; the support of the clinical mentor, the perception of being comprehensively prepared for prescribing practice, and overall satisfaction with educational preparation were areas highly rated by course participants. High levels of satisfaction were also associated with the organization of the educational delivery and the attainment of the skills required for prescribing.

Key Findings from the Audit of Nurse Prescribing of Ionising Radiation

Seven hospitals were identified for the audit phase of the evaluation. Within each hospital all nurses who actively prescribed radiographs, defined as at least one episode of medical ionising radiation prescribing in the past three months, were eligible for inclusion. In total 41 nurses contributed data to the audit, this accounted for 29% of nurse prescribers with ionising radiation prescriptive authority at the time of the evaluation. The majority of nurse prescribers audited worked in emergency departments; advanced nurse practitioners and staff nurses were the most frequent grades audited. In total 221 patient records were audited.

Overall, 95% of ionising radiation prescribing decisions made by nurses audited were judged to be appropriate by consultant medical reviewers (a radiologist and emergency medicine physician); in 4% of records reviewed there was insufficient information available to make a decision on the appropriateness or otherwise of the decision. In two cases (1%) the nurse prescribing decisions may have required amendment of the radiographic projection requested. These amendments included a suggestion that there be an extra radiograph of an adjacent site or greater specificity provided by the nurse prescriber in the anatomical area to be imaged.

The vast majority of nurse prescribers' documentation of the nurse-patient consultation reviewed that related to a radiological investigation were found to be detailed, comprehensive and of a high quality; however, there were some areas where improvements could be made. In 65% of radiology request forms audited, pregnancy status was recorded as 'unknown' or 'patient states not pregnant'. In 35% of radiology request forms audited, there was no evidence that the pregnancy status of women of childbearing age had been recorded. In 95% of radiology request forms reviewed by two independent radiographers, the anatomical site of the radiological investigation was clearly indicated and it was identified that there was sufficient information provided by a nurse prescriber of ionising radiation to allow a radiographer complete the radiographic examination. In 4% of radiology request forms audited, radiographer

reviewers highlighted that there may have been a need for a radiographer to seek further clarification regarding the type of imaging required. A small proportion of radiology request forms were identified that included abbreviations, spelling or grammatical errors; it was assessed that these factors could impact on the clarity of the imaging requested by the nurse prescriber of ionising radiation.

Key Findings from Patients' Evaluation of Nurse Prescribing Ionising Radiation

Approximately 200 questionnaires were distributed to patients who had received a prescription for ionising radiation from a nurse with 83 returned resulting in a response rate of 41.5%. The majority of patients reported that their radiographic image was requested for the upper limb followed by radiographs of the lower limb. Seventeen per cent reported that they had a chest radiograph, the majority of respondents in this category reported that the radiographic examination was part of the process for pre-operative preparation.

Patients surveyed were highly satisfied with the care they received from nurses who prescribed ionising radiation and all patients surveyed were of the opinion that nurses should be involved in the requesting of radiographic examinations; the majority of patients reported that they have no preference whether a doctor or nurse prescribed their ionising radiation. Patients also reported that they received comprehensive education and advice from the nurse on the radiological process; approximately a fifth reporting that they would like to have received more information on the radiographic examination that was requested. Waiting time was also perceived by respondents to have been positively impacted upon with the vast majority of patients reporting that it had reduced their waiting time for treatment. The majority of respondents also reported that they were asked for information prior to their radiographic examination on medical history, current medications and allergies; however, a proportion of respondents reported that they were not asked for information on their family history.

Overall satisfaction with the consultation process was high with the majority of patients surveyed of the opinion that the nurse who prescribed their ionising radiation was comprehensive in their care, listened to their concerns and treated them as a person. Patients were also generally satisfied with the time the nurse spent with them during the consultation process; however, some patients, especially those reporting poorer health, would like to have had more time with the nurse. Overall there were high levels of support for the prescribing initiative with the vast majority of patients in

favour of nurses prescribing ionising radiation. Patients were also highly satisfied with the care and advice provided by prescribers of ionising radiation.

Key Findings from Stakeholders' Evaluation of the Nurse Prescribing Initiative

Approximately 300 stakeholders were surveyed, 199 responded resulting in a response rate of 66.3%. Approximately half of the sample were radiographers with approximately twenty-seven per cent identifying their profession as nursing; fifteen per cent of the sample were medical practitioners and approximately 1 in 10 respondents were either academics or were involved in policy or regulation (Nursing and Midwifery Board of Ireland, Health Service Executive, Department of Health).

Overall, there were generally good levels of support from stakeholders for nurse prescribing of ionising radiation with the majority of respondents identifying that it had a positive impact on patient care and met the needs of patients; however, there was variability in levels of support according to the professional group surveyed. There was also support for the safety of the initiative with the majority of healthcare professionals and key stakeholders surveyed identifying that nurses had the knowledge to correctly prescribe ionising radiation and that they had received adequate training for their role. The vast majority of clinical stakeholders surveyed were also of the view that the prescribing of ionising radiation should be extended beyond the remit of the medical profession, that there was a need for more nurses to prescribe ionising radiation and that overall the introduction of the initiative had been a success.

Although healthcare professionals surveyed were overall supportive of the initiative, there were areas in which there was variation when responses of the nursing, medical and radiography professions were compared. Nurses tended to hold stronger positive attitudes and little or no negative perceptions of nurse prescribing of ionising radiation when compared to their medical or radiography colleagues. There were differences of opinion between the cohorts in relation to the extent to which nurses had the knowledge to prescribe ionising radiation, the extent to which it met the needs of patients, and whether the prescribing of ionising radiation should only be undertaken by doctors. Medical practitioners, overall, were supportive of the initiative with the vast majority surveyed in favour of nurses prescribing ionising radiation as well as perceiving that nurses had the necessary knowledge to safely prescribe ionising radiation. In addition, the vast majority of medical practitioners reported that, overall,

the introduction of the initiative had been a success. The level of support and attitudes towards nurse prescribing of ionising radiation were variable amongst respondents from radiography. Although the majority of radiographers surveyed were in agreement that the initiative had a positive impact on patient care and met the needs of patients, levels of agreement were significantly lower than that reported by other cohorts of healthcare professionals. In relation to statements related to the safety of nurse prescribing of ionising radiation, whereas the vast majority of nurse, medical practitioner and education/registration/policy respondents were in agreement that they trusted nurses to prescribe safely, a significant proportion of radiography respondents disagreed.

Respondents who worked closely with a nurse prescriber were specifically asked a number of questions pertaining to nurse prescribing of ionising radiation in clinical practice. Overall, clinical stakeholders reported that the introduction of nurse prescribing of ionising radiation had reduced delays in initiating the care of patients and that it enabled patients to access treatment quicker. Clinical stakeholders were also of the opinion that nurse prescribing of ionising radiation impacted positively on patient satisfaction. There was also a consensus amongst clinical stakeholders that the extension of prescribing ionising radiation had freed up doctor's time and, in addition, it did not impact negatively on nurse prescribers' time. Although the majority of medical practitioners perceived that supervising a nurse prescriber of ionising radiation was not, overall, a burden on their workload, a quarter reported that supervision had added to their workload. Overall, working relationships with prescribers of ionising radiation were perceived to be good by clinical stakeholders. The majority of respondents reported that medical practitioners and radiographers supported nurse prescribers of ionising radiation in their role. Nurses in particular reported that nurse prescribers of ionising radiation received high levels of support from other healthcare professions.

Key Findings from Nurses' Evaluation of their Role Related to the Prescribing of Ionising Radiation

The majority of nurses, who had completed an educational programme preparing them to prescribe ionising radiation, described themselves as 'frequent' prescribers; only a small number of respondents reported that they were prescribing 'infrequently' (less than once a month). Those who were prescribing occasionally or infrequently reported limitations placed on their prescribing practice as reasons why the number of orders for radiographic examinations was low.

The majority of respondents reported that they were limited in their practice of prescribing ionising radiation. The main limitation reported by prescribers related to requesting ionising radiation for children. Other respondents were also restricted in the anatomical sites they could request radiographs for by local policies and guidelines. The vast majority of respondents reported that they could prescribe ionising radiation safely and effectively and that they felt confident in the education and training they had received to practice effectively. Awareness of scope of practice was also high; however, a large proportion of respondents reported that the scope in which they were required to work limited their prescribing practice. Overall, nurse prescribers of ionising radiation reported that the introduction of the initiative has had a positive impact on the care that can be offered to patients, respondents' overall level of job satisfaction and the professional development of nurses. In addition, respondents reported that the prescribing initiative had impacted positively on their professional autonomy; however, a majority of respondents also reported that undertaking the role of prescribing ionising radiation had led to increased workloads. Although workloads had increased, the majority of respondents reported that the prescribing of ionising radiation had led to a better use of their skills without negatively impacting on their core nursing role. One area in particular highlighted in the responses of nurse prescribers of ionising radiation was the positive impact the initiative had on the access patients had to treatment and their overall care. Respondents identified convenience for patients, reduced delays in initiating treatment and enabling patients to access care quicker as the most positive outcomes.

Levels of support received from nurse prescribers of ionising radiation for their role from other healthcare professionals were reported as being high. In particular respondents were in agreement that they received particularly high levels of support from medical colleagues, radiographers and other nursing colleagues. High levels of support were also noted as being provided by nursing management, the Local Implementation Group and their prescribing mentor.

The majority of respondents identified that they undertook informal forms of CPD such as keeping up-to-date through professional journals and informal sessions with clinical colleagues. The majority, however, reported that they had not undertaken some form of formal CPD since they completed their prescribing of ionising radiation preparation programme. The areas in which respondents identified that they required further, ongoing education included: advanced physical assessment, anatomy training, legislation related to the prescribing of ionising radiation and radiation safety.

There was variability in the extent to which respondents reported the presence of barriers and limitations to the practice of prescribing ionising radiation, with fifty-five per cent reporting limitations and forty-five per cent identifying no barriers. Limitations identified included: the inability to prescribe ionising radiation for children and a restriction on the anatomical sites that nurses were permitted to request a radiographic image.

The evaluation also explored reasons why nurses who had completed the education programme were not currently prescribing ionising radiation. On average, respondents who were not prescribing were 2 years post completion of the preparation programme. Reasons for not prescribing were found under three main groups: 1) delays at hospital/Local Implementation Group level, 2) delays in prescribers receiving their personal identification number (PIN) to access the prescribing of ionising radiation database and, 3) 'other' reasons. The principal reasons at hospital/LIG level included: no policy developed at hospital level, withdrawal of support at hospital level for nurses prescribing ionising radiation, resistance to the initiative from other groups of healthcare professionals and disbandment of the LIG.

Overall, despite some issues at local levels, nurse prescribing of ionising radiation has been successfully implemented and is well supported by the nursing, medical and radiography professions. It is evident from the majority of nurses who are currently prescribing ionising radiation that it is having a positive impact on the quality of care that they provide to patients and their professional practice.

Conclusion

This is the first major evaluation completed nationally or internationally of nurse prescribing of ionising radiation. Through using a number of methods including audit and review of patient records as well as measuring the initiative from the perspective of key stakeholders including patients, nurse prescribers of ionising radiation, members of the medical, nursing and radiography professions and relevant policy and regulation bodies, a comprehensive picture of the operationalisation of nurse prescribing of ionising radiation in practice was ascertained.

When the results of the evaluation are taken together, it was identified that overall patients and health professionals are accepting of nurses taking on a role that was previously the domain of the medical profession. Patients in particular were overwhelmingly positive of the initiative. The results from the patient and stakeholders' surveys and the audit of patient notes and radiographs requested found that nurse

prescribers of ionising radiation were comprehensive in the care they provided, prescribed ionising radiation appropriately and impacted positively on the experience patients had of the care they received when in contact with the health service. In particular, clinical stakeholders and patients were in agreement that waiting times were positively impacted upon as the initiative enhanced the patient journey through the healthcare system. It was also evident from the evaluation that the foundation for nurses to prescribe ionising radiation appropriately and safely was based on the comprehensive preparation received from their education programmes. These programmes were, overall, positively evaluated and prepared nurses for their role in clinical practice.

The effectiveness of the practice of nurse prescribers of ionising radiation was highlighted in the results from the audit phase of the evaluation where it was found that the radiological investigations requested by nurse prescribers of ionising radiation were appropriate based on the patient's history and/or physical examination. There were some issues identified in a minority of prescriptions for ionising radiation such as the inappropriate use of abbreviations or inexact identification of anatomical sites; however, overall, ionising radiation prescribing decisions were appropriate and radiology request forms were accurately completed.

Patients who came into contact with a nurse prescriber of ionising radiation were highly satisfied with the care they received. There were high levels of agreement among patients that nurses should be involved in prescribing ionising radiation. In addition, patients reported that they received comprehensive education and advice and that receiving a request for a radiographic examination from a nurse had reduced the time they spent waiting for treatment. The majority of patients surveyed were also of the opinion that the nurse who prescribed their ionising radiation was comprehensive in their care, listened to their concerns and treated them as a person. This component of the evaluation found that patients reported that they were receiving care that was a high quality and that nurse prescribing of ionising radiation had also facilitated their access to timely treatment and care.

A variety of stakeholders were surveyed from the nursing, medical and radiography professions. In addition, stakeholders from education, regulation and policy were also involved in the evaluation of the initiative. Overall there were good levels of support for the initiative with the majority of stakeholders reporting that the introduction of nurse prescribing of ionising radiation had had a positive impact on patient care as well as meeting the clinical the needs of patients. There was also support for the safety of the

initiative with the majority of healthcare professionals and key stakeholders surveyed identifying that nurses had the knowledge to correctly prescribe ionising radiation and that they had received adequate training for their role. The majority of clinical stakeholders surveyed also reported that the prescribing of ionising radiation should be extended beyond the remit of the medical profession and that, overall, the introduction of the initiative had been a success. However, attitudes towards, and perceptions of, nurse prescribing of ionising radiation were variable according to the professional group surveyed. Although radiographers surveyed were overall supportive of the introduction of nurse prescribing of ionising radiation, this cohort tended to report more negative views on aspects of the initiative when compared to the nursing or medical professions. However, despite the variation amongst stakeholders on the merit of nurse prescribing of ionising radiation, the vast majority of nurse prescribers reported that they were well supported in their role by both medical and radiographer colleagues.

Overall the evaluation found that the educational programmes preparing nurses to prescribe ionising radiation were evaluated positively in terms of their adherence to An Bord Altranais *Requirements and Standards for Education Programmes for Nurse Prescribing Ionising Radiation (X-Ray)* (2008). In effect, the evaluation found that the education programmes ensured that programme participants' were effectively and competently prepared to practice as nurse prescribers of ionising radiation.

It was evident from the results of the evaluation that the introduction of the initiative had had a positive impact on the professional role of nurse prescribers of ionising radiation. Nurses reported that they felt confident in their ability to prescribe ionising radiation and that it had greatly improved the quality of care they could provide to patients. In particular, respondents reported that their ability to prescribe ionising radiation had reduced delays in initiating treatment for patients as well as enabling patients to access care quicker.

Although the majority of nurses surveyed were actively prescribing, a number of respondents identified that there were limitations that were negatively impacting on their prescribing practice. The principal limitations to practice were identified as the inability to prescribe ionising radiation for children and a restriction on the number of anatomical sites that nurses were permitted to request imaging for.

In conclusion, the evaluation identified that the introduction of nurse prescribing of ionising radiation has had a positive impact on patient care. It is also evident that nurses

have been well prepared for their role and are prescribing ionising radiation safely, and effectively. In addition, radiological investigations requested by nurse prescribers were identified to be appropriate based on the patient's history. Similarly the identification of the site for radiographic examination, provisional diagnosis and clinical information supplied to radiographers were identified as being of a high standard. Patient management plans were generally well articulated; especially the more extensive plans written by nurses working in advanced practice roles. There are issues in relation to the continuing development and expansion of the role, not least in relation to perceptions and barriers identified in this report. The greatest benefit of the initiative has been the impact it has had on facilitating patients access treatment and care in an equitable and timely manner. The results of this evaluation should be used to further develop and support nurse prescribing of ionising radiation.

Recommendations

Conclusive Finding and General Recommendation

This evaluation has found that overall nurse prescribing of ionising radiation is safe and that the prescriptions for ionising radiation were appropriate.

The evaluation recommends that the development and implementation of nurse prescribing of ionising radiation continue and be further supported and strengthened through the implementation of the recommendations outlined below.

Governance

1. The National Advisory Group will expand the governance and education programme(s) to include the prescribing of ionising radiation for children guided by service need and by the *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray)* (An Bord Altranais 2008).
2. The National Advisory Group will consider amalgamating the governance and administration of all nurse and midwife prescribing initiatives i.e. medicinal products and X-Ray prescribing.

And specifically:

- a. Review the continued use of the database considering the national rollout of NIMIS.
 - b. Engage with key stakeholders to ensure that Radiology Information Systems (RIS) support the identification of nurse prescribers of ionising radiation.
3. The National Advisory Group will review the *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray) in Ireland* (HSE 2009) to reflect the implications of findings and the recommendations of this evaluation report.

4. The National Advisory Group will arrange for the national dissemination and communication of this report to relevant stakeholders.
5. Local Implementation Groups will identify and support the expansion of the scope of nurse prescribing of ionising radiation to include:
 - a. Prescribing of ionising radiation for children guided by service need.
 - b. An expanded list of additional imaging views guided by service need that may be requested by nurses already prescribing within their services.
 - c. The implementation of audit of prescribing practice at agreed intervals as a means of quality and safety assurance and improvement.
 - d. Put into place processes to ensure the timely introduction of nurse prescribers of ionising radiation into their healthcare organisation.

Prescribing Practice

1. All nurses prescribing ionising radiation will incorporate the implications of the findings of this national evaluation into their practice.

And specifically:

- a) Regularly engage in audit of their practice of prescribing ionising radiation.
- b) Develop the evidence base to expand their scope of prescribing ionising radiation practice where there is a service need.

Educational Preparation for Prescribing Practice

1. All providers of preparatory educational programmes for prescribing practice will incorporate the implications of the findings of this national evaluation into their programmes to ensure continued best practice by those undertaking the programme.

This includes:

- a. Design and development of preparatory educational programme(s) that:
 - i. Incorporate education on the prescribing of ionising radiation for children.
 - ii. Facilitate additional preparation for nurse prescribing of ionising radiation for children for those nurses already prescribing for adults where it is required within their service.
- b. Enhancing the content and experiential learning related to physical assessment in educational programmes with due recognition of prior learning and level of clinical experience of nurses on the programme.

Continuing Professional Development

1. Nurse prescribers of ionising radiation will identify their continuing professional development needs and access relevant education/development activities (local

or national) that will maintain and enhance their competence as prescribers. Services will facilitate the provision of, and access to, relevant education and development activities.

2. Nurse prescribers of ionising radiation will maintain records of continuing professional development relevant to their role in prescribing ionising radiation as they do for other areas of practice.

Public/Patient Involvement

1. It is recommended that there should be public/patient involvement with the National Advisory Group. This will allow the public and patients to bring their experience of healthcare to inform decision on services that will directly affect them and the care they receive from nurse prescribers of ionising radiation.

Chapter I

Introduction

1.1 Introduction

Nurse prescribing of medical ionising radiation (X-Ray) was introduced in Ireland following the publication of *Statutory Instrument No. 303 European Communities (Medical Ionising Radiation Protection) (Amendment) Regulation 2007*. As well as legislation, the prescribing of ionising radiation by nurses is guided by the documents *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation* (An Bord Altranais 2008) and the *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray)* (HSE 2009). Nurses are authorised to prescribe ionising radiation following the successful completion of a programme of study and assessment at a designated centre of education or as part of a master's programme offered by a number of higher education institutions.

This report outlines the findings from a national evaluation of nurse prescribing of ionising radiation¹. A research team from the School of Nursing, Midwifery and Health Systems and the School of Medicine and Medical Science at University College Dublin and a research team from the School of Nursing and Midwifery at University College Cork undertook the evaluation. The evaluation was based on the tender set out by the Office of the Nursing and Midwifery Services Director, Health Service Executive and included the requisite to design an appropriate project methodology to collect original data on the following:

1. Evaluation of the HSE supported education programme in terms of:
 - a) Adherence to An Bord Altranais *Requirements and Standards for Education Programmes for Nurse Prescribing of Ionising Radiation* (An Bord Altranais 2008).
 - b) Evaluate programme participants' preparedness for practice as nurse prescribers of ionising radiation (fit for practice).
2. Evaluation of the implementation of HSE *Guiding Framework* by healthcare providers in terms of:
 - a) Establishment of governance through Local Implementation Groups.
 - b) Impact of nurse prescribing of ionising radiation in clinical areas as quality improvement from the perspective of quality, access and cost.

¹ Throughout the document, prescribing, unless otherwise stated refers to the prescribing of medical ionising radiation.

c) Evaluation of the monitoring and audit procedures undertaken by healthcare providers and the Office of the Nursing and Midwifery Services Director (ONMSD) (HSE).

3. Present findings and suggested recommendations through the Project Evaluation Steering Group for consideration by the National Advisory Committee on the following:
 - a) Effectiveness of education programmes in developing a cohort of nurses competent in the role of nurse prescribers of ionising radiation.
 - b) Utility of the HSE *Guiding Framework* in supporting the continued implementation of nurse prescribing of ionising radiation in Ireland.
 - c) Expansion of education programmes and governance arrangements to support nurse prescribing of ionising radiation in the area of children's services.

The research design was informed by best practice in evaluative research and measured the prescribing initiative from a number of perspectives. The aim of the evaluation design was to include the perspectives of key stakeholders including nurse prescribers of ionising radiation, health professionals, key policy makers and patients who received care from a nurse who requested a radiographic examination. These key stakeholders formed the sample in the evaluation. The research consisted of five distinct but interlinked phases. Phase 1 evaluated the educational programmes completed by nurses that prepared them to prescribe ionising radiation; Phase 2 consisted of an audit of nurse prescriptions for ionising radiation and the associated consultations; Phase 3 evaluated patients' perspectives of nurse prescribing of ionising radiation including their levels of satisfaction with the initiative; Phase 4 evaluated health professionals' (nursing profession, medical profession, radiography profession, educators and policymakers) perceptions of outcomes that occurred as a consequence of the prescribing initiative including patient benefits, safety and inter-professional communication and, finally; Phase 5 evaluated the prescribing of ionising radiation in practice from the perspective of nurses who had completed the prescribing of ionising radiation educational programme.

1.2 Organisation of the Evaluation

The evaluation of nurse prescribing of ionising radiation is outlined in nine chapters. Chapter 1 introduces and outlines the background to the evaluation. Chapter 2 describes the key legislation and policy and regulation documents that informed the introduction of nurse prescribing of ionising radiation in Ireland. This chapter also outlines the limited

literature available on nurse prescribing of ionising radiation. Chapter 3 discusses the design of the evaluation and the methods used in the five phases of research to evaluate the prescribing initiative. This chapter includes an overview of the instruments used, the methods of data collection, the sampling procedures, the ethical processes and data analysis techniques employed. Chapter 4 presents the results from the evaluation of the educational preparation of nurses to prescribe ionising radiation. Within this chapter the extent to which course participants changed in competencies related to prescribing as a consequence of the programme are evaluated. Chapter 4 also evaluates course participants' perceptions of the quality of their educational programme that prepared them to prescribe ionising radiation. Chapter 5 describes the results of an audit of nurses' prescriptions for ionising radiation and consultations, the overall aim being to evaluate the safety and clinical appropriateness of prescribing ionising radiation by nurses. The method used in this phase of the evaluation entailed a documentary audit of a random sample of patient prescriptions for ionising radiation and the associated patient records. Chapter 6 reports on the results of a survey of patients' level of satisfaction with their experience of being prescribed ionising radiation by a nurse. The survey measured patients' attitudes towards nurse prescribing of ionising radiation; patients' level of satisfaction with the consultation process, and patients' perceptions of education and advice received. Chapter 7 outlines the results of the evaluation of the prescribing initiative from the perspective of key stakeholders such as nurses, medical practitioners, radiographers and those involved in regulation, guidance and the education of nurse prescribers of ionising radiation. Key stakeholders were surveyed on their attitudes towards the introduction of nurse prescribing of ionising radiation, their perceptions of the impact of the initiative on patient care, the perceived safety of the initiative, the necessity for nurse prescribing of ionising radiation and their level of knowledge of the initiative. In addition, those key stakeholders whose work brought them into day-to-day contact with nurse prescribers of ionising radiation were further surveyed on their perceptions of the impact the initiative was having on patient care. Chapter 8 reports on the findings of the evaluation of the prescribing initiative from the perspective of nurses following the completion of the prescribing of ionising radiation preparation programme and their experience of prescribing ionising radiation in practice. This chapter in particular explores the perceived barriers and facilitators to the development of a prescribing of ionising radiation role for nurses. Chapter 9 discusses the overall findings from the evaluation and concludes with recommendations for the further development of nurse prescribing of ionising radiation in Ireland.

Chapter II

Background and Context

2.1 Introduction

This chapter outlines the context in which nurse prescribing of ionising radiation was introduced. The first part of the chapter discusses Irish legislation related to the protection of patients receiving medical exposure to ionising radiation. This is followed by an overview of the policy and legislation that resulted in extending the prescribing of ionising radiation to nurses. This section also describes the key policy document published by the HSE that outlines the requirements for the introduction, implementation and governance of nurse prescribing of ionising radiation in Ireland. The educational preparation of nurses to prescribe ionising radiation is outlined including a discussion of the An Bord Altranais requirements. This chapter also discusses the structures set up at health care provider level to support the introduction of nurse prescribing of ionising radiation in the clinical setting. The final part of the chapter provides an overview of the limited international literature that has been published on nurses requesting and interpreting radiographic images.

2.2 Legislation for the Protection of Individuals Receiving Medical Exposures (Patients) in Ireland²

The system of radiation protection used throughout Ireland and the European Union is based on the recommendations of the International Commission for Radiological Protection (ICRP). This system is embodied in various European directives, most notably the Basic Safety Standards (BSS), 96/29/EURATOM and the Medical Exposure Directive (MED), 97/43/EURATOM. The BSS was transposed into Irish legislation by Statutory Instrument (SI) 125 (2000) (workers and the public). The Medical Exposures Directive 97/43 EURATOM (MED) was transposed into Irish law by Statutory Instruments 478 (2002), 303 (2007) and 459 (2010) (patients).

The Medical Exposure Directive 97/43 EURATOM (MED) deals with the protection of individuals (patients) against the dangers of ionising radiation in relation to medical exposure. This Directive is the main legal instrument dealing with the protection of patients undergoing diagnostic and therapeutic procedures using radiation. One of the aims of MED is to eliminate unnecessary medical exposures and to this end the principles

² The research team would like to acknowledge the input and advice of Ms Bernadette Moran, Trinity College Dublin, in preparing this section of the chapter.

of Justification and Optimisation in a context where dose limits are not applied to medical procedures are central.

2.2.1 National Arrangements for Patients' Regulation

SI 478 (2002) allows for the Chief Executive of the HSE to introduce additional guidelines with respect to radiation protection of patients as appropriate. The role of the Medical Exposure Radiation Unit, HSE is to regulate patient radiation protection practices in radiological facilities and receives advice from the National Radiation Safety Committee. The Medical Exposure Radiation Unit is also the executive, administrative and advisory unit for the National Radiation Safety Committee.

2.2.2 Legislation for the Protection of Workers and General Public in Ireland

The BSS lays down the requirements for protection of workers and the general public against the dangers of ionising radiation. It encapsulates the principles of Justification, Optimisation and Dose Limitation articulated by the ICRP and develops them into a regulatory system that can control those practices involving ionising radiation that impact on public and workers' safety. Statutory Instrument S.I. 125 of 2000 (Workers and the Public) gives effect to the BSS Directive in Ireland.

2.2.3 National Arrangements for Workers and the General Public Regulation

The Radiological Protection Institute of Ireland (RPII) is the competent authority to ensure that Irish people and the environment are adequately protected from the harmful effects of ionising radiation. It fulfils this statutory responsibility through a system of regulatory control and inspections, by providing advice to the public and the Government, by monitoring people's exposure to radiation, by providing technical support to Ireland's plan to deal with radiation emergencies and by cooperating with similar bodies internationally. S.I. 125 requires all practices that use radioactive sources and/or irradiating apparatus (such as an X-ray unit) to hold a valid licence from the RPII, unless they have been exempted. Licensees must also adhere to the conditions the RPII attaches to each licence. Inspections undertaken by the RPII are designed to assess compliance with both the legislative requirements as set out in S.I. No. 125 of 2000, S.I. No. 875 of 2005 (for HASS sources) and the licence conditions. Inspectors also assess the level of radiation protection in place at each licensed facility and encourage licensees to strive to attain best practice in relation to radiation protection.

2.2.4 Revised Basic Safety Standard Directive

The Basic Safety Standard Directive has been redrafted by Council Directive 2013/59/Euratom of December 2013, and will be transposed into Irish law by 2018.

2.3 Nurse Prescribing of Medical Ionising Radiation

The policy for introducing nurse prescribing of ionising radiation (X-Ray) originates in the Department of Health and Children (DOHC). In the mid 2000s, the Minister for Health and Children identified the need to improve patient access to care and prioritised the introduction of nurse prescribing of medical ionising radiation by amending the relevant statutory instruments. In June 2007 the Minister signed into Irish law Statutory Instrument (S.I.) No.303 of 2007 (Government of Ireland 2007) which amended S.I. 478 (2002) European Communities (Medical Ionising Radiation Protection) Regulations 2002. This S.I. incorporated an amendment to the previous definition of prescriber to include nurses as "prescribers". S.I. No. 303 European Communities (Medical Ionising Radiation Protection) (Amendment) Regulation 2007 states that a nurse prescriber is:

(d) a person whose name is entered on the register of nurses as maintained by An Bord Altranais established by the Nurses Act 1985 and who meets the standards and requirements set down by An Bord Altranais from time to time to allow them to refer individuals for medical exposures to a practitioner.

In practice this legislation authorises a nurse to refer an individual (patient/service user) to a practitioner for medical exposure to ionising radiation provided that the nurse is registered with An Bord Altranais and has successfully completed an education programme (approved by An Bord Altranais) to prepare for this role as outlined in the *Requirements and Standards for Education Programmes for Nurse Prescribing of Ionising Radiation* (An Bord Altranais 2008).

The importance of the scope of practice of the prescriber is highlighted in that the nurse can 'make an independent decision to prescribe medical ionising radiation (X-Rays) and is professionally accountable for his or her decision' (HSE 2009: 22). However, it is further noted that it 'is the Consultant who assumes responsibility for treatment actions that maybe necessary as a result of findings on radiographic studies that the nurse may have requested' (HSE 2009: 22). To ensure that nurses are operating within their scope of practice the *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray)* (HSE 2009) recommends a number of areas that should be considered prior to commencing and during the prescribing role.

2.3.1 Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray) (HSE 2009)

The *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray)* (hereafter referred to as the *Guiding Framework*) was published by the HSE in 2009. The *Guiding Framework* outlines the requirements for the introduction and process of nurse prescribing of medical ionising radiation, including governance, implementation, and educational requirements. The principal rationale for implementing nurse prescribing of ionising radiation was to enhance patient access to care and treatment. This access was placed in the context of a growing and ageing population and the need to ensure all patients have equitable contact with the health services.

Nurse prescribing of ionising radiation was introduced at a time of great change in the nursing profession, especially in terms of expanding roles and the development of clinical career pathways. Building on the HSE (2006) *Transformation Programme 2007 - 2010*, the HSE authorised for nurse prescribing of ionising radiation to be introduced to ensure the following:

- Appropriate prescribing of ionising radiation (X-Ray) using evidence-based practice;
- Improved access by patients/service users to radiological diagnostics;
- Convenience for patients/service users with enhanced user satisfaction;
- Effective and efficient utilisation of nurses' roles and competencies;
- Greater awareness of the risk management issues associated with ionising radiation (X-Ray) amongst nurses and;
- Appropriate clinical decision-making within shorter time frames for patients/service users (HSE 2009: 13).

Nurse prescribing of ionising radiation is overseen by the *Advisory Committee for the Implementation of the Nurse Prescribing of Medical Ionising Radiation (X-Ray)* (National Advisory Committee) and guided by the HSE Office of the Nursing and Midwifery Services Director (ONMSD).

The role of the National Advisory Committee in preparing for the introduction of nurse prescribing of ionising radiation was to:

Develop clinical governance protocols, advise on site preparation and nurse selection for the role, develop the arrangements for the educational preparation

for nurses and audit and monitor nurse prescribing of medical ionising radiation (HSE 2009: 28).

Building on the experience of nurse and midwife prescribing of medicinal products, the prescribing of ionising radiation is underpinned by ten core principles: patient centredness, maximising benefit to patients, governance, quality, safety, collaboration, radiation protection (including the radiation protection principles of justification and optimisation), consistency, accountability and sustainability (HSE 2009).

In addition, the *Guiding Framework* provided health service providers with a blueprint to implement nurse prescribing of ionising radiation within their organisation including governance structures, processes and supporting documentation. Based on the HSE (2008) model of change, the *Guiding Framework* outlined the key documentation required to implement the process as well as the principal stakeholders needed to instigate and oversee the initiative at operational and clinical levels. Underlying this direction was the recommendation that health service providers identified the extent to which there was a need for nurse prescribing of ionising radiation and to identify whether the introduction of the initiative would impact positively on both patient care and patient access to care. Health service providers who were considering the introduction of nurse prescribing of ionising radiation were also asked to consider the extent to which human and structural resources were in place to support the initiative; for example the availability of clinical supervision, clinical consultants, infrastructural resources, information technology support and audit structures.

Associated with support structures required in the clinical area, the HSE put in place a number of resources that monitor the implementation of the prescribing of ionising radiation. Central to this was the *National Nurse Prescribing Ionising Radiation Minimum Dataset* (NNPIRMD). The aim of the dataset was to collect data that would allow for the efficient monitoring of the initiative. The dataset includes: the clinical site prescriber's name and personal identification number, time and date of the prescription and the radiographic examination prescribed (HSE 2009). The NNPIRMD is backed up by the *National Nurse Prescribing Ionising Radiation Data Collection System*; this system allows prescribers record the minimum dataset on an online database. The data collection system provides information on the ionising radiation prescribing practice of nurses at a number of levels.

To be eligible to prescribe ionising radiation, nurses must be registered in the General or Children's divisions of the An Bord Altranais register and have completed a

recognised education programme as well as being employed by, and have the support of, their employing health service provider.

Following the completion of an education programme that prepares a nurse to prescribe ionising radiation, the HSE *Guiding Framework (2009: 76-77)* outlines a number of responsibilities of the prescriber:

- Is responsible for the assessment of the patient/service user, determining what the problem is and making a diagnosis that may lead to a clinical decision to prescribe ionising radiation (X-Ray). The registered nurse prescriber holds full accountability and responsibility for this process/action.
- Ensures their name is entered on HSE national database.
- Practices in compliance with all of the relevant statutory provisions, An Bord Altranais guidelines and all local guidelines and conditions.
- Prescribes for patient/service user populations within the practice setting and scope of practice set out in their local policy.
- Inputs information for the National Nurse Prescribing Ionising Radiation (X-Ray) Minimum Data Set on all prescriptions written in the Nurse Prescribing Ionising Radiation (X-Ray) Data Collection System and furnishes statistical reports as required.
- Commits to and undertakes continuing professional development to maintain their competence for prescriptive authority. Informs their director or line manager of any concerns pertaining to their competence.
- Conducts audits of prescribing ionising radiation (X-Ray) practice and furnishes reports as required.
- Works collaboratively with other members of the healthcare team in order to enhance therapeutic outcomes for patients/service users.
- Acts as an educated advisor to other students undertaking the certificate in nursing (nurse prescribing ionising radiation (X-Ray)).
- Maintains on-going communication and collaboration with members of the health care team including collaborating medical practitioners and the radiology departments.
- Discusses with the Director of Nursing or designate any situations where these responsibilities cannot or are not being fulfilled.

2.4 Educational Preparation for Nurse Prescribing of Ionising Radiation

One of the central aims of the National Advisory Committee was to design, develop and implement the educational preparation of nurses for the prescribing of ionising

radiation. This was operationalised through a National Education Programme Board subcommittee that consisted of nurse educators, a consultant radiologist, radiographers, physicists and the Office of the Nursing and Midwifery Services Director. The education programme was designed in accordance with the *Requirements and Standards for Nurse Education for Authority to Prescribe Ionising Radiation (X-Ray)* (An Bord Altranais 2008) and, following submission, was approved by An Bord Altranais. The educational preparation for nurses is underpinned by the document *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray)* (An Bord Altranais 2008).

2.4.1 Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray) (An Bord Altranais 2008)

Following on from the change in legislation that extended the definition of a prescriber of ionising radiation to nurses, An Bord Altranais were charged by the Department of Health and Children to develop the *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray)* (An Bord Altranais 2008). This document 'sets out the educational requirements and standards for nurse authority to prescribe ionising radiation (X-Ray)' (An Bord Altranais 2008: 5) and provides guidance to educational providers on the requirements for delivering a programme to enable nurses prescribe ionising radiation following completion of the programme. Programmes cannot commence without the approval of An Bord Altranais. Interprofessional collaboration in the development of the education programme is a core theme that runs through the document with an emphasis on equality of input from all disciplines involved in the planning delivery and assessment of the educational intervention.

The outcomes from the programme outlined by An Bord Altranais (2008) identifies that the nurse must:

- Demonstrate a systematic understanding of the regulatory framework associated with the authority to prescribe ionising radiation (X-Ray), including the legislation and professional guidelines, supporting safe practice.
- Critically utilise evidence-based knowledge and skills of patient/client assessment and consultation to achieve a holistic approach to patient/client care in prescribing ionising radiation (X-Ray).
- Apply clinical decision-making skills in relation to prescribing ionising radiation (X-Ray) within her/his scope of practice.
- Demonstrate an understanding of radiological sciences in relation to ionising radiation (X-Ray) and its implication on patient/client safety.

- Demonstrate effective communication skills and knowledge of the role of the multi-disciplinary team management involved in safe and appropriate use of ionising radiation (X-Ray).

In addition to the learning outcomes, the *Requirements and Standards* (An Bord Altranais 2008: 11) outline competencies within five domains that nurses who prescribe ionising radiation should achieve: 1) professional and ethical practice; 2) holistic approaches to the integration of knowledge; 3) interpersonal relationships; 4) organisation and management of care and; 5) personal and professional development. The indicative content that underpins the syllabus covers six main areas including: professional accountability and responsibility, legal and ethical aspects, ionising radiation, radiation protection, principles of the prescribing process for ionising radiation and collaboration/referral with other health professionals.

An Bord Altranais (2008) outlines a number of essential requirements for the programme. These include that theoretical instruction should be no less than 30 hours and that there should be no less than 10 episodes of prescribing ionising radiation and a demonstration of competence. Other requirements include: the nurse must be practicing in the clinical area where the clinical instruction will take place, they must obtain the agreement from a medical practitioner that they will be supervised by them for the duration of the programme and that the programme must be completed within a six-month period. To be eligible for entry to an educational programme preparing nurses to prescribe ionising radiation, applicants must be currently registered on the General Nurse or Children's Nursing Divisions of the Live Register maintained by Bord Altranais and have a minimum of three years post-registration experience in the designated area of clinical practice (acute adult or children's services), one of which must be within the last three years. In addition, they must be nominated by their Director of Nursing to undertake the programme based on a clearly identified service need and clinical governance arrangements must be in place through a Local Implementation Group.

The scope of practice in relation to the prescribing of ionising radiation is also outlined in the *Requirements and Standards* document (An Bord Altranais 2008). In outlining the list of anatomical sites for which a nurse can prescribe ionising radiation, An Bord Altranais (2008: 18) highlight that the list is a 'guide' and that 'the nurse must consider her/his scope of practice and any local guidelines/policies relating to this role' (see Table 2.1).

Table 2.1 Radiographic Examinations that a Nurse is Permitted to Prescribe (Adapted from An Bord Altranais 2008: 18)

<i>X-Ray</i>	<i>Site</i>
Chest	Chest
Abdomen	Abdomen
Pelvis	Pelvis Hip
Upper Limb	Shoulder Elbow Wrist Clavicle Acromio-clavicular joint Humerus Forearm Scaphoid Hand Finger/thumb
Lower Limb	Femur Knee Ankle Foot Patella Tibia and fibula Toe

The first national education programme for nurse prescribing of medical ionising radiation was held in the Centre for Learning and Development, St. James's Hospital, Dublin in 2009. The programme was delivered with the support of the Faculty of Radiologists in Ireland, the Radiography Services Managers Association, the Irish Institute of Radiography and Radiation Therapy and the Association of Physical Scientists in Medicine. At the time of this evaluation, educational programmes for the preparation of nurses to prescribe ionising radiation were provided at Regional Centre of Nursing and Midwifery Education-Midland Regional Hospital, Tullamore, Co. Offaly; Regional Centre of Nursing and Midwifery Education, Connolly Hospital, Dublin; School of Nursing and Midwifery, Trinity College Dublin and; the School of Nursing, Midwifery & Health Systems, University College Dublin. Nurses undertaking an educational programme to prepare for the prescribing of ionising radiation are funded by the HSE.

2.5 Local Implementation Groups

To further support the implementation and governance of nurse prescribing of ionising radiation, Local Implementation Groups (LIGs) were recommended to be formed at hospital level. The LIGs report to the Radiation Safety Committee in the hospital in

which nurse prescribers of ionising radiation are practising. The HSE (2009: 29) *Guiding Framework* outlines the function of the LIG which include: the identification of suitable clinical settings for the introduction of nurse prescribing of ionising radiation, the implementation of relevant policies and guidelines, monitoring the impact of the initiative on radiology services at local level, putting in place risk management structures and reviewing any unexpected events. It is envisaged by the HSE that as nurse prescribing of ionising radiation becomes internalised into the health service, the LIG would become 'subsumed into the overall radiology services' governance arrangements once the nurse prescribing of medical ionising radiation (X-Ray) is embedded in services' (HSE 2009: 29).

2.6 Educational Preparation and Continuing Professional Development of Nurse Prescribers of Ionising Radiation – A Review of the Literature

In contrast to a small but growing body of published evaluations of educational programmes designed for nurse and midwife medicinal prescribing (e.g. Latter *et al.* 2005, 2007, Drennan *et al.* 2009; Latter *et al.* 2011), similar evaluations specific to the prescribing of medical ionising radiation are notably sparse. Most literature to date relates to studies on nurses' abilities to request and interpret radiographic imaging in emergency departments (Lindley-Jones and Finlayson 2000, Fry 2002, Kec *et al.* 2003, Summer 2005, Free *et al.* 2008). Only one study was identified that explicitly evaluated a medical ionising radiation prescribing educational programme for registered nurses (Considine *et al.* 2013). This study was also within the clinical context of emergency nursing. Likewise, only one study that explicitly addressed continuing professional development (CPD) was identified, focusing on nurses performing X-Ray examinations in rural areas of Australia (Smith and Fisher 2011).

Although published evaluations of educational programmes for nurse prescribing of ionising radiation are limited, it is possible to make appraisals from existing literature on entry requirements to programmes and curricular processes and outcomes. In addition, some 'grey' literature (e.g. universities, professional and regulatory Bodies websites and documentation) provide insights into preparation and continuing education for nurse prescribing of ionising radiation.

2.6.1 Entry to Education Programmes for Nurse Prescribing of Ionising Radiation

In Australia, master's degree programmes leading to qualification as a nurse practitioner include preparation for prescribing medical ionising radiation, following which successful candidates can register with the Australian Health Practitioner Regulation Agency. A nurse practitioner is described as a highly qualified registered nurse with diagnostic and treatment authority. Minimum entry requirements to these programmes are that applicants must be registered nurses with a degree in nursing (or equivalent) and a postgraduate nursing qualification relevant to their field of practice. They must have at least 3 years full-time equivalent clinical experience in the relevant field of practice. Access to a clinical support team during the programme is also an entry requirement (Queensland Health 2013).

Similarly, in Canada educational preparation for medical ionising radiation prescribing is typically within the context of a master's degree programme leading to qualification as a nurse practitioner, although with some variation in specific entry requirements. For example, in Ontario Canada, a primary degree and at least two years practical experience is required to enter a master's degree programme to prepare as a nurse practitioner with medical ionising radiation prescribing authority (Health Professions Regulatory Advisory Council (HPRAC) (2008).

The level of qualification that nurses require for medical ionising radiation prescribing has been investigated in Australia (Considine *et al.* 2013). In this study, the aim was to examine whether registered nurses (RNs), with or without a postgraduate qualification in emergency nursing, differed in practice following an education programme preparing them for medical ionising radiation prescribing. Regardless of the entry level of RNs to the educational programme, they were found to safely and appropriately prescribe radiographic imaging within their scope of practice. The authors concluded that a postgraduate qualification in a nursing speciality was not necessarily required for nurse medical ionising radiation prescribing practice. However, there are a number of issues concerning both the internal and external validity of this study that suggest that the results need to be treated with caution.

2.6.2 Educational Preparation Programmes for Nurse Prescribing of Medical Ionising Radiation

In relation to educational preparation specific to nurse prescribing of ionising radiation, a review of studies by Free *et al.* (2008) found considerable variation in educational methods with no formal training identified for nurses engaged in requesting and interpreting radiographic images in practice. In a UK emergency department, Summer (2005) found that compared to junior nurses (less than 5 years of emergency nursing experience, n=10), senior nurses (n=10) were safely able to interpret radiographic images that they requested without formal training. In other words, they learned to request and interpret radiographic images through experience gained 'on the job'. An evaluation of a structured medical ionising radiation prescribing educational programme in Australia, however, found that nurses on completion of this programme demonstrated increased accuracy and appropriateness in requesting radiographic images compared to nurses following *ad hoc* educational preparation (Considine *et al.* 2013); a finding also evident in Fry's (2002) evaluation of expanding the role of triage emergency nurses to include radiology requests. Accuracy in the interpretation of radiographic images following specialist training of emergency nurses has also been reported (Tambimutti *et al.* 2002; Free *et al.* 2008).

Educational programmes in medical ionising radiation prescribing for nurses gleaned from the literature are best described as in-service training. For some programmes the duration of training was between one to two days (Derksen *et al.* 2006, Lindley-Jones and Finlayson 2000) and for others the duration was not reported (Fry 2002, Considine *et al.* 2013). In terms of programme structure, content and delivery, Considine *et al.* (2013) evaluated a nurse initiated medical ionising radiation education programme for emergency nurses in a prospective exploratory study. The programme included a theoretical and clinical practice component consisting of preparation through knowledge acquisition, readiness assurance in using knowledge, and application of acquired knowledge. The theory content included anatomy and physiology, advanced assessment of distal limb injuries, diagnostic imaging for specific injuries, and radiation safety. Readiness assurance and knowledge application were assessed using a multiple-choice examination. A decision support checklist was designed to support students' application of knowledge in practice. In advance of the theory component delivered in the classroom, students were provided with an online mini-movie and selected reading. Team based learning was the principal pedagogical approach to education delivery, which the researchers described as a highly structured method that promotes deep learning, student

engagement, and the development of skills of collaboration, negotiation and communication. The outcomes assessed were compliance with scope of practice defined within the programme, accuracy and appropriateness of documenting patient assessment data, and accuracy and appropriateness of radiographic imaging requests. These outcomes were assessed by auditing a sample of requested radiographic examinations and patient data from the emergency information system. The programme was evaluated positively in terms of achieving all three outcomes. Specific elements of the programme were not evaluated, which the researchers noted was beyond the scope of their study (Considine *et al.* 2013).

Fry (2002) reported on an evaluation of a medical ionising radiation prescribing educational programme for nurses. The content of this programme, designed for emergency triage nurses as part of an Australian study on role expansion, addressed history and physical assessment, documentation guidelines, radiation safety, and the radiology department protocol. Fry reported that survey and interview data from staff indicated that the educational programme was appropriate in supporting them to expand their role in relation to requesting radiographic examinations. Similar to Considine *et al.* (2013), specific elements of the programme were not evaluated in Fry's (2002) study.

The curricular content of both studies (Fry 2002, Considine *et al.* 2013), taken together, are broadly consistent with some requirements of regulatory authorities for the educational preparation of nurses and midwives in X-Ray prescribing, such as in Ontario, Canada and Ireland (HPRAC 2008, An Bord Altranais 2008). In addition, these regulatory authorities require that educational programmes address professional and legislative frameworks for safe prescribing of ionising radiation within a nurse's scope of practice, the development of clinical reasoning skills for evidence based decision making and clinical instruction through clinical supervision, which in Ireland must be provided by a medical practitioner.

In conclusion, due to the absence of published literature on rigorous evaluations of medical ionising radiation prescribing programmes for nurses, a piecemeal and incomplete picture exists on the quality of educational preparation. Furthermore, evaluative data available to date apply to emergency nurses only, leaving little information on the educational preparation of nurses for medical ionising radiation prescribing practice across a range of healthcare contexts and population groups.

2.6.3 Continuing Professional Development

There is some reference in the literature that nurses educated to prescribe ionising radiation need to engage in continuing professional development following initial preparatory programmes. For example, regular in-service education sessions have been recommended to prevent unnecessary ordering of radiographic images (Fry 2002, Kec *et al.* 2003); however, no details were provided on what this continuing education should involve. In an Australian survey, the self-perceived need for continuing education amongst remote radiographic imaging operators (nurses, GPs and physiotherapists) in rural areas was investigated, the majority of whom were nurses (Smith and Fisher 2011). Radiation protection was reported as the highest level of understanding among respondents whereas lower levels of understanding were reported regarding image quality assessment, evaluating radiographs for errors, and identifying radiograph pathology. Although most nurses were found to have never or rarely partaken in continuing education, they reported that there was a need for on-going education. The preferred methods of continuing education were reported as: one or two day intensive face-to-face training including a clinical component at regular intervals ranging from every 6 months to every 2 to 3 years; spending time working with a radiographer; structured and formal process of reviewing and critiquing radiographs; and online or distance learning, although face-to-face and practical learning was preferred over web-based learning.

Apart from Smith and Fisher's (2011) study, little is known about the continuing educational needs of nurses following their initial preparation programme for medical ionising radiation prescribing. No literature was identified in relation to the evaluation of continuing professional development of nurse prescribers. In Ireland, An Bord Altranais (2008) requires that nurses preparing to prescribe ionising radiation identify and plan their continuing professional development needs to ensure continued competence beyond initial education. On successfully exiting a preparation programme, nurses who prescribe ionising radiation are required to 'maintain their level of competence to ensure safe and effective practice within their scope of practice' (HSE 2009: 53). Without adequate continuing professional development for medical ionising radiation prescribers, it has been identified that nurses may become less competent and less skilled over time (Smith and Fisher 2011).

Chapter III

Design of the Evaluation

3.1 Introduction

This chapter outlines the methods that were used by the research team to conduct an evaluation of the implementation of the *HSE Guiding Framework on Nurse Prescribing of Medical Ionising Radiation (X-Ray) in Ireland* (HSE 2009). The five phases of the evaluation are outlined; this is followed by a discussion of the research design including the instruments used, the methods of data collection, the sampling procedure, data analysis techniques employed and ethical issues. The evaluation was completed in 2013 and data was collected from the 22 organisations that had nurse prescribers of ionising radiation in post at the time of the evaluation. Data was also collected from key stakeholders who had a view on, or were involved in, nurse prescribing of ionising radiation. The methods used in the evaluation of nurse prescribing of ionising radiation were based on those used in the *Independent Evaluation of the Nurse and Midwife Prescribing Initiative* (Drennan *et al.* 2010).

3.2 Aims of the Evaluation as per the Tender

The aims of the evaluation were informed by the objectives of the Tender set out by the HSE and included:

1. Evaluation of the HSE supported education programme in terms of:
 - a) Adherence to *An Bord Altranais Requirements and Standards for Education Programmes for Nurse Prescribing of Ionising Radiation* (An Bord Altranais 2008).
 - b) Evaluate programme participants' preparedness for practice as a nurse prescriber of ionising radiation (fit for practice).
2. Evaluation of the implementation of *HSE Guiding Framework* by Healthcare Providers in terms of:
 - a) Establishment of Governance through Local Implementation Groups.
 - b) Impact of nurse prescribing of ionising radiation in clinical areas as quality improvement from the perspective of quality, access and cost.
 - c) Evaluation of the monitoring and audit procedures undertaken by healthcare providers and ONMSD (HSE).
3. Present findings and suggest recommendations through the Project Steering Group for consideration by the National Advisory Committee on the following:
 - a. Effectiveness of education programmes in developing a cohort of nurses competent in the role of nurse prescribers of ionising radiation.

- b. Utility of the HSE *Guiding Framework* in supporting the continued implementation of nurse prescribing of ionising radiation in Ireland.
- c. Expansion of education programme and governance arrangements to support nurse prescribing of ionising radiation in the area of children's services.

3.3 Design of the Evaluation

The design of the evaluation is based on the theory underpinning evaluation research. Evaluation theory examines the effectiveness and merit of an intervention, in this case the implementation of nurse prescribing of ionising radiation in Ireland. Evaluation research may be carried out using quantitative methods, qualitative methods, or a combination of quantitative and qualitative methods (Creswell 1994, Weiss 1998). This study utilises a combination of qualitative and quantitative methodologies. This combination of a quantitative approach (survey questionnaires, audit of prescriptions) and qualitative approach (documentary analysis, and open-ended qualitative comments from the survey questionnaires) was used to add scope, breadth and comprehensiveness to the evaluation (Goodwin & Goodwin 1984, Creswell 1994, Weiss 1998, Dillman 2000, Drennan 2003).

3.4 Sample

Those who were involved in the nurse prescribing of ionising radiation initiative or had contact with prescribers were identified in the evaluation as stakeholders and were central to the evaluation process. Therefore the sample included, nurses (including prescribers and non-prescribers of medical ionising radiation), members of the medical and radiography professions, relevant regulatory bodies, hospital management, educators and patients and service users. In addition, the sample consisted of radiographic examinations requested by nurse prescribers of ionising radiation, the consultations associated with the request and the radiologists' reports on the imaging requested.

3.4.1 Sample of Nurse Prescribers of Medical Ionising Radiation

At the time of the evaluation (i.e. postal surveys in August 2013), 164 nurses had completed educational programmes relating to the preparation of nurses for prescribing of medical ionising radiation in Ireland. The sample size was informed by best practice in survey research and included all registered nurses who had completed the medical ionising radiation prescribing educational programme at any of the following: The Regional Centre for Nursing and Midwifery Education, Regional Hospital, Tullamore, Co.

Offaly; the Regional Centre for Nursing and Midwifery Education, Connolly Hospital, Dublin; the School of Nursing and Midwifery, Trinity College Dublin; the School of Nursing, Midwifery, and Health Systems, University College Dublin and; St. James's Hospital, Centre for Learning and Development. A sample frame of 164 nurses was created by the Health Service Executive, and this included 18 nurses who completed the programme in July 2013. Three programme participants could not be contacted (unknown addresses).

3.4.2 Sample of Patients

Patients who received a prescription for ionising radiation from a nurse were requested, following consultation, to complete a questionnaire which measured their level of satisfaction with the prescribing and consultation process. Eligibility for patient inclusion incorporated the following: 1) ability to understand English; 2) no evidence of cognitive impairment; 3) aged 18 years and older; 4) were not precluded from taking part in the survey due to their illness. Due to the ethical procedures associated with the study, patients were presented with the questionnaire and an information leaflet by the nurse prescriber of ionising radiation following the consultation in which the radiographic examination was requested. The patient was requested to fill in the questionnaire at a time suitable to them and to return the questionnaire directly to the research team. Patients were provided with a stamped addressed envelope to facilitate this process.

3.4.3 Sample of Stakeholders

This stage of the evaluation undertook a survey to ascertain key stakeholders' perceptions of nurse prescribing of ionising radiation. Key stakeholders were defined as health professionals that had a specific interest, or were involved in the development of nurse prescribing of ionising radiation. Stakeholders surveyed included nurse clinicians, managers and administrators, radiographers, academics, medical doctors and members of Local Implementation Groups as well as key stakeholders in each of the relevant regulatory and policy bodies. The sample was identified through contact lists of key stakeholders involved in the development, initiation and governance of nurse prescribing of ionising radiation. Key medical, radiography and nursing stakeholders were identified from clinical sites where nurse prescribers of ionising radiation were currently practising.

3.4.4 Sample of Prescriptions Written and Consultations Completed

The units of analysis in this phase of the evaluation were radiographic images requested and consultations undertaken by nurse prescribers of ionising radiation. This sampling

procedure formed part of the audit component of the evaluation and explored the quality of the prescribing process.

3.5 Phases of the Evaluation

To ensure that each element of the nurse prescribing of ionising radiation initiative was comprehensively evaluated, five distinct but interlinked phases of research were carried out. The overall aim of this approach was to enable key stakeholders have a voice in the evaluative process. The five phases were as follows:

1. Evaluation of Educational Preparation for Prescribing Practice – this phase addressed the following objective: 'Evaluation of the HSE supported education programme in terms of: 1) adherence to *An Bord Altranais Requirements and Standards for Education Programmes for Nurse Prescribing Ionising Radiation* (2008) and; 2) evaluate programme participants preparedness for practice as nurse prescribers of ionising radiation (fit for practice).
2. Audit of Nurse Prescribing of Ionising Radiation – this phase addressed the following objectives: 1) Impact of nurse prescribing of ionising radiation in clinical areas as a process of quality improvement from the perspective of quality, access and cost; 2) evaluate programme participants' preparedness for practice as a nurse prescriber of ionising radiation (fit for practice) and; 3) evaluation of the monitoring and audit procedures undertaken by Healthcare Provider and ONMSD (HSE).
3. Evaluation of Patient Outcomes – This phase addressed the following objective: 1) Impact of nurse prescribing ionising radiation in the clinical area as quality improvement from the perspective of quality, access and cost.
4. Evaluation of Health Professionals' Perception of Outcomes - This phase addressed the following objectives: 1) evaluate programme participants' preparedness for practice as nurse prescribers of ionising radiation (fit for practice); 2) establishment of governance through Local Implementation Groups and; 3) impact of nurse prescribing of ionising radiation in clinical areas as quality improvement from perspective of quality, access and cost.
5. Evaluation of Prescribers' Outcomes – This phase addressed the following objectives: 1) evaluate programme participants preparedness for practice as nurse prescribers of ionising radiation (fit for practice); 2) establishment of governance through Local Implementation Groups and; 3) impact of nurse prescribing of ionising radiation in clinical areas as quality improvement from perspective of quality, access and cost.

3.6 Phase 1 - Evaluation of the Education Programme for Nurse Prescribing of Medical Ionising Radiation

Two questionnaires were used to evaluate the education programme undertaken by nurses to prepare them to prescribe ionising radiation. The first, entitled the *Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire* (PIRCOEQ) evaluated course participants' abilities and understanding of prescribing practice as a consequence of the preparation programme. The second, the *Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire* (PIRCEQS), evaluated course participants' perceptions of the quality of their preparation programme. Both of these questionnaires were developed by the research team and were based on those used to evaluate the nurse and midwife medicinal prescribing initiative (Drennan *et al.* 2009). They were adapted and modified to measure the specific outcomes that pertain to nurse prescribing of medical ionising radiation.

3.6.1 *Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire (PIRCOEQ)*

The framework for the evaluation of outcomes achieved as a consequence of the educational programme were determined by the documents *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation* (An Bord Altranais 2008), the *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray)* (HSE 2009) and the best practice in the evaluation of education programmes (Ramsden 1991). These frameworks were used to develop evaluative questionnaires that measured nurses' self-reports of their abilities, outcomes and satisfaction following the completion of an educational programme for nurse prescribing of medical ionising radiation. Programme participants' self-reports are recognised as valid indicators of outcomes in evaluative research (Ellett 1997, Anaya 1999, Drennan and Hyde 2008). The *PIRCOEQ* was presented in the format of a post-test/then-test measurement. The post-test section of the questionnaire asked respondents to rate where they perceived themselves now as a result of completing the prescribing course. The then-test section requested the course participant to rate where they saw themselves prior to commencing the prescribing course. This method is called a retrospective pre-test design and has been used extensively in the evaluation of education programmes including a short term educational programme (Moore and Tananis 2009), the evaluation of a nurse and midwife prescribing programme (Drennan *et al.* 2009) and the evaluation of an education psychology course (Coulter 2012). This design is an alternative to the typical pre-test/post-test design in settings where perception of ability/understanding (both pre and post) serves to form part of a course evaluation

(D'Eon and Trinder 2013). The then-test and post-test responses are provided from the same perspective (i.e. at the same time), however the then-test (retrospective pre-test) scores have been associated with weaker psychometric performances than the pre-test/post-test approach which may be linked to the implicit theory of change, propensity for socially desirable answers, and potential recall bias (Nolte *et al.* 2009). However, as it was not possible to collect pre-test data, the retrospective pre-test is a design that can allow change to be measured as well as controlling for response-shift bias³. The outcomes from the educational programmes were measured under six domains. These included:

1. Professional Accountability and Responsibility

This section of the questionnaire measured programme participants' understanding and ability in relation to:

- Professional regulations and guidelines.
- Accountability and responsibility for prescribing ionising radiation.
- Critical review and self-audit.
- Risk management.
- Evidence-based practice and clinical governance in relation to prescribing ionising radiation.

2. Legal and Ethical Aspects

This section of the questionnaire measured programme participants' understanding and ability in relation to:

- Legislation for nurses prescribing ionising radiation.
- Ionising radiation.
- Radiation protection.
- Legal liability and clinical indemnity for prescribing ionising radiation and expansion of nursing practice.
- Informed consent of patient/client for treatment.

3. Ionising Radiation

This section of the questionnaire measured programme participants' understanding and ability in relation to:

- Principles of ionising radiation.
- Radiation physics.

³ For further information on the retrospective pre-test and response shift bias see: Drennan J. (2013) Quasi-experimental and retrospective pretest designs for health care research. In Curtis E., and Drennan J. (editors) *Issues and Methods for Quantitative Health Research: Theory and Application*. Open University Press, London.

- Radiation biology.
- Imaging modalities.
- Dosimetry.

4. Radiation Protection

This section of the questionnaire measured programme participants' understanding and ability in relation to:

- Principles of radiation protection.
- Practical aspects of radiation protection.
- Radiation protection during pregnancy.
- Radiation protection techniques.

5. Principles of the Prescribing Process for Ionising Radiation

This section of the questionnaire measured programme participants' understanding and ability in relation to:

- Assessment of patient/client – history and physical examination.
- Consultation skills.
- Knowledge and skills for decision-making.
- Diagnostic reasoning.
- Risk vs. benefit ratio in treatment decisions.
- Writing and processing an X-Ray request form.
- National and local health care provider's guidelines, policies and protocols for prescribing ionising radiation.

6. Collaboration/Referral with other Health Care Professionals

This section of the questionnaire measured programme participants' understanding and ability in relation to:

- Interpersonal and communication skills necessary to foster collaborative relationships with allied health professionals.
- Role and function of other health care professionals involved in the process of prescribing, providing and/or interpreting ionising radiation procedures.
- Interdisciplinary sharing of patient/client medical records.
- Scope of practice.
- Clinical audit.

3.6.2 Reliability of the Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire (PIRCOEQ)

The items that comprised the PIRCOEQ were summated into six scales that measured course participants' ability and understanding in the following domains: professional accountability and responsibility, ionising radiation, radiation protection, legal and ethical aspects of prescribing ionising radiation, principles of the prescribing process and,

collaboration with other healthcare professionals. Reliability estimates relating to the six scales that comprise the PIRCOEQ, measured using Cronbach's alpha, are outlined in Table 3.1. Cronbach's alpha is a coefficient marker of the internal consistency of scales (Cronbach 1951). It is a commonly used psychometric estimate of the reliability of test scores when items within a scale are measuring the same concept or construct. As the value of Cronbach's alpha increases the more correlated items on the scale are to each other. Reliability estimates in Table 3.1 indicate that the scales used were internally consistent as all values were above the recommended value of 0.70 (DeVillis 2003, Tavakil and Dennick 2011).

Table 3.1 Reliability estimates of the PIRCOEQ subscales

*Subscales	Number of items	Before Programme		After Programme	
		n	Cronbach's alpha	n	Cronbach's alpha
Professional Accountability and Responsibility	7	95	0.95	93	0.96
Ionising Radiation	5	98	0.93	99	0.94
Radiation Protection	4	97	0.92	97	0.93
Legal and Ethical aspects	5	95	0.95	96	0.96
Principles of the Prescribing Process for Ionising Radiation	8	93	0.96	94	0.95
Collaboration/Referral with other Health Care Professionals	6	95	0.92	98	0.95

n= number of participants who completed all items in the subscale. *Subscales measure understanding and ability in that domain.

3.6.3 Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire (PIRCEQS)

The Course Experience Questionnaire (CEQ) was developed in Australia as an instrument for collecting data from graduates relating to the quality of individual educational programmes (Ramsden 1991) and latterly as an annual survey instrument for higher education institutes (Marsh, *et al.* 2011). The second questionnaire used in the survey package was an adaptation of the CEQ and was titled the *Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire* (PIRCEQS). The original CEQ was

used as a proxy measure of student satisfaction with their programme acknowledging that a good course experience is a clear antecedent to students' satisfaction with their educational programme. Taking this a step further, Grace *et al.* (2012) highlight the need to measure student's satisfaction with a programme of study as a key component of evaluating the student's programme experience. The PIRCEQS is comprised of 48 closed items divided into eight subscale dimensions measuring good teaching (6 items), clear goals and standards (5 items), appropriate workload (4 items), appropriate assessment (11 items), skills (preparation for prescribing Practice) (5 items), infrastructure (4 items), mentor support (10 items) and overall satisfaction with the quality of the course (3 items) (McInnis *et al.* 2001, Drennan *et al.* 2009, Grace *et al.* 2012). Each item in the PIRCEQS requires a response in the format of a 5-point Likert scale, ranging from a score of one (strongly disagree) to five (strongly agree) to reflect students' reported perceptions of their course experience.

3.6.4 Reliability of the Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire (PIRCEQS)

Reliability estimates relating to the subscales of the PIRCEQS are outlined in Table 3.2. Cronbach's alpha is a coefficient marker of the internal consistency of scales (Cronbach 1951). It is a commonly used psychometric estimate of the reliability of test scores when items within a scale are measuring the same concept or construct. The value of Cronbach's alpha increases the more correlated items on the scale are to each other. However the length of the scale also affects the value of alpha, if the scale has too few items, the alpha may be reduced. Reliability estimates in Table 3.2 indicate that the scales used were internally consistent as all values were above the recommended value of 0.70 with the exception of the workload subscale. It is notable that there was considerable variability (dispersion from the mean) in the answering pattern for the workload subscale (i.e. standard deviation). The variability in the answering pattern of the workload subscale may be due to variations in the level of clinical experience/skills of the programme participants e.g. assessment skills of staff nurses in comparison to advanced nurse practitioners. For this reason, we also assessed the reliability of the subscales using the mean inter-item correlation. Clark and Watson (1995) recommend that the average inter-item correlation lie in the range 0.15 to 0.50, the workload scale did not meet this criterion. A Cronbach's alpha was not computed for the infrastructure subscale as this scale contained heterogeneous items (not all measuring the same construct). Reliability of subscales within the CEQ and latterly the CEQS has been reported previously with values over 0.80 noted for all subscales (Marsh 2011, Grace *et al.* 2012, Stergiou and Airey 2012).

Table 3.2 Reliability estimates of the PIRCEQS subscales

<i>Subscales</i>	<i>Number of items</i>	<i>Number of respondents</i>	<i>Cronbach's alpha</i>	<i>Mean inter-item correlation</i>
Good Teaching	6	97	0.84	0.47
Appropriate Assessment	11	96	0.77	0.24
Preparation for Prescribing Practice	5	96	0.85	0.53
Workload	4	94	0.20	0.06
Mentor Support	10	98	0.94	0.63
Organisation of Programme	5	97	0.71	0.33
Overall Satisfaction	3	96	0.85	0.66

3.7 Phase 2 - Audit of Nurse Prescribing of Ionising Radiation

The audit of nurse prescribing of ionising radiation was a retrospective multi-site audit and entailed a documentary analysis of patient records, radiological request forms and the associated radiological report. The audit tool was adapted from a study by Stavem *et al.* (2004) to evaluate the quality of radiology requests by physicians.

3.7.1 Sample Selection

A multistage cluster random sampling approach was used to obtain a representative sample of patients who received a prescription for medical ionising radiation from a nurse prescriber in the previous six months. Based on response distribution of 50%, a sample size of 200 records would provide 80% power with a margin of error of 0.05.

- Stage 1: A purposeful sample of 13 clinical sites with nurse prescribers was identified from the HSE National Nurse Prescribing Ionising Radiation Data Collection System. Sites were selected based on size, geographical location and teaching status.
- Stage 2: All nurse prescribers within each audit site who were active prescribers (at least one prescription for ionising radiation in the past three months) were eligible for inclusion in the audit.
- Stage 3: A systematic random sample of patients prescribed a radiological

investigation by each nurse prescriber was identified using the electronic data management systems in each radiology department. The lead radiographer with responsibility for the Radiology Information Management System (RIS) in each of the audit sites was asked to identify the 50 most recent patient radiographic examination prescriptions requested by the individual nurse prescriber. The audit period covered the six months prior to the initial site visit by the audit team. The most recent patient entry on the database for each nurse prescriber was regarded as record number 1 for the purpose of generating a sampling frame. Counting backwards from this initial record the radiographer identified patient number: 6, 11, 16, 24, 29, 36, 38, and 48 (these numbers were generated using random number selection in SAS Software, Version 9 of SAS for Windows). In the case of each nurse prescriber a maximum of eight radiographic examination prescriptions for adult patients were identified; in the case of nurses with less than eight prescriptions, all available records were selected. The patient was the unit of analysis; if a patient had more than one radiographic examination prescribed by a nurse prescriber than the first two prescriptions were selected. The radiographer printed the radiology request form and the radiology report for each of the identified prescriptions. The patient's hospital health care record or emergency department (ED) health care record was obtained from medical records for the purpose of the audit.

3.7.2 Data Collection

Members of the research team visited each audit site and collected data to address the audit aims using a standardised electronic proforma. All data was anonymised prior to removal from the audit site and data collection was in compliance with Irish data protection regulations.

Data collected included the following:

- 1) The nurse-patient consultation that resulted in a prescription for ionising radiation. Information included the patient's age, gender, initial and final diagnosis, physical examination, past medical history, previous radiological investigations, reason for the imaging request, pregnancy status (if applicable), treatment plan based on radiological investigation and follow-up.

- 2) The radiological request form included presence of patient details, pregnancy status, clinical information provided, anatomical detail of site to be imaged, previous investigations, prescriber's name, signature and extension/bleep number.
- 3) Patient outcomes from patient records included unscheduled ED visits and/or adverse incidents reported to the radiology safety committee.

Two independent medical practitioners (a consultant radiologist and a consultant in emergency medicine) carried out the evaluation of the appropriateness of the ionising prescription and clinical information recorded in the patient health care record for each radiographic examination prescription. In the case of nurses working in extended roles (Advanced Nurse Practitioner and Clinical Nurse Specialist), the subsequent patient management strategy recorded was also evaluated.

In addition, two radiographers working independently of each other assessed the accuracy of the radiology request form. The description of the anatomical site and the rationale for the radiographic examination was evaluated. Other information assessed included a record of previous radiographic examinations and contra-indications for a medical ionising radiation prescription.

3.7.3 Piloting the Audit Process

Training in using the evaluation tool was provided to all reviewers and included a protocol providing comprehensive information on the decision options. As part of the training each reviewer initially evaluated seven records. In the pilot stage the two medical consultants discussed discordant decisions with the study team to ensure consistent interpretation of the evaluation criteria. The same process occurred with the radiographer reviewers.

3.7.4 Data Analysis

Data was analysed using descriptive statistics (measures of central tendency, counts and percentages). Concordance for each evaluation criterion between reviewer pairs is also reported; concordance measures percentage of decisions where both reviewers identified appropriate or inappropriate decisions or the extent to which insufficient information was available on the audited record to make a decision on the appropriateness or otherwise of the prescription for ionising radiation.

3.8 Phase 3 - Evaluation of Patient Satisfaction with Nurse Prescribing of Ionising Radiation

A structured questionnaire measuring patients' level of satisfaction with nurse prescribing of ionising radiation was developed. The patient satisfaction survey measured a number of domains in relation to the patients' experience of being prescribed ionising radiation from a nurse. These domains included: 1) attitudes towards nurse prescribing of ionising radiation; 2) satisfaction with education and advice received during the consultation process, and; 3) overall satisfaction with the consultation process (operationalised by the Consultation Satisfaction Questionnaire (CSQ) (Baker 1990; Baker and Whitfield 1992; Poulton 1996).

3.8.1 Measuring Patients' Attitudes Towards Nurse Prescribing of Ionising Radiation

Items that measured patients' attitudes towards nurse prescribing of ionising radiation were adapted from a number of sources including an evaluation of extended independent nurse prescribing (Latter *et al.* 2005) and the evaluation of nurse and midwife prescribing in Ireland (Drennan *et al.* 2009, 2011). Attitudinal questions measured the level of support patients had towards nurses prescribing ionising radiation during their visit or stay in hospital.

3.8.2 Measuring Patients' Satisfaction with Education and Advice Received

Patients' attitudes towards the education and advice received from a nurse prescriber of ionising radiation were measured. This included satisfaction with advice received regarding the need for the radiographic examination and potential treatments. In addition, patients were asked to recall the extent nurses checked their past medical history, previous times they were imaged, known allergies and their family history prior to prescribing ionising radiation.

3.8.3 Measuring Patients' Satisfaction with the Consultation Process Undertaken by the Nurse Prescriber of Ionising Radiation - Consultation Satisfaction Questionnaire

The *Consultation Satisfaction Questionnaire* (CSQ), originally developed to measure patient satisfaction with the consultation process undertaken by a medical practitioner (Baker 1990; Baker and Whitfield 1992) and later adapted by Poulton (1996) to measure patient satisfaction following consultation with nurse practitioners was used to measure patient satisfaction with the consultation process undertaken by a nurse prescriber of ionising radiation. Previous testing of the nurse version of the CSQ has

demonstrated strong construct validity and acceptable levels of internal consistency (Poulton 1996, Drennan *et al.* 2010, 2011). The CSQ has been used in many studies to evaluate patient satisfaction. These include: comparison of nurse practitioners with general practitioners on patient satisfaction with consultation in primary care (Kinnersley *et al.* 2000) and patient satisfaction with the consultation process with nurse and midwife medicinal prescribers (Drennan *et al.* 2010, 2011).

The CSQ is comprised of 13 items that are summated into three scales that measure patient satisfaction with the extent to which the nurse was professional in approach (Professional Care), the extent to which the nurse gave the patient time to discuss issues and queries (Perceived Time) and satisfaction with the process (Overall Satisfaction). The results of the reliability of the three scales that comprise the CSQ are reported in Table 3.4. The reliability of the scale was measured using the internal consistency measure, Cronbach's Alpha (Cronbach 1951). The results indicated that all scales were internally consistent (Nunnally 1978).

Table 3.4 Reliability Estimates of the Consultation Satisfaction Questionnaire Scales

<i>Scale Name</i>	<i>Number of Items</i>	<i>Number of Respondents</i>	<i>Cronbach's Alpha</i>
Professional Care	7	82	0.80
Perceived Time	3	80	0.73
Overall Satisfaction	3	81	0.72

3.8.4 Demographic Data Collected from Patients

The final section of the questionnaire collected data related to patients' demographic and health profile. Demographic data included the patient's gender and age with health data recording patient's subjective rating of their health, and the reason why they were requested a radiographic examination. Patients were also given an opportunity to comment on the prescribing initiative on an open-ended section of the questionnaire.

3.8.5 Procedure for Patient Questionnaire Distribution

The patient was requested to take the questionnaire away with them, complete it at a time suitable to them and to return the questionnaire directly to the research team at University College Dublin. Patients were provided with a stamped addressed envelope to facilitate this process. It should also be noted that nurse prescribers of ionising radiation did not have access to the questionnaires completed by patients as these were returned directly to the evaluation team.

3.9 Phase 3: Health Professionals' Evaluation of Nurse Prescribing of Ionising Radiation

This phase of the evaluation used self-administered postal questionnaires and online surveys to measure health professionals' evaluations of nurse prescribing of ionising radiation. Health professionals that had a specific interest in the nurse prescribing of ionising radiation were surveyed. These included nurse clinicians and managers, radiographers and medical doctors as well as key stakeholders in regulation and education with an interest in this area. The survey for this phase of the study was based on the previous evaluation of stakeholders involved in nurse and midwife medicinal prescribing in Ireland (Drennan *et al.* 2010). Items developed for the stakeholders' questionnaire were the same for each group surveyed and this allowed responses from each group of health professionals to be compared. The stakeholders' questionnaire was divided into two sections: section one, which was completed by all stakeholders, evaluated distinct but interrelated areas of nurse prescribing of ionising radiation including respondents' perceptions of regulation and guidance, educational preparation, factors facilitating and inhibiting prescribing of ionising radiation by nurses, monitoring processes, patient safety, teamwork and communication, impact on the work of other health professionals, quality of care and overall merit of nurses prescribing ionising radiation. Section two evaluated the merit of the prescribing initiative from the perspective of clinical stakeholders who had day-to-day contact with nurse prescribers of ionising radiation in the clinical area (e.g. hospital consultants, non-consultant hospital doctors, radiographers and nurses). The clinical stakeholders' section of the questionnaire evaluated the impact the prescribing initiative had on patient care, the impact on the role of the nurse, and the impact on the role of other healthcare teams.

The final section of the stakeholder questionnaire collected the demographic and professional profile of the stakeholders. This included the post currently held, their extent of involvement in the prescribing of ionising radiation and their involvement with health care providers' Local Implementation Group.

3.10 Phase 4: Nurse Prescribers of Ionising Radiation Evaluation of their Role

Nurses who had completed the prescribing of ionising radiation educational programme were evaluated in relation to their prescribing practice following completion of the programme. For the purpose of the evaluation nurses were separated into two cohorts: those who had completed the education preparation programme and were currently

prescribing and those who had completed the education preparation programme but were not currently prescribing.

Those who were prescribing ionising radiation at the time of the evaluation were surveyed in relation to their current prescribing practices, their perceptions of the safety of prescribing practice, the impact of the role on their professional practice and their perceptions of the impact of the role on patient care. The support received by nurses and from other healthcare professionals was also evaluated. Prescribers were also questioned on the extent to which they engaged in continuing professional development following the commencement of their prescribing role. A number of items on the prescribers' questionnaire were similar to questions on the stakeholders' questionnaire; this allowed comparison of the perceptions of both cohorts to be made.

A separate survey was administered to nurses who had completed the prescribing of ionising radiation preparation programme but were not yet prescribing. The aim of this survey was to identify reasons why this cohort had not yet commenced prescribing ionising radiation and to identify their future plans in relation to developing their prescribing practice. Items for the prescribers/non-prescribers questionnaires were developed following an extensive review of the literature and drew on the previous evaluations of nurse prescribing in the UK (Latter *et al.* 2005) and Ireland (Drennan *et al.* 2010).

3.11 Procedure for Postal and Online Surveys

The main procedure for the distribution of questionnaires to key stakeholders and nurses who had completed the prescribing preparation programme was through the postal system and through online surveys using the SurveyMonkey platform. The procedure to ensure acceptable response rates was informed by best practice in the design and distribution of postal and online questionnaires (Dillman 2000, Drennan 2003, Edwards *et al.* 2009), and involved up to four contacts by post or email with respondents. Contacts included pre-notification letters or emails of the survey, questionnaire administration with a cover letter, follow-up with a replacement questionnaire and a final reminder letter or email. It has been demonstrated that multiple contacts are the most effective means by which to increase postal survey or online response rates (Dillman 2000, Edwards *et al.* 2009). The aim of using these procedures was to reduce both sampling error and sampling bias. Research has shown that respondents to surveys may be significantly

different than those who do not respond to surveys. Therefore to ensure that sampling bias was kept to a minimum, a comprehensive and systematic survey approach was used.

3.12 Data Analysis

Data obtained was analysed by computer using the Statistical Package for the Social Sciences (SPSS version 21.0). Both descriptive and inferential statistics were used in the analysis and description of the data set through the use of univariate and bivariate statistics. Descriptive statistics (frequencies, frequency per cents, measures of central tendency, and measures of variability) were used to summarise demographic data and results from the instruments used in the study. The types of parametric or nonparametric inferential tests used were determined by level of measurement and assumptions of normality.

To aid interpretation of findings on the scales that comprise the Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire (PIRCEQS) a linear transformation of the mean score was conducted. In the PIRCEQS, the scales 1, 2, 3, 4, 5 used in the questionnaire were recoded to -100, -50, 0, +50, +100 respectively. This transformation aids interpretation and standardises comparisons. Positive values indicate students are in agreement, negative values indicate disagreement. The raw scores of the Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire (PIRCOEQ) and the Consultation Satisfaction Questionnaire (CSQ) were transformed to a 0 to 100 scale. This transformation converted the lowest and highest scale scores on the instruments to 0 and 100 respectively. The linear transformation enabled ease of interpretation of the scales of the PIRCEQS, the PIRCOEQ and the CSQ.

3.13 Ethical Considerations

To undertake a survey of patients and to complete the audit phase of the evaluation ethics applications were submitted and approval granted from hospitals that had nurse prescribers of ionising radiation in post at the time of the evaluation. Ethical approval was received from the Research Ethics Committee of University College Cork to survey nurses who had completed an education programme to prepare them for prescribing ionising radiation and from the Research Ethics Committee of University College Dublin to survey health professionals. All participants surveyed were informed about the measurement procedures involved in this study (full-disclosure). Participants were also informed about the nature of the research and that they were entitled not to participate in the study if they

so chose (informed consent). Patients in particular were assured that refusal to participate in the study would in no way alter their treatment (the right to fair treatment). Information on these aspects of the study was provided on a Patient Information Leaflet appended to the patient questionnaire.

All data was coded and individuals or individual third level institutes, organisations or hospitals were not identifiable in any subsequent reporting of results. No individual identifying information was entered onto computer files, identification numbers were used throughout (right to privacy). All questionnaires remained in a locked cabinet when not in use by the researcher and all computer datasets were password protected (right to privacy). Data was only used for the purposes disclosed.

Due to the requirements of the ethics committees it was not possible to post questionnaires directly to patients who had received a prescription of ionising radiation from a nurse. The reason being that the capacity of the patient to complete the questionnaire was not known. There was also a possibility that the questionnaire may be posted to the address of a person who is now deceased. However, ethics committees did agree that the research team could request nurse prescribers of ionising radiation to distribute the questionnaire at the time of consultation. This process ensured that patients met the eligibility criteria for the evaluation. It also tied the distribution of the questionnaire to the consultation thereby aiding patient recall.

In relation to nurses who completed the prescribing of ionising radiation programme, the research team at no stage had access to their contact details. The HSE, who held the database of prescribers, posted the questionnaires on behalf of the research team. The HSE also facilitated the team in sending follow-up reminders. This ensured that at no time did the research team have access to the names and addresses of nurses who had completed the prescribing of ionising programme. However, all completed questionnaires were returned to directly to the research teams at University College Dublin and University College Cork.

Chapter IV

Evaluation of the Educational Preparation of Nurses to Prescribe Medical Ionising Radiation

4.1 Introduction

Within this chapter course participants' experiences of their educational preparation for the role of prescribing medical ionising radiation are evaluated. Specifically the educational programme (preparing nurses for prescribing ionising radiation) is evaluated in terms of its adherence to An Bord Altranais *Requirements and Standards for Education Programmes for Nurse Prescribing Ionising Radiation (X-Ray)* (2008), the participants' experience of, and satisfaction with, the programme and programme participants' evaluation of their preparedness for practice as nurse prescribers of ionising radiation (fitness for practice).

The outcomes of the programme, that is the understanding and abilities of programme participants to prescribe ionising radiation, were ascertained using the *Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire* (PIRCOEQ), which was developed specifically for this study. These capabilities were ascertained in terms of key curricular areas as identified by An Bord Altranais (2008) in the document *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray)*. These included understanding and ability in the areas of professional accountability and responsibility, legal and ethical aspects, ionising radiation, radiation protection, principles of the prescribing process for ionising radiation, and collaboration/referral with other healthcare professionals.

The second section of this chapter relates to the evaluation of the quality of the educational programme undertaken by nurses to prepare them for prescribing practice. Respondents completed the *Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire* (PIRCEQS). The results of the analysis of this survey presents data relating to eight individual programmatic areas including evaluation of teaching, students' levels of satisfaction with programme goals and standards, workload, assessment, skills (preparation for prescribing practice), infrastructure, mentor support, and overall satisfaction.

4.2 Demographic, Professional and Academic Profile of Course Participants

A total of 164 nurses who had completed a preparation programme for prescribing ionising radiation were surveyed, 100 responses were received resulting in a response rate of 61.0%. The vast majority of the sample was female (78.6%) with just over a fifth (21.4%) male. The mean age of the sample was 41.9 years (SD = 6.80) and respondent's ages ranged from 30 years to 59 years. Course participants had, on average, been qualified for 19.60 years (SD = 7.00) and length of time qualified ranged from 2 years to 40 years. The majority of respondents were at advanced nurse practitioner (36.4%) or staff nurse (28.3%) grades. Approximately twenty-two per cent of respondents were at clinical nurse manager level (grades I, II or III) (see Figure 4.1).

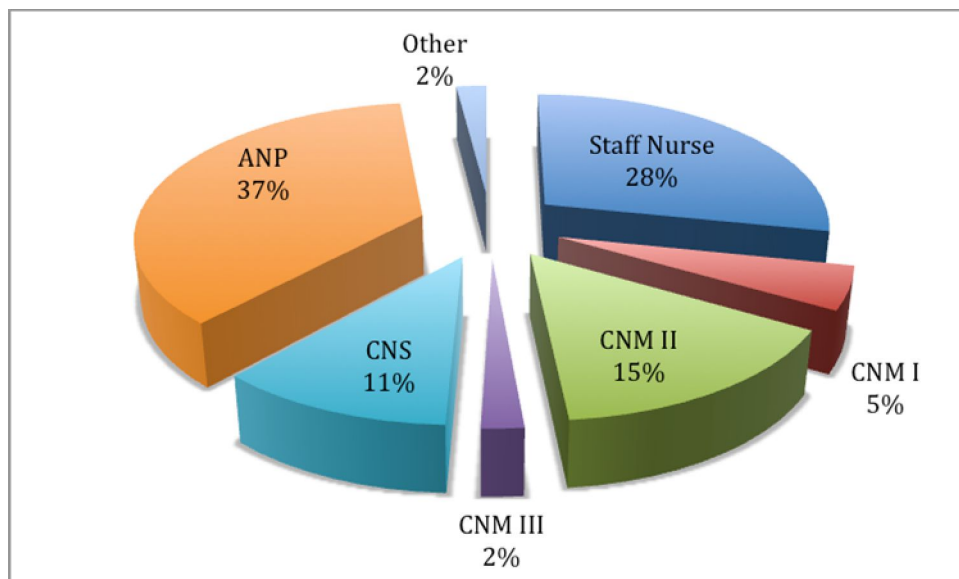


Figure 4.1 Clinical Grade of Respondents

The highest academic qualification held by the majority of respondents was a master's degree (47.5%) with approximately twenty eight per cent identifying a higher diploma or postgraduate diploma as their highest academic qualification. The remainder of respondents identified certificate, diploma, bachelor's degree or PhD as their highest academic qualification (see Figure 4.2).

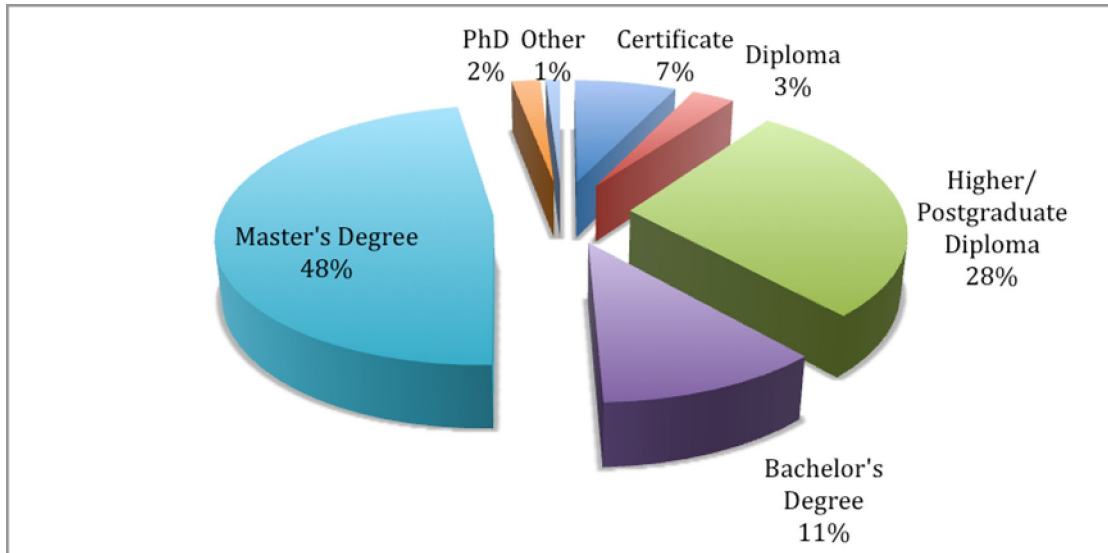


Figure 4.2 Highest Academic Qualification Held by Respondents

The vast majority of respondents who took part in the survey were practising in the area of emergency or urgent care (70%); this was followed by respondents working in orthopaedics (9%), oncology (4%) and respiratory care (2%). Fifteen per cent of respondents were working in 'other' clinical settings; these included medical assessment units, the community, coronary care, intensive care, pre-operative assessment units, haematology units, out-patient departments and rheumatology (Figure 4.3).

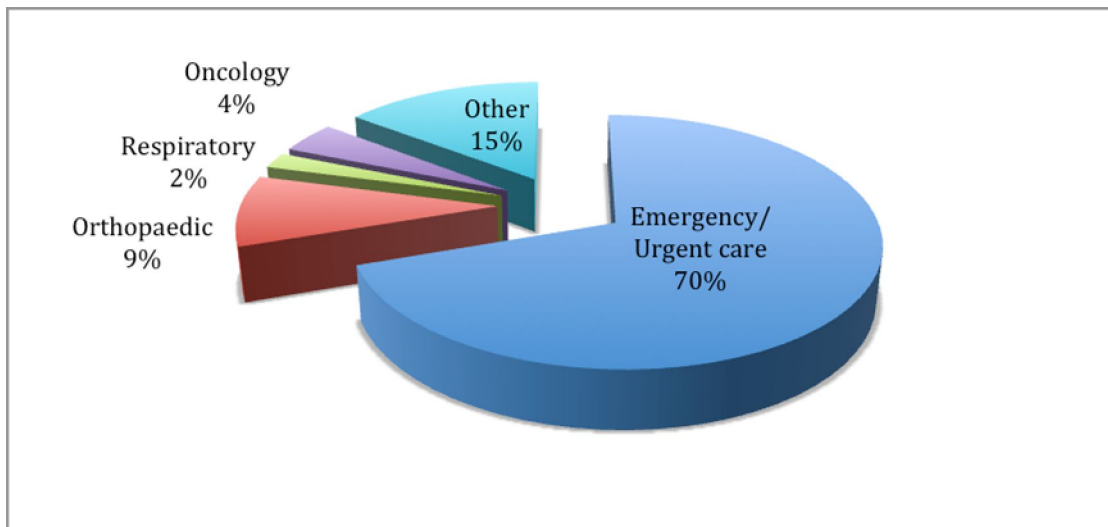


Figure 4.3 Clinical Areas in which Nurse Prescribers of Ionising Radiation are Currently Practising

Respondents were asked to indicate which type of educational preparation programme they participated in to prepare them as independent nurse prescribers of ionising radiation. The majority completed a Level 8 Certificate in Nurse Authority to Prescribe Ionising Radiation. However, participants undertook a variety of educational routes in preparing for the role of a prescriber of ionising radiation (Table 4.1).

Table 4.1 Details of Programme of Educational Preparation Completed by Respondents

<i>Details of Programme of Educational Preparation</i>	<i>Number of Respondents*</i>	<i>(%)</i>
Course provided by An Bord Altranais Approved- HSE/ Centre of Nursing and Midwifery Education	25	26.9
Certificate in Nurse Authority to prescribe Ionising Radiation (X-Ray)- HETAC Accredited NOAI level 8 Special Purpose Award (20 credits)- HSE/ Centre of Nursing and Midwifery Education	50	53.8
Professional Certificate Nursing Prescription of Ionising radiation- NOAI level 8-University Sector	7	7.5
Professional Diploma Nursing Prescription of Ionising radiation- NOAI level 8-University sector	1	1.1
Preparation for prescribing as part of an MSc programme	8	8.6
Other	2	2.2

*Note: 93 respondents completed this question

Course participants were also asked to indicate the type of X-Rays that they were approved to prescribe by the Local Implementation Group in the clinical setting in which they were based. The highest proportion of respondents were approved to prescribe radiographic imaging of the lower (78%) and upper limbs (77%) (Figure 4.4). Just under half were approved to prescribe chest radiographs (48%). Respondents were also approved to prescribe radiographic examinations of the pelvis (26%), abdomen (12%) and facial bones (8%). A number of respondents reported that they were only allowed to prescribe particular radiographic images in specific clinical situations, for example a chest radiograph only following insertion of a naso-gastric tube, post-operative radiographic examinations of the hip, radiographs to establish the presence of foreign bodies in soft tissue, and screening assessments like mammogram or Dual Energy X-Ray Absorptiometry (DXA) scan.

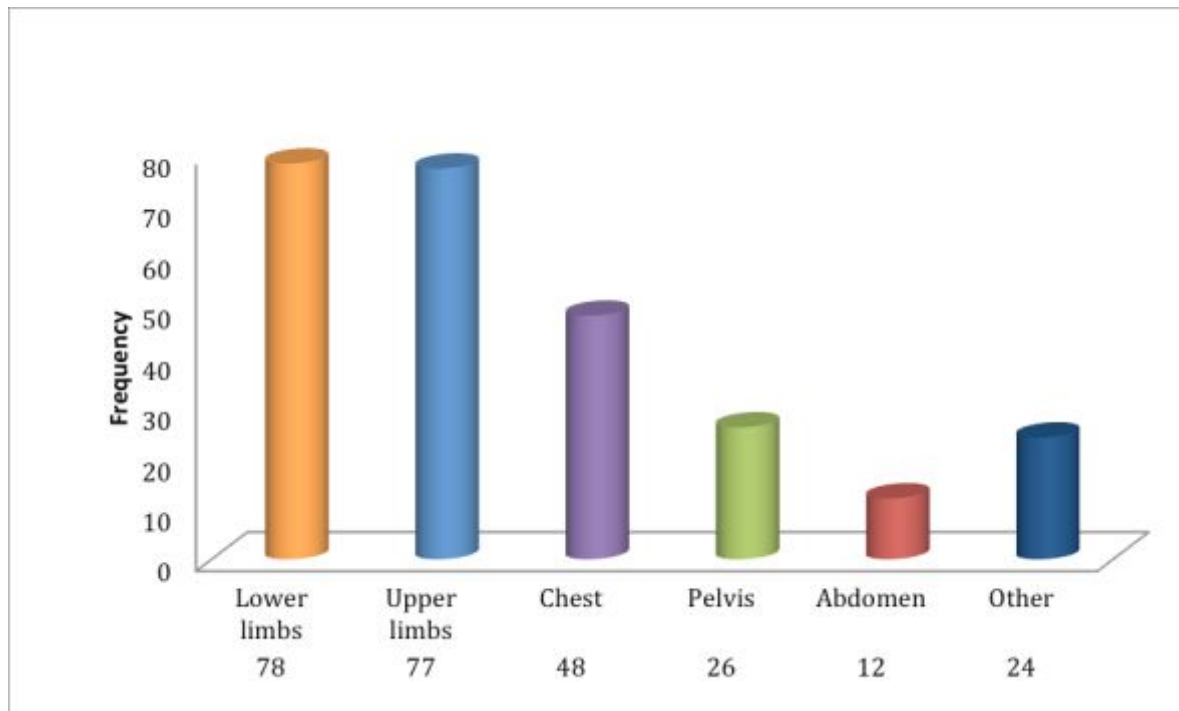


Figure 4.4 Types of X-Rays that Nurse Prescribers were Approved to Prescribe by the Local Implementation Group (LIG)

4.3 Evaluation of Course Participants' Level of Change as an Outcome of the Educational Preparation Programme

The outcomes of educational preparation in terms of programme respondents' understanding of, and ability to, prescribe ionising radiation are presented within this section. Using the *Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire* (PIRCOEQ), these outcomes were measured under six domains. Respondents self-rated their understanding/ability before (using retrospective recall) and after programme completion in terms of key identified areas (subscales) which included understanding and ability in areas related to professional accountability and responsibility, legal and ethical aspects, ionising radiation, radiation protection, principles of the prescribing process for ionising radiation, and collaboration/referral with other health care professionals (see Tables 4.2 and 4.3). The instrument was presented in the format of a post-test/then-test measurement. The post-test section of the questionnaire asked respondents to rate where they perceived themselves now as a result of completing the prescribing course. The then-test section requested the course participant to rate where they saw themselves prior to commencing the prescribing course. This method is called a retrospective pre-test.

Respondents self-rated their understanding or ability in each of the items lower at the commencement of the educational programme when compared to their rating after

programme completion. It was identified that, for each individual item within the subscales, respondents reported that they had developed a greater understanding or ability as a consequence of programme participation. In addition, it was identified that the difference between the “before” and “after” scores for all items were statistically significant; that is respondents reported that they made statistically significant gains in all domains as a consequence of the programme.

Table 4.2 Course Participants’ Understanding and Ability in Relation to the Programme⁴ Syllabus/ Indicative Content as Measured using the Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire (PIRCOEQ) - Domains and Associated Items

	<i>Median Before</i>	<i>(IQR)</i>	<i>Median After</i>	<i>(IQR)</i>	<i>p-value*</i>
1. Professional Accountability and Responsibility					
Understanding of the An Bord Altranais regulatory framework associated with prescribing of X-Rays	2	(1 to 3)	6	(6 to 7)	<0.001
Understanding of the Health Service Executive (2009) Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray)	3	(1 to 4)	7	(6 to 7)	<0.001
Understanding of accountability and responsibility for prescribing ionising radiation (X-Ray)	3	(2 to 5)	7	(6 to 7)	<0.001
Understanding of risk management in prescribing ionising radiation practice	3	(2 to 5)	7	(6 to 7)	<0.001
Understanding of evidence-based practice in relation to prescribing ionising radiation	3	(2 to 5)	7	(6 to 7)	<0.001
Understanding of clinical governance in relation to ionising radiation prescribing practice	3	(2 to 4)	6	(6 to 7)	<0.001
The ability to engage in critical self-reflection and self-audit in relation to ionising radiation practices/procedures	2	(1 to 4)	6	(6 to 7)	<0.001
2. Ionising Radiation					
Understanding of the principles of ionising radiation	2	(1 to 4)	7	(6 to 7)	<0.001
Understanding of principles of radiation physics	2	(1 to 3)	6	(5 to 7)	<0.001
Understanding of radiation biology (action of ionising radiation on humans)	2	(1 to 4)	6	(5 to 7)	<0.001
Understanding of imaging modalities (methods of application of medical ionising radiation)	2	(1 to 4)	6	(5 to 7)	<0.001
Understanding of dosimetry (measurement and calculation of radiation dose in tissue as a result of exposure to radiation)	1	(1 to 2)	6	(4 to 6)	<0.001
3. Radiation Protection					
Understanding of the principles of radiation protection	3	(2 to 5)	7	(6 to 7)	<0.001
Understanding of radiation protection techniques	3	(2 to 5)	7	(6 to 7)	<0.001
Understanding of radiation protection during pregnancy	5	(3 to 6)	7	(6 to 7)	<0.001
Ability to practice aspects of radiation protection	4	(2 to 5)	7	(6 to 7)	<0.001

⁴ An Bord Altranais (2008) *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray)*. Dublin: An Bord Altranais.

	<i>Median Before</i>	<i>(IQR)</i>	<i>Median After</i>	<i>(IQR)</i>	<i>p-value*</i>
4. Legal and Ethical aspects					
Understanding of legislation for nurse prescribing of ionising radiation	2	(1 to 4)	7	(6 to 7)	<0.001
Understanding of legislation relating to ionising radiation	2	(1 to 4)	7	(6 to 7)	<0.001
Understanding of legislation for radiation protection	2	(1 to 4)	6	(6 to 7)	<0.001
Understanding of legal liability and clinical indemnity for nurse prescribing ionising radiation	2	(1 to 4)	6	(6 to 7)	<0.001
Ability to obtain informed consent from patient/client for ionising radiation (X-Ray)	4	(2 to 5)	7	(6 to 7)	<0.001
5. Principles of the Prescribing Process for Ionising Radiation (X-Ray)					
Understanding of the knowledge required to underpin the prescribing of ionising radiation (X-Ray)	2	(2 to 4)	7	(6 to 7)	<0.001
Understanding of the skills required to underpin the prescribing of ionising radiation (X-Ray)	3	(1 to 5)	7	(6 to 7)	<0.001
Understanding of national and local guidelines, policies and protocols for prescribing ionising radiation (X-Ray)	2	(1 to 4)	7	(6 to 7)	<0.001
Understanding of risk vs. benefit ratio in prescribing decisions	3	(2 to 5)	7	(6 to 7)	<0.001
Ability to apply diagnostic reasoning to prescribing practices	3	(1 to 5)	7	(6 to 7)	<0.001
Ability to take the history of the patient/client	5	(3 to 7)	7	(6 to 7)	<0.001
Ability to perform a physical assessment of the patient/client	5	(3 to 7)	7	(6 to 7)	<0.001
Ability to write and process an X-Ray request form	4	(2 to 6)	7	(6 to 7)	<0.001
6. Collaboration/Referral with other Health Care Professionals					
Understanding of the role and function of other healthcare professionals involved in the process of prescribing, providing and/ or interpreting ionising radiation procedures	4	(3 to 6)	7	(6 to 7)	<0.001
Understanding of communication skills necessary to foster collaborative relationships with allied health professionals	5	(3 to 6)	7	(6 to 7)	<0.001
Understanding of documentary practices related to prescribing (inclusive of entering ionising radiation prescriptions (X-Ray) on the nurse prescribing radiation minimum data set)	3	(2 to 5)	6	(6 to 7)	<0.001
Understanding of the collaborative interdisciplinary sharing of patient medical records	4	(3 to 6)	7	(6 to 7)	<0.001
Understanding of the role and function of clinical audit in measuring and improving the quality of patient care services	5	(3 to 7)	7	(6 to 7)	<0.001
Ability to practice within the scope of practice of a nurse prescriber for ionising radiation (X-Rays)	2	(1 to 5)	7	(6 to 7)	<0.001
Overall ability					
Overall self-confidence in my ability to prescribe ionising radiation (X-Ray)	2	(1 to 5)	7	(6 to 7)	<0.001
Overall ability to prescribe ionising radiation	3	(1 to 5)	7	(6 to 7)	<0.001

Note: Scales ranged from 1-7 with higher values indicating greater understanding and ability. *Indicates a statistically significant difference between participants self-rating of their understanding/ability after programme completion when compared with their retrospective recall of their rating for understanding/ability before the commencement of the programme. Note for each item, only respondents who answered the "after" and "before" section are included in the statistical analysis, between 96 and 99 respondents answered the "before" and "after" sections of the individual items. The Wilcoxon Signed Rank Test was used to compare before and after responses to the items.

The largest changes in self-rated understanding and ability in terms of the difference between "before" and "after" scores for individual items occurred for the following areas:

- Understanding of the principles of ionising radiation.
- Understanding of legislation for nurse prescribing of ionising radiation.
- Understanding of legislation relating to ionising radiation.
- Understanding of the knowledge underpinning the prescribing of ionising radiation.
- Understanding of national and local guidelines, policies and protocols for prescribing ionising radiation.
- Ability to practice within the scope of practice of a nurse prescriber for ionising radiation.
- Overall self-confidence in ability to prescribe ionising radiation.

Conversely the lowest numeric changes scores for individual items equating to the least change in understanding and ability from "before" to "after" occurred for the following items:

- Understanding of radiation protection during pregnancy.
- Ability to take the history of the patient/client.
- Ability to perform a physical assessment of the patient/client.
- Understanding of communication skills necessary to foster collaborative relationships with allied health professionals.
- Understanding of the role and function of clinical audit in measuring and improving the quality of patient care services.

The lowest scored (least understood) individual pre-programme item (i.e. lowest "before" score) related to "*Understanding of dosimetry (measurement and calculation of radiation dose in tissue as a result of exposure to radiation)*".

Respondents to the survey made a number of comments on the content of the programme that they completed in preparation for prescribing ionising radiation. There was a sense from some course participants that they would like to have seen more emphasis on physical assessment and less on the theoretical aspects of ionising radiation; however, this was not a predominant view with a number of respondents identifying the theoretical elements of the programme were both appropriate and effective. The area of the programme that received most comments related to physical assessment of patients. Although course participants generally expressed satisfaction with this component, a number of respondents identified that they would like to have had more input on this aspect of the programme:

Overall [I was] disappointed with the level of lectures on physical assessment. There is a need for physics and radiation safety but not enough emphasis was placed on the importance of physical assessment. After all if a nurse is unable to correctly/competently carry out a physical assessment how can they be competent and autonomous in justifying an x-ray? (Nurse Prescriber 049).

[I] would recommend more in-depth physical examination of clients [in the programme] e.g. auscultation of chest etc. (Nurse Prescriber 063).

We did not have enough time allocated to the clinical aspects of the X-Ray prescribing i.e. one day is not sufficient to demonstrate how to clinically examine limbs (Nurse Prescriber 069).

A review of data pertaining to PIRCOEQ subscales (mean (SD) and median (IQR)) (Figure 4.5 and Table 4.3) reveals that the largest numeric changes occurred in education relating to understanding and ability in the legal and ethical aspects and ionising radiation subscales. The lowest changes occurred in the collaboration/referral with other health care professionals subscale. In terms of ability to practice as a prescriber, the majority of respondents scored the items "Overall ability to prescribe ionising radiation" (88%) and "Overall self-confidence in my ability to prescribe ionising radiation" (84%) at either 6 or 7 respectively after programme completion, equating to the highest level of understanding and ability for these items. Specifically the educational programmes were evaluated positively in terms of their adherence to An Bord Altranais *Requirements and Standards for Education Programmes for Nurse Prescribing Ionising Radiation (X-Ray)* (2008) and in terms of respondents' overall ability to prescribe ionising radiation (fitness for practice).

Table 4.3 Course Participants' Understanding and Ability in Relation to the Programme Syllabus/ Indicative Content as Measured using the Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire (PIRCOEQ)

<i>Subscales</i>	<i>Before Programme</i>	<i>After Programme</i>
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	Mean	(SD)	Median	(IQR)	Mean	(SD)	Median	(IQR)	P value*
Professional Accountability and Responsibility (n=96)	36.3	(28.3)	28.6	(14.9 to 54.8)	85.7	(18.6)	92.9	(81.0 to 97.6)	<0.001
Ionising Radiation (n=99)	25.7	(26.0)	16.7	(6.7 to 43.3)	78.5	(22.3)	83.3	(70.0 to 93.3)	<0.001
Radiation Protection (n=97)	49.1	(29.9)	45.8	(20.8 to 70.8)	88.7	(17.5)	95.8	(83.3 to 100)	<0.001
Legal and Ethical aspects (n=96)	32.4	(30.0)	21.7	(7.5 to 53.3)	86.9	(18.3)	93.3	(83.3 to 100)	<0.001
Principles of the Prescribing Process for Ionising Radiation (n=97)	44.5	(28.7)	39.6	(19.8 to 65.6)	88.5	(16.1)	93.8	(84.4 to 100)	<0.001
Collaboration/Referral with other Health Care Professionals (n=98)	50.2	(27.3)	48.6	(27.8 to 72.5)	87.7	(16.8)	94.4	(83.3 to 100)	<0.001
Ability (n=94)	38.0	(33.5)	33.3	(8.3 to 60.4)	89.63	(17.7)	100.0	(83.3 to 100)	<0.001

Subscale data ranged from 1-7 was linearly transformed to a 0-100 scale. Higher scores indicate greater ability/understanding. Note for each item, only respondents who answered the "after" and "before" section are included in the statistical analysis. The Sign test was used to compare before and after responses to the items, as the differences observed were not symmetric. *Indicates a statistically significant difference between participants' self-rating of their understanding/ability after programme completion when compared with their retrospective recall of their rating for understanding/ability before the commencement of the programme.

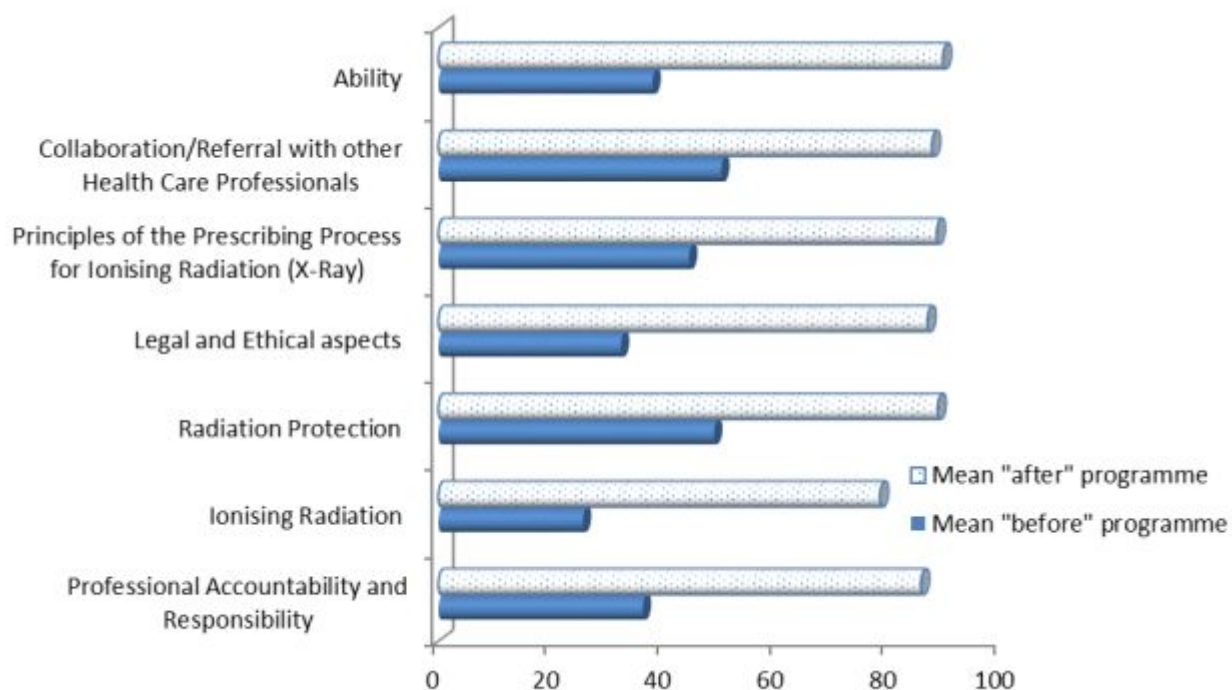


Figure 4.5 Course Participants' Understanding and Ability in Relation to the Programme Syllabus/ Indicative Content as Measured using the Prescribing Ionising Radiation Course Outcomes Evaluation Questionnaire (PIRCOEQ) (Subscale data ranged from 1-7 was linearly transformed to a 0-100 scale. Higher scores indicate greater ability/understanding.)

4.4 The Quality of the Educational Preparation of Nurse Prescribers of Medical Ionising Radiation

The second section of this chapter relates to the quality of the educational programme undertaken by nurses to prepare them for prescribing practice. Respondents completed the *Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire* (PIRCEQS). Data relating to eight individual programmatic areas including course participants' satisfaction with teaching, programme goals and standards, workload, assessment, skills (preparation for prescribing Practice), infrastructure, mentor support, and overall satisfaction are outlined. Responses to the individual items that comprise each of the subscales are firstly displayed (Table 4.4). This is followed by summative data relating to each of the seven subscales (Table 4.5).

Data relating to the response options for individual items on the PIRCEQS "*strongly disagree*" and "*disagree*" were combined to form a category titled "*percentage disagreement*" and the response options "*agree*" and "*strongly agree*" were combined to yield a category titled "*percentage agreement*".

Overall the responses to each of the items that comprise the PIRCEQS, with some exceptions, were generally positive indicating that respondents were satisfied with their programme of study. Positive affirmation of the teaching staffs' ability to explain materials (83% agreement), make their subject interesting (69% agreement), and endeavouring to understand the difficulties of participants on the programme (69% agreement) underpin the results on the good teaching sub-scale. In contrast, over half of the respondents (52%) stated that teaching staff did not put a lot of time into commenting on their academic work. A number of respondents in the open-ended section of the survey commented that the level of feedback on work submitted was variable. One respondent stated that the feedback received was the 'most unsatisfactory part' of the course with the student receiving a mark but 'no feedback on the correct or incorrect answers'. Another respondent identified the importance of receiving feedback as part of their development on the course:

We were offered no feedback from our written assignments/exams. Feedback would have redirected our study if needed and we could have improved areas where our knowledge/skills were weaker. We asked on numerous occasions for such feedback but none was forthcoming (Nurse Prescriber 022).

Overall satisfaction with the assessment processes was evident in that the majority of respondents reported that the theoretical (79% agreement) and clinical aspects (80% agreement) of the prescribing examination process were fair. Students were also highly satisfied with the assessment of their supervised episodes of prescribing ionising radiation (90% agreement). It should be noted that 20% of respondents were dissatisfied with their written and 14% dissatisfied with their oral examinations. Overall satisfaction with mentor (clinical supervisor) support was high with 90% agreeing or strongly agreeing that they were well supported in this area.

The majority of course participants knew what was expected of them on the programme (83% agreement). However, 37% of respondents noted that the course was too long and 28% agreed with the statement that the course workload was too heavy. A quarter of respondents felt they did not receive appropriate financial⁵ support during the course. Just under a third of programme participants (30%) reported that they felt pressure to do well in the programme.

⁵ Fees for the programme are provided by the HSE.

Students who commented on the workload aspect of their programme on the questionnaire generally highlighted the pressure associated with completing assignments and working at the same time. There was also a sense from respondents that the requirements of the course were 'excessive' compared to that required for the medical profession:

I felt that the course was too long for its purpose given that medical doctors receive little or no training in this area (Nurse Prescriber 041).

A lot of the course work could be condensed into less time as it is more about the practical side, physical examination, and justification for requesting the X-Ray... which is more relevant, and this is gained during clinical mentorship (Nurse Prescriber 019).

The majority of course participants perceived they were well prepared for prescribing practice following completion of the programme with 83% agreeing with the statement that the course prepared them to prescribe radiographic examinations. In addition, 84% of respondents agreed that they had the requisite knowledge, skills and competencies to prescribe ionising radiation, and 90% agreed that they had the confidence to prescribe radiographic examinations at the end of their programme.

Table 4.4: Percentage Level of Agreement with Items on the Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire (PIRCEQS).

<i>Item Number</i>	<i>PIRCEQS items</i>	<i>Percentage Disagreement</i>	<i>No Opinion</i>	<i>Percentage Agreement</i>
3	Good Teaching The teaching staff (lecturers) made a real effort to understand difficulties I might be having with my course work	11	19	69
4	The teaching staff (lecturers) were extremely good at explaining things	5	11	83
8	The teaching staff (lecturers) normally gave me helpful feedback on how I was doing	24	21	54
15	The teaching staff (lecturers) motivated me to do my best during the course	7	33	60
25	The teaching staff (lecturers) put a lot of time into commenting on my work	52	23	24
27	The lecturers/teaching staff worked hard to make their subjects interesting	10	20	69
	Appropriate Assessment			
1	The theoretical aspects of the prescribing examination process were fair	11	10	79
2	The clinical aspects of the prescribing examination process were fair	12	8	80
9*	To do well in this course all you really needed was a good memory	65	18	17
16*	The teaching staff (lecturers) seemed more interested in testing what I had memorised than what I had understood	57	29	14
18*	Too many course staff (lecturers) asked me questions just about facts	65	23	11
26	I was satisfied that the multiple choice question (MCQ) examination was appropriate for assessing my knowledge of ionising radiation	16	19	65
29	I was satisfied with the assessment of my supervised episodes of prescribing ionising radiation	6	4	90
33	The examination of my assessments was completed in a reasonable time	5	11	84
44	I was satisfied with the written examinations	20	22	57
45	I was satisfied with the examination of my oral presentation	14	12	73

<i>Item Number</i>	<i>PIRCEQS items</i>	<i>Percentage Disagreement</i>	<i>No Opinion</i>	<i>Percentage Agreement</i>
46	I was satisfied with the examination of my Clinical Practice Portfolio	6	13	80
5	Preparation for Prescribing Practice The course prepared me to prescribe X-Rays	10	7	83
10	The course helped me develop my ability to plan my prescribing work	18	13	68
17	The course has enhanced my ability to work as a member of the multidisciplinary prescribing team	16	15	68
40	The course equipped me with the appropriate knowledge, skills and competencies to prescribe ionising radiation (X-Rays) in my specific area of clinical practice	13	3	84
41	At the end of the course I was confident prescribing x rays	6	4	90
6*	Appropriate Workload The course workload was too heavy	58	13	28
20*	There was a lot of pressure on me to do well in this course	48	22	30
23	I was generally given enough time to understand the things I had to learn	8	12	79
35*	The sheer volume of work to be got through in this course meant that it couldn't all be thoroughly comprehended/understood	56	25	19
7	Mentor (Clinical Supervisor Support) I had good access to the supervisory support I needed from my medical practitioner mentor (clinical supervisor)	7	9	84
11	My medical practitioner mentor provided suitable learning opportunities for me to prescribe X-Rays	5	8	87
13	Overall I was satisfied with the mentoring provided by my medical practitioner mentor	6	4	90
19	My medical practitioner mentor provided helpful feedback on my progress	7	9	84
22	My medical practitioner mentor communicated effectively with me	4	6	90

<i>Item Number</i>	<i>PIRCEQS items</i>	<i>Percentage Disagreement</i>	<i>No Opinion</i>	<i>Percentage Agreement</i>
24	My medical practitioner mentor made a real effort to understand the difficulties I faced	12	23	64
28	My medical practitioner mentor provided additional research/resources/information to me which was relevant to my X- ray prescribing practice	26	18	55
30	My medical practitioner mentor provided time and opportunities for me to conduct full episodes of X-Ray prescribing and associated patient care under supervision	6	6	88
32	My medical practitioner mentor encouraged me to link the theory with the practice of x- ray prescribing	12	17	70
34	My medical practitioner mentor encouraged critical thinking and reflection	12	19	68
12	Organisation of Programme (Clear Goals and Standards) The teaching staff (lecturers) made it clear right from the start what they expected from students	12	15	72
31	I had a clear idea of where I was going and what was expected of me on this course	8	9	83
36	It was always easy to know the standard of work expected of me on the course	15	21	64
39*	It was often hard to discover what was expected of me on the course (n=100)	62	17	21
21	Inter professional learning was facilitated on the course	16	21	63
	Infrastructure			
14*	The course was too long	52	10	37
37*	The course was too short	80	12	8
38	There was appropriate financial support during the course	25	24	50
43	I had ready access to informational resources (e.g. library, computers) during the course	5	5	90
42	Overall, I would recommend the course in medical ionising radiation (X-Ray) prescribing preparation to others	13	12	74

<i>Item Number</i>	<i>PIRCEQS items</i>	<i>Percentage Disagreement</i>	<i>No Opinion</i>	<i>Percentage Agreement</i>
	Overall Satisfaction			
47	Overall I was satisfied with the medical ionising radiation (X-Ray) prescribing preparation course	14	14	72
48	Overall, I enjoyed taking the course in medical ionising radiation (X-Ray) prescribing preparation	12	14	73

*Items marked with an asterisk were reverse coded for calculation of the mean scores. Respondent number=100 (i.e. 100%), percentages were calculated taking cognisance of missing data.

Table 4.5 Transformed mean scores on the subscales of the Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire (PIRCEQS).

Subscales	n	Mean	(SD)	Minimum	Maximum
Good teaching	98	27.5	(33.0)	-50	+100
Appropriate assessment	97	36.5	(24.5)	-50	+100
Preparation for prescribing practice	98	45.5	(37.5)	-50	+100
Appropriate workload	94	21.5	(26.5)	-75	+100
Mentor support	98	47.5	(37.0)	-95	+100
Organisation of programme	98	32.5	(11.8)	-70	+100
Infrastructure	98	31.5	(26.0)	-50	+100
Overall satisfaction	96	38.5	(18.5)	-100	+100

Transformed mean scores on the subscales of the Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire (PIRCEQS). Data in the Figure is presented post linear transformation of the scale data. The PIRCEQS response options (1, 2, (levels of disagreement), 3 (no opinion) 4, 5 (levels of agreement)) used in the survey were recoded to -100, -50 (levels of disagreement) 0 (no opinion), +50, +100 (levels of agreement). Positive values indicate participants were in agreement with statements whilst numerically increasing negative values indicate greater disagreement with statements in each domain. n=number of respondents for the entire scale.

A review of the mean subscale scores (Table 4.5 and Figure 4.6) indicates that, overall, respondents positively evaluated their educational preparation programme and were generally satisfied with the programme. Areas that scored highest in terms of overall mean subscale scores were “mentor support” and “preparation for prescribing practice”; scales with the lowest scores, although still positively evaluated, were “appropriate workload” and “good teaching”.

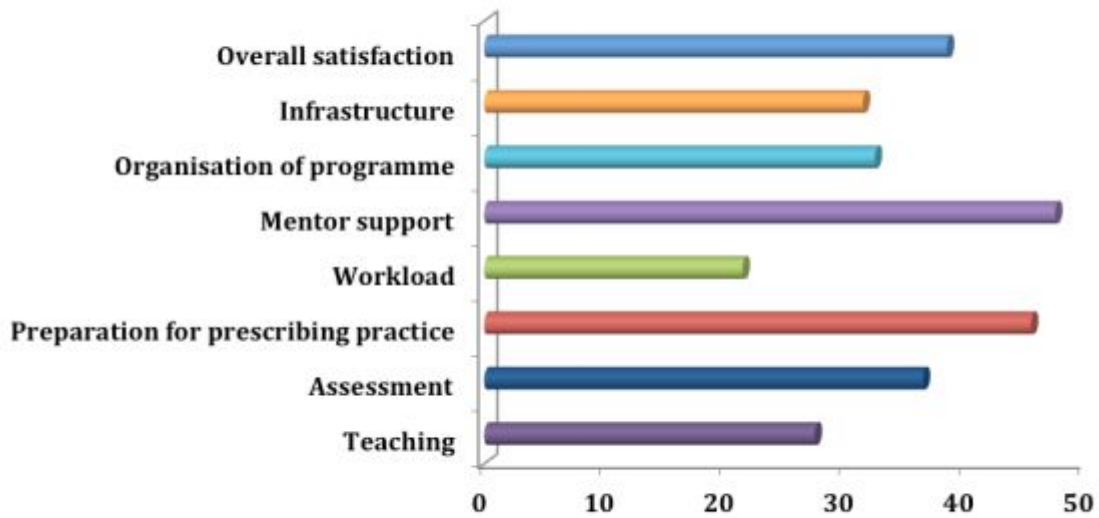


Figure 4.6 Transformed mean scores on the subscales of the Prescribing Ionising Radiation Course Evaluation Quality and Satisfaction Questionnaire (PIRCEQS). Data in the Figure is presented post linear transformation of the scale data. The PIRCEQS response options (1, 2, (levels of disagreement), 3 (no opinion) 4, 5 (levels of agreement)) used in the survey were recoded to -100, -50 (levels of disagreement) 0 (no opinion), +50, +100 (agreement). Positive values indicate students were in agreement with statements whilst numerically increasing negative values indicate greater levels of disagreement with statements in each domain.

Overall respondents were satisfied with their programme of study and a number of nurse prescribers commented on the impact their programme of study had on their professional practice:

I found this course to be the most relevant and comprehensive course that I have undertaken to date. It was very focused on the subject and really prepared me for prescribing X-Rays. It taught me to really consider if an X-Ray was the most appropriate investigation or if required at all (Nurse Prescriber 022).

I enjoyed all the teaching sessions I am delighted to have completed the course. I strongly feel that nurse managers are not aware of the content or workload involved in this course. It is a must for all specialists; it is of great benefit to be able to prescribe...(Nurse Prescriber 037)

4.5 Conclusion

The respondents undertook a variety of educational routes in their preparation for the role of nurse prescriber of ionising radiation, with the largest cohort undertaking a

certificate programme. The highest numbers of respondents reported that they were approved to prescribe ionising radiation of the lower and upper limbs respectively, with a lower proportion also approved to prescribe radiographic examinations of the chest, pelvis, abdomen, and facial bones.

The educational programmes were evaluated positively in terms of their adherence to An Bord Altranais *Requirements and Standards for Education Programmes for Nurse Prescribing of Ionising Radiation (X-Ray)* (2008), and in terms of participants' overall ability to prescribe ionising radiation (fitness for practice). The greatest gains in terms of increased understanding and ability were noted in the curricular areas of ionising radiation and the legal and ethical aspects related to prescribing. The areas where the lowest gains were made were associated with roles that nurses already undertook in their day-to-day clinical practice; that is, taking a history from a patient/client and performing a physical assessment of a patient/client. The high scores in items relating to ability to prescribe ionising radiation after programme completion is identified as a positive outcome of the programme.

Respondents' overall experience of the quality of the education programme was positive; results on the PIRCEQS indicate that participants rated the quality of the programme in the domains measured as high. Using percentage agreement on the PIRCEQS as a proxy measure for the quantification of this positivity has some limitations, however results are broadly comparable to ratings of course experience identified by Drennan *et al.* (2009) in their evaluation of the programme which prepared participants to prescribe medicinal products. The support of the clinical mentor, the perception of being prepared for prescribing practice, and the overall satisfaction were areas course participants rated very highly. Some issues were noted with lower ratings related to the quality of teaching, the assessment processes, and overall workload.

4.6 Summary: Key Findings from the Evaluation of the Educational Preparation Programme for Nurse Prescribing of Ionising Radiation (X-Ray)

1. *Adherence to An Bord Altranais Requirements and Standards for Education Programmes for Nurse Prescribing Ionising Radiation (X-Ray)* (An Bord Altranais 2008)

- Respondents indicated that their understanding and abilities relating to the key curricular areas (professional accountability and responsibility, legal and ethical aspects, ionising radiation, radiation protection, principles of the prescribing process for ionising radiation, collaboration/referral with other health care professionals), prescribers' reports of their overall ability to prescribe and their

overall self-confidence in their prescribing ability had positively changed over the course of the education programme.

- Course participants indicated that they had positively developed an understanding and ability in all areas of prescribing ionising radiation as a result of the course. The largest changes occurred in understanding legal and ethical aspects associated with prescribing ionising radiation, understanding ionising radiation, and overall ability to prescribe ionising radiation.

2. Respondents' experience of, and satisfaction with, the programme

- The highest rated outcomes identified by course participants were satisfaction with mentorship support received during the course.
- High levels of satisfaction were also associated with the organization of the educational delivery and the attainment of the skills required for prescribing (preparation for prescribing practice).
- The lowest rated outcome indicated variability in the extent to which course participants were satisfied/dissatisfied with the workload associated with programme participation.

3. Evaluation of programme participants' preparedness for practice as nurse prescriber of ionising radiation (fit for practice)

- Course participants reported that the programme had comprehensively prepared and developed their ability to undertake the prescribing of ionising radiation in practice.
- Overall self-confidence in ability to prescribe ionising radiation was highly rated.

Chapter V

Audit of Nurse Prescribing of Ionising Radiation

5.1 Introduction

In this chapter the results of a multi-site clinical audit examining the appropriateness and safety of ionising radiation prescribing by nurses are presented. The extension of medical ionising radiation prescriptive authority to nurses carries with it the responsibility of the practitioner to ensure that prescribing decisions are appropriate and safe. Appropriateness relates to the criterion that the radiographic examination is necessary to inform the clinical management of an individual and, in the case of nurse practitioners working in advanced roles, that the patient treatment following radiological investigation is also clinically appropriate. The safety criterion focuses on the accurate identification of the patient, the area of the body to be imaged, and the recognition of any contra-indications to ionising radiation exposure. A decision to prescribe ionising radiation is based on the assessment of the patient and physical examination, thus the evaluation of quality of care concerns nurse prescribers' consultation with the patient. This audit entailed a retrospective analysis of the documented nurse-patient consultation recorded in the patient's health care record, the radiology request form and the associated radiologist's report. The rationale identified by the prescriber to justify the prescribing decision and the accuracy of the radiology request form were the primary areas of interest for the analysis.

Specific objectives:

- 1) To evaluate the appropriateness of the prescribing of radiological investigations based on the patient's presenting symptoms.
- 2) To evaluate the quality of the radiology request form in terms of complete, accurate and relevant clinical case information supplied to the radiographer.
- 3) In the case of nurses working in advanced roles, to evaluate the appropriateness of the patient management plan following investigation (the outcome of the radiological investigation, that is the proportion of fractures or anomalies identified did not form part of this evaluation).

A profile of the organisations selected for audit and nurse practitioners that participated in the audit is presented followed by the results of the assessment of the quality of the documented patient consultations and the radiology request forms. In the final phase of the analysis, the results concerning the appropriateness and safety of the ionising radiation prescribing decision and request are outlined. A consultant radiologist and a

consultant in emergency medicine undertook the assessment of the prescribing decisions and treatment plans. Two radiographers undertook the assessment of the accuracy and detail in the radiology request form. All reviewers worked independently of each other during the assessment process.

5.2 Organisations Audited

At the time of the audit there were 31 hospitals identified by the HSE as employing nurses with ionising radiation prescriptive authority. A purposeful sample of sites where these nurses were employed was selected to reflect geographical distribution and hospital size. The audit team contacted thirteen hospitals with seven hospitals responding that they were in a position to facilitate the audit within the timeframe of the overall review. Of the hospitals that were contacted but did not participate in the audit, two hospitals were eliminated from the sample because they did not have active nurse prescribers at the time of contact, a further two hospitals were unable to progress the ethics application within the timeframe required and the remaining two hospitals were unable to accommodate the audit within the timeframe of the evaluation.

The seven hospitals included two Band 1 academic teaching hospitals with emergency departments (EDs), three regional hospitals with EDs and two hospitals with minor injury units. The hospitals were located in the South/South West, Dublin Midlands and West/North West Hospital Groups. Ethical approval was obtained in each hospital or hospital group prior to data collection.

5.3 Nurse Prescribers of Ionising Radiation Audited

Within each hospital all nurses who actively prescribed radiographs, defined as at least one episode of medical ionising radiation prescribing in the past three months, were eligible for inclusion. The research team visited each site and met with nurse prescribers and their nurse line managers; all nurses provided verbal assent to participate in the audit. In total 41 nurses contributed data to the audit, this accounted for 29% (41/139) of nurse prescribers with ionising radiation prescriptive authority at the time of the evaluation. There was an average of 5.8 (SD 2.9) nurses per audited site, the minimum was 2 nurses and the maximum was 10.

The majority (63%) of nurse prescribers audited worked in ED, 7% worked in satellite minor injury units with the remaining (30%) working in a variety of settings including

outpatient, orthopaedic, rheumatology or specialist respiratory clinics. Advanced nurse practitioners (ANPs), at 31% were the most frequently represented grade of nurses prescribing radiographs followed by a similar proportion (29%) at staff nurse level.

Table 5.1 Grade of Nurses Audited.

Nurse Grade	%	<i>n</i>
Advanced Nurse Practitioner (ANP)	31	13
Clinical Nurse Specialist (CNS)	12	5
Clinical Nurse Manager (CNM) I/II/III	10	11
Staff Nurse	29	12

Nurses audited prescribed 225 radiographic examinations, with two patients receiving two separate requests. The most frequent investigation requested by nurse prescribers of ionising radiation that were audited was lower limb radiography (24%, this includes knee and ankle), followed by hand radiographs (23%). There was a single request each for facial bones and a lumbar spine (in particular coccyx) radiographic examination (Figure 5.1).

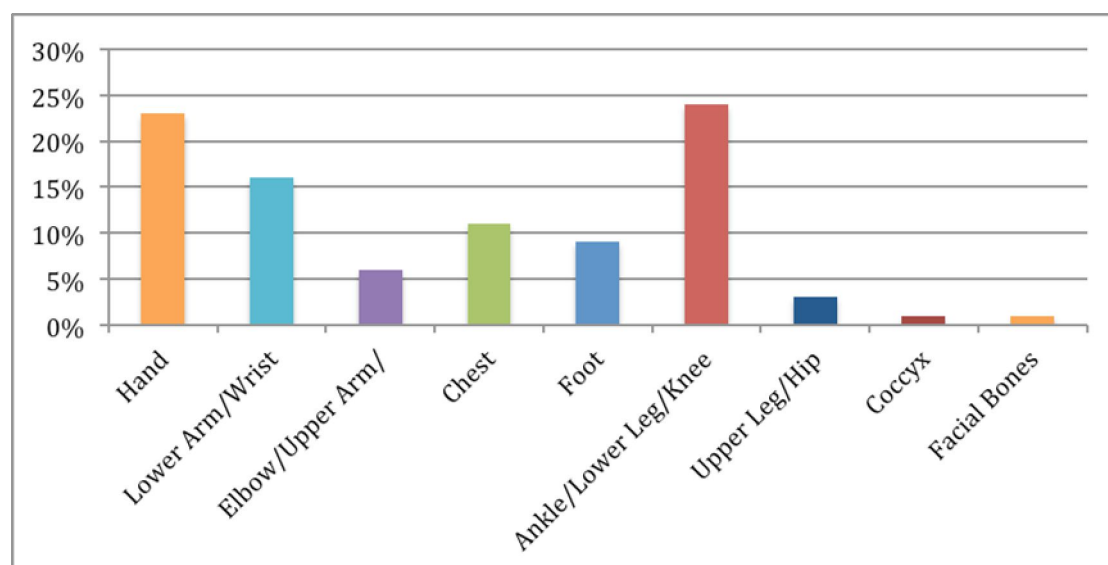


Figure 5.1 Radiographic Examinations Requested by Audited Nurse Prescribers of Ionising Radiation

5.4 Patient Health Care Records Audited

In total 221 patient records were audited. The mean age of the patients whose records were reviewed was 41.9 years (SD 19.3), the minimum age was 15⁶ years and the maximum age was 90 years. There was an equal distribution of males (50.2%) and females (49.8%) in the sample. The majority (71%) of patients were seen in ED or a minor

⁶ In some sites, referring a patient under 16 for a radiographic image is authorized by locally agreed protocols.

injuries unit, 23% were seen in outpatient departments (OPD), 2.7% were in-patients and 1.8% received care in a day ward. The majority of the patient consultations (65%) were shared whereby both a nurse prescriber and physician saw the patient. In 35% of consultations the patient was solely assessed and treated by a nurse prescriber, these nurses were at ANP or CNS grades.

5.5 Audit of Nurse Prescriber-Patient Consultation

Eighty-eight per cent of patient records contained evidence of documentation of a nurse-patient consultation prior to the prescription of the radiographic examination. In 12% of records reviewed there was evidence of a patient consultation documented by the treating physician but not of the nurse who requested the imaging. This occurred most frequently in follow-up out-patient fracture clinics where repeat radiographs were requested in the patient's notes by the initial treating physician in ED. Nurses in out-patient departments subsequently processed these radiograph requests and submitted them to the radiology department. These 28 records were removed from the assessment by the independent review panel, as the nurse prescriber's rationale for the prescription could not be determined.

The level of detail recorded on the patient consultation by nurse prescribers of ionising radiation is outlined in Table 5.2. The ANP/CNS records reviewed tended to be relatively detailed and reflected their expanded role, particularly concerning provisional diagnosis, management plans and patient education. The records of triage nurses tended to focus on the primary injury and contained little detail on wider patient medical conditions or medication. It was identified in the audit that 10% of prescribers recorded details of previous radiographic examinations. This may be due to the fact that in these cases, radiographs prescribed were due to trauma where previous radiographs may have had little bearing on the patient's current condition and management.

The concept of a treatment or action plan was broadly interpreted for the purpose of the audit. In approximately 80% of patient records reviewed, there was evidence that the nurse prescriber of ionising radiation had recorded evidence of the treatment/action plan. In addition, in approximately 90% of patient records reviewed the nurse prescriber had identified the type of radiographic examination requested; it should be noted that in 10% of patient records reviewed the type of radiographic examination requested was not

documented. Evidence of patient education or advice was documented in approximately 30% of patient records reviewed.

The research team in the clinical sites audited the recording of pregnancy status on the radiology request forms of women of childbearing age who were prescribed ionising radiation; this data was collected from the radiological request form⁷. Overall, the recording of pregnancy status was not applicable for forty-three per cent of the female cohort of the sample; that is they were not of childbearing age. Of those who were of childbearing age, thirty-six per cent of radiology request forms reviewed had recorded pregnancy status 'unknown' with twenty-nine per cent recording actual pregnancy status; for example patient 'states that they are not pregnant'. On 35% of radiology request forms reviewed, no recording of pregnancy status was identified.

Table 5. 2 Documentation of patient consultation in the health care record

		<i>Evidence of documentation</i>	
		%	N=194
Record legible	Yes,	92	178
	No (required >3 minutes to decipher)	8	16
Date of assessment	Yes	100	194
Time of assessment	Yes	93	180
Records primary injury/complaint	Yes	100	194
Records duration of symptoms	Yes	73	142
Records past medical history	Yes	74	145
Records current medication	Yes	63	123
Record allergies	Yes	76	148
Record physical examination	Yes	75	146
Record of previous X-Rays	Yes	10	19
Type of X-Ray requested documented	Yes	89	173
Record of working diagnosis	Yes	45	89
Evidence of action/treatment plan	Yes	79	154
Evidence of patient advice or education	Yes	33	65
Nurse name & signature	Yes	96	187
Pregnancy status*	Yes	65	42

*This includes pregnancy status recorded on the radiology request form as 'unknown' or actual pregnancy status recorded. Only women of childbearing age are included in this analysis.

⁷ Due to the data collection procedures adopted in clinical sites, the research team when collecting data at each site undertook the audit and recording of pregnancy status at that time.

5.6 Patient Outcomes

The majority of patients (80%) seen by nurse prescribers of ionising radiation were discharged home on the same day from either ED or OPD (Figure 5.2). Six per cent of patients were admitted to the hospital from the ED or OPD/Day ward. Three patients were transferred to another hospital following radiographic imaging and two patients self-discharged prior to completion of their consultation (Table 5.2).

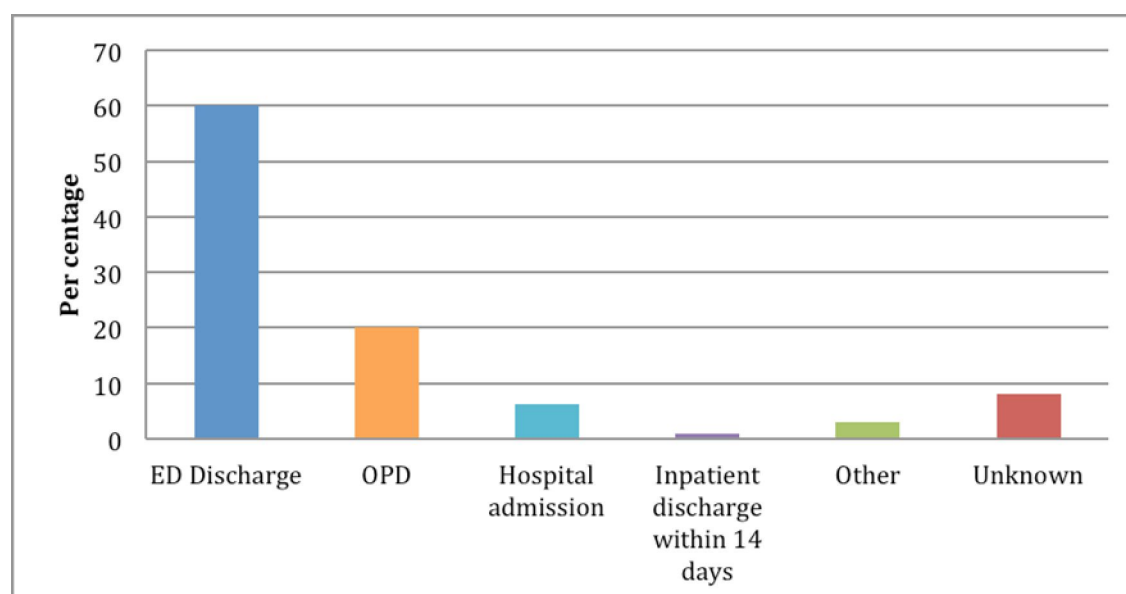


Figure 5.2 Summary of Patient Outcomes Following their Radiographic Examination

Table 5.2 Detailed Breakdown of Patient Outcomes Following Consultation with a Nurse Prescriber of Ionising Radiation

	%	<i>n</i>
ED discharge - no follow-up	41	91
ED discharge - scheduled return	19	43
ED discharged - unscheduled return within 14 days	0.5	1
Admitted from ED	1.8	4
OPD discharge	20	44
ODP/day ward admission	4.5	10
Inpatient discharge within 7 days	0.5	1
Inpatient discharge within 14 days	0.5	1
Hospital transfer	2	3
Self-discharge	1	2
Unknown (no record)	8	17

5.7 Evaluation of Appropriateness and Safety of Ionising Radiation Prescribing Decisions

Two reviewers, a consultant radiologist and a consultant in emergency medicine, working independently of each other examined 194 patient records. As highlighted in section 5.5,

twenty-eight cases were excluded from the analysis, as there was no record of a nurse-patient consultation, thus the rationale for the prescribing decision could not be assessed. The documents examined consisted of the nurse prescriber-patient consultation including the assessment and management plan and the radiology request form.

The independent reviewers assessed three criteria:

- i) Was the ionising prescribing decision justified based on the patient's clinical presenting symptoms or condition?
- ii) Was the site accurately identified in the patient's clinical consultation and radiology request form?
- iii) In the case of patients managed by ANP and CNS practitioners, was the post-radiographic patient management plan reasonable?

The results from each reviewer are reported separately (Table 5.3) followed by the degree of concordance between reviewers (percentage of decisions where both reviewers agreed on the same response option: yes, no or insufficient information).

5.7.1 Criterion (i): Was the ionising radiation prescribing decision justified based on the patient's clinical presenting symptoms or condition?

Reviewer 1 identified that 99% of ionising radiation prescribing decisions were justified based on the patient's presenting condition as recorded by the nurse prescriber in the patient consultation. In one case the reviewer reported that there was insufficient information to make a judgement on the rationale for the radiographic examination.

Reviewer 2 identified that 95% of the ionising radiation prescribing decisions were appropriate based on the patient's history. In two cases (1%) the reviewer suggested that, based on the information in the patient consultation, a radiograph of an adjacent site may have been more appropriate or should also have been included; the imaging request was for lower limb, the reviewer suggested that the foot, tibia and fibula should be specified. In one other record reviewed, the doctor at the clinical site had amended the radiology request to include an investigation of the knee. In 4% of cases there was insufficient information collected to assess the criterion.

This reviewer commented that although the vast majority of decisions to prescribe ionising radiation were justified, in 7% (13/196) of the consultations the rationale documented for the investigation lacked specificity. For example, on one request audited,

the indication was for a radiographic examination of a fracture of left distal radius; however, the reviewer highlighted that the prescriber did not comment that the imaging was requested to assess alignment post immobilisation. In another record audited, the indication recorded was fracture of right clavicle, however, it was not indicated on the request form that the patient was two weeks following a surgical intervention involving open reduction and internal fixation (ORIF) of the fracture.

The concordance between reviewers (the extent to which they both agreed) was that 95% of nurse prescribing decisions were justified with 1% of decisions to prescribe ionising radiation possibly requiring amendment, for example a radiograph of an adjacent site may have been required or greater specificity provided by the nurse prescriber in the anatomical areas to be imaged. Both reviewers identified cases (4%) where there was insufficient information recorded to make a judgement on the prescribing of ionising radiation decision.

5.7.2 Criterion (ii): Was the site accurately identified in the patient's clinical consultation and radiology request form?

Both reviewers judged that between 98-99% of body sites for imaging were accurately identified. Reviewer 2 identified one record where there was a lack of specificity that could impact on the radiographic projection. The radiology request indicated 'out rule fracture', but did not highlight cuboid tenderness on a patient requiring a foot radiograph. The reviewer concordance was 97% in relation to this criterion.

5.7.3 Criterion (iii): In the case of patients managed by an ANP/CNS, was the post radiograph patient management plan appropriate?

Thirty four per cent of cases were included in the assessment of this criterion. In total there were 88 ANP/CNS consultations; however, complete documentation, including nurses' consultations, radiology request and radiology report was only available for 76 cases. Advanced nurse practitioners and clinical nurse specialists independently assess and treat patients within their speciality and scope of practice. In the case of medical ionising radiation prescribing, as well as assessing the need for a radiograph they can also treat patients following the investigation, this is not the case in other nursing roles where treatment has to be managed and overseen by a physician. It should be noted that while the radiograph may be available, the nurse treatment plans are not dependent on reviewing the radiograph, as this is not within the nurse prescribers of ionising radiation scope of practice.

Reviewer 1 agreed that 100% (76/76) post-radiograph treatment plans described in the patient health record were reasonable, consistent with the radiology report and in line with the patient's condition.

Reviewer 2 agreed that 85% of the treatment plans were appropriate, in 6% (5/76) of these cases there was evidence that the nurse consulted with a physician. In only one case did the reviewer question the advice given to the patient, where the reviewer commented: 'Healed fracture, unsure of the value of immobilising foot again, notes very difficult to read'. In the remaining 13% of records reviewed there was insufficient information available (not enough detail in the consultation) to allow the reviewer judge the quality of the treatment plan.

Overall agreement between reviewers was 85% that patient management plans were clinically appropriate. Both reviewers commented on the high quality of the case management notes and level of detail recorded in the majority of advanced nurse or clinical nurse specialists' documentation. There was a single case where one reviewer questioned the advice; in the remaining records there was insufficient detail to judge the appropriateness or otherwise of the care plans.

Table 5.3 Expert Reviewers' Assessment of Appropriateness of Ionising Radiation Prescribing Decisions

		<i>Reviewer 1</i>		<i>Reviewer 2</i>		<i>Reviewer Concordance</i>
Criterion	Response options	%	n	%	n	%
i X-Ray clinically indicated	Yes	99	192	95	185	95
	No		-	1	2	0
	Insufficient information	0.5	1	3	6	0
ii Site accurately identified	Yes	99	191	98	189	97
	No		-	0.5	1	
	Insufficient information	1	2	1	2	0
iii Treatment appropriate ANP/CNS consultation, (n=76)	Yes	100	76	85	65	85%
	No		-	1	1	

Insufficient information	-	13	10
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5.8 Audit of Radiology Request Forms

The radiology request forms for the entire patient population (n=221) were available to the audit team at each site. The accurate completion of patient identifying information was verified during the site visit, due to data protection this data was not removed from the clinical site. Over 60% of the radiology request forms were electronic. All the radiology request forms reviewed contained accurate patient identification information including the patient's name, date of birth and hospital number. In 19% of the records reviewed it was difficult to identify the prescriber identification and in a number of cases the radiographic procedure appeared to be requested under a physician's name. This may have occurred due to local policies in the electronic prescribing system or the unique prescriber ID may be registered on a different part of the system at login.

5.9 Radiographer Review of Radiology Request Forms

There were 187 radiology⁸ request forms available for review by the independent radiographers. The request forms were assessed against five criteria concerning the accuracy and completeness of information required by a radiographer to identify the correct site and radiographic image with the minimum of risk to the patient (Table 5.4).

5.9.1 Radiographer Criteria (i): Was there sufficient information available on the radiology request form for the imaging to be undertaken?

Both radiographer reviewers agreed that in 95% of radiology request forms audited there was clear and accurate information provided to identify the specific body site to be imaged and, if necessary, the type of radiographic view required. In 4% of cases the radiographer reviewers identified some discrepancies between the clinical information supplied and the type of examination requested which may have required further clarification prior to proceeding with the investigation. For example, a radiographer reviewer commented: 'unclear reason - assume its pre-op but not enough information given to know if justified'; 'Query which side, also FBD abbreviation not approved'. However, there was no evidence from the records reviewed that further clarification was sought by radiographer in the clinical site concerned.

⁸ In the case of 34 records the data collection team were unable to obtain de-identified records for removal from the audit site due to difficulties with photocopying or scanning equipment.

5.9.2 Radiographer criterion (ii) was the clinical information on the radiology request form legible?

This criterion was only relevant to hand-written radiology request forms and related to 86 records; the majority of imaging was requested using an electronic system. All of the hand-written records audited were judged to be legible by both radiographer reviewers.

5.9.3 Radiographer criterion (iii) was the urgency/priority of the request indicated?

The urgency of the radiographic investigation was explicitly identified in 20% of radiology request forms. In the majority of electronic request forms reviewed there was no specific 'tick box' that required this information and whether or not urgency of the request was indicated may have been due to whether or not this function of the NIMIS system was enabled.

5.9.4 Radiographer criterion (iv): Was previous radiographic imaging radiation exposure indicated?

In just over 10% of request forms, there was explicit mention of previous imaging or other radiological investigations. The radiographers commented that in the case of acute trauma, 62% of records, previous imaging were unlikely to impact on the clinical need for the radiology request reviewed in this audit. In other cases where the clinical information described follow-up of a previous injury, there was an assumption of previous imaging, but it was not explicitly stated on the request form.

5.9.5 Radiographer criterion (v): Females only: was there an indication of and last menstrual period recorded where required (LMP)?

In relation to the recording of last menstrual period (LMP), this criterion was applicable to only one of the radiology requests reviewed, a 26-year-old women where a radiograph of the coccyx was requested. The nurse prescriber had recorded the LMP of the woman in the patient health record but not on the radiology request form. There were hip and chest radiographs prescribed for a small number of women; however, all patients were over 60 years of age.

5.9.6 Other Comments from Radiographer Reviewers

In addition to the above criteria, the radiographer reviewers identified up to 13% of radiology request forms where there were spelling or grammatical errors or

inappropriate use of abbreviations that that could have potentially impacted upon the accuracy of the information supplied and contributed to difficulties in reading the request form. Examples of difficult to interpret abbreviations identified in the request forms reviewed included: 'Hurl', 'BIBA', 'rgt', 'inj', 'bil'. In a small number of cases there was a lack of anatomical clarity; for example requesting a foot radiograph where the injury only concerned a toe; a hand radiograph where only the finger was involved and; use of the term 'little finger'. Similar to comments made by the consultant reviewers, the radiographers identified that in 18% of requests the clinical rationale for the imaging request was poorly articulated. Both radiographers queried the value of imaging for a coccyx injury and imaging where a patient previously had an MRI scan.

Table 5.4 Radiographers' Review of Radiology Request Forms

			<i>Radiographer Reviewer 1</i>		<i>Radiographer Reviewer 1</i>		<i>Concordance</i>
			%	N=187	%	N=187	%
i	Was there sufficient information available on the radiology request form for the X-Ray to be undertaken?	Yes	95	178	95	178	99
		No	3	7	4	8	
		Incomplete information	0.5	1	-	-	
ii	Was the clinical information on the radiology request form legible (Paper records only n=86)	Yes	100	86	100	86	100
		No		-		-	
iii	Was the urgency/priority of the request indicated?	Yes	20	37	20	37	100
		No	79	148	79	148	
iv	Was previous ionising radiation exposure indicated?	Yes	10	19	11	20	99
		No	89	168	89	167	
v	Females only: was there an indication of LMP?	Yes		-		-	-
		No	0.5	1	0.5	1	
		N/A		186*		186*	
Other comments							
	Spelling/ grammar errors		6	12	4	8	-
	Inappropriate abbreviations		7	13	5	10	-
	Clinical rationale poorly indicated		18	33	16	29	-
	Lack of anatomical detail		2	4	0.5	1	-
	Appropriateness of ionising radiation prescription		1	2	0.5	1	-

*Males, females not of childbearing age, radiographic examinations not between the diaphragm and symphysis pubis.

5.10 Discussion

An independent consultant radiologist and a consultant in emergency medicine judged the vast majority of radiological investigations requested by nurse prescribers of ionising radiation to be appropriate based on the patient's history and/or physical examination. The correct site was identified in the radiology request forms and in the vast majority of patient records reviewed. Similarly, the majority of treatment plans recorded by advanced nurse practitioners or clinical nurse specialists were deemed appropriate and consistent with the patient's presenting condition.

Ninety-five per cent of radiological prescribing decisions were deemed appropriate; in essence this is the most important criterion as subsequent decisions are dependent on initial appropriate assessment and provisional diagnosis. In the current evaluation there were two (1%) patient consultations that indicated the need for additional radiological investigations. In the remaining four per cent of records reviewed there was insufficient information recorded in the documentation to assess the prescribing decision. Three previously published studies have identified similar high levels of appropriate radiological investigations by nurses. The rate of inappropriate requesting of radiological investigations in these studies was 3.7% (Benger 2002), 5.4% (Lee *et al.* 2013) and 13.2% (Sakr *et al.* 1999). In the current audit, the reviewers did not identify any inappropriate imaging requests. Where queries did arise, the reviewers identified that additional radiological requests were recommended rather than the radiographic examination requested being deemed unnecessary.

The vast majority of ionising radiation prescribed by nurses were identified as being within the guiding framework for the 'usual range of X-Rays that a registered nurse who has successfully completed an approved education programme can prescribe' (HSE 2009: 22). Two radiographic examinations, one for facial bones and one for the coccyx, were outside the 'usual list' outlined by An Bord Altranais in the document *The Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray)* (An Bord Altranais 2008). It should be noted that this list is regarded as a guide only and that individual practitioner's scope of practice and local guidance can influence the range of examinations that can be prescribed (HSE, 2009). It

was beyond the scope of this audit to investigate individual nurses' scope of practice in this regard.

The recording of pregnancy status of women of childbearing age on the radiology request forms varied. In over a third of the electronic forms reviewed the pregnancy status of women of childbearing age was recorded as 'unknown' with approximately thirty per cent recording that the patient stated that they were not pregnant. In thirty-five per cent of radiology request forms reviewed there was no evidence that pregnancy status was recorded. It should be noted that radiological precautions in pregnancy apply to all radiological investigations, with a legal requirement for prescribers to inquire of female patients of childbearing age whether she is pregnant and to record this answer in writing (Government of Ireland, 2002).

It was found that only one female patient in the audit, who was of childbearing age, had an X-Ray between the diaphragm and symphysis pubis (coccyx radiograph); in this case the last menstrual period (LMP) of the patient was not on the radiology request form but was recorded in the patient's medical notes. It should be noted that for examinations between the diaphragm and symphysis pubis of females of childbearing age, patients should be asked their last menstrual period and this answer also recorded in writing (RPII, 2010).

The review of the quality of the radiology request forms by two radiographers found a high degree of accuracy in identifying the body site for radiological investigation. In approximately 4% of radiology requests the reviewers identified that there was a possibility that a radiographer may require further information before proceeding with the investigation. In both the healthcare records and radiology request forms reviewed there was a low level of recording of the urgency of the request and previous radiation exposure where it may be appropriate. Other areas identified as issues in the review was the need to use anatomical terms to describe the specific body site for imaging, articulating the precise rationale for the examination, and, in some cases, the inappropriate use of abbreviations as well as spelling and grammatical errors that may impact on the clarity of the documentation and the radiology request forms.

5.11 Conclusion

The majority of nurses with prescribing authority in this audit worked in high volume patient areas such as ED or outpatient departments. With the assistance of the nurse prescribers of ionising radiation, radiographers and consultant radiologists it was possible to identify a random systematic sample of patients for audit. Overall the vast majority of

ionising radiation prescribing decisions were appropriate and radiology request forms were accurately completed.

5.12 Summary: Key Findings from the Audit of Nurse Prescribing of Ionising Radiation

- Overall, 95% of ionising radiation prescribing decisions made by nurses audited were judged to be appropriate by consultant medical reviewers (a radiologist and emergency medicine physician); in 4% of records reviewed there was insufficient information available to make a decision on the appropriateness or otherwise of the decision.
- In two cases (1%) the nurse prescribing decisions may have required amendment of the radiographic projection requested. These amendments included a suggestion that there may have been the need for an extra radiograph of an adjacent site or greater specificity provided by the nurse prescriber in the anatomical area to be imaged.
- The vast majority of nurse prescribers' documentation of the nurse-patient consultation reviewed that related to a radiological investigation were found to be detailed, comprehensive and of a high quality.
- In approximately 7% of patient healthcare records reviewed, the rationale for the prescribing decision was not fully outlined in the documentation. In a further 12% of records reviewed, although there was evidence of a patient consultation documented by the treating physician, there was no documentation identified by the nurse prescriber in relation to the ionising radiation prescribing decision.
- There was some variability in the level of patient detail recorded by specific roles held by nurse prescribers of ionising radiation such as triage nurses and ANP/CNS consultations.
- In 65% of radiology request forms audited, pregnancy status was recorded as 'unknown' or 'patient states not pregnant'. In 35% of radiology request forms audited, there was no evidence that the pregnancy status of women of childbearing age had been recorded.
- In 95% of radiology request forms reviewed by two independent radiographers, the site of the radiological investigation was clearly indicated and it was identified that there was sufficient information provided by a nurse prescriber of ionising radiation to allow a radiographer complete the radiographic examination.
- In 4% of radiology request forms audited, radiographer reviewers highlighted that there may have been a need for a radiographer to seek further clarification regarding the type of imaging required.

- Additional information on the radiology request form such as urgency of request and previous radiation exposure was explicitly recorded in 10%-20% of records.
- A small proportion of radiology request forms were identified that included abbreviations, spelling or grammatical errors; it was assessed that these factors could impact on the clarity of the imaging requested by the nurse prescriber of ionising radiation.

Chapter VI

Evaluation of Patients' Level of Satisfaction with Nurse Prescribing of Ionising Radiation

6.1 Introduction

This chapter reports on patients⁹ level of satisfaction with their experience of being prescribed ionising radiation by a nurse. The patient satisfaction survey measured four domains in relation to patients' experience of nurse prescribing of ionising radiation. These domains included: patients' attitudes towards a nurse requesting their radiograph; patients' levels of satisfaction with the consultation process and; patients' perceptions of the extent to which the nurses explained the need for a radiographic examination. The first section of this chapter reports on patients' attitudes towards receiving a prescription from a nurse who prescribed their ionising radiation. This is followed by patients' perceptions of the level of advice they received from the nurse regarding the radiographic examination. The final section explores patients' level of satisfaction with the consultation process in relation to three main domains: patients' perceptions of the level of professional care received, patients' perception of the time given to them by the nurse, and patients' overall level of satisfaction.

6.2 Demographic Profile of Patients Surveyed

Approximately 200 questionnaires were distributed to patients with 83 returned resulting in a response rate of 41.5%. The proportion of males (49.4%) and females (50.6%) that responded to the survey was relatively equal. The age of patients for whom a nurse prescribed ionising radiation and who responded to the survey ranged from 18 years to 89 years (mean age 41.9, SD = 17.9). Sixty-five per cent of respondents described their health as 'very good' or 'excellent' whereas approximately seventeen per cent of respondents described their health as 'fair' or 'poor'. Eighteen per cent of patients identified their health as good (Figure 6.1).

⁹ Patients surveyed were a different cohort from those patients whose records were included in the audit.

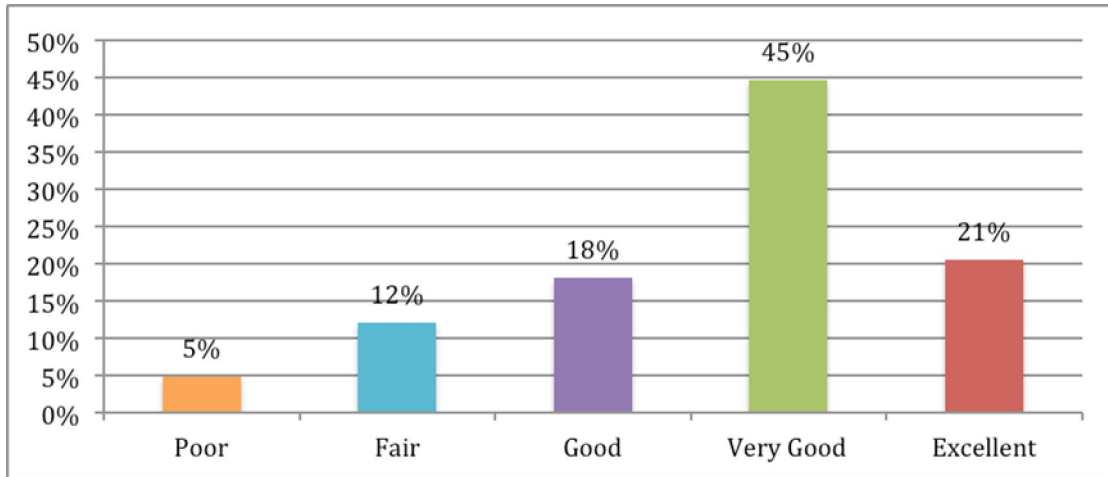


Figure 6.1 Respondents' Ratings of their Overall Health

Patients surveyed were presented with the following statement: 'a nurse requested an X-Ray for you. Can you name the reason why the X-Ray was requested?'¹⁰ (See Figure 6.2). The majority reported that the radiographic was requested for the upper limb followed by radiographs of the lower limb. Seventeen per cent reported that they had a chest radiograph, the majority of respondents in this category reported that the radiographic examination was part of the process for pre-operative preparation. Overall, patients reported that the vast majority of radiographic examinations were requested for the upper and lower limbs following an episode of trauma.

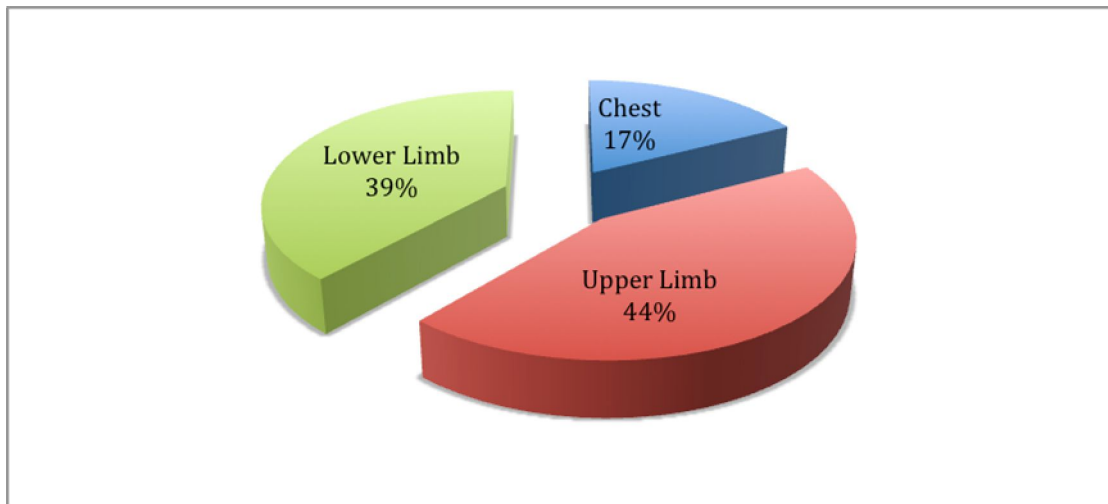


Figure 6.2 Sites Imaged as Reported by Patients

6.3 Patients' Attitudes Towards Receiving a Prescription for Ionising Radiation from a Nurse

¹⁰ For ease of understanding, the term X-Ray was used in all written materials presented to patients.

Patients were asked a number of questions on their attitudes related to receiving a prescription for a radiographic examination from a nurse. The vast majority of respondents were in favour of nurses prescribing ionising radiation for patients; none of the respondents disagreed with the statement: 'nurses should be able to order X-Rays for patients'. In addition, the majority of respondents disagreed that they would have preferred a doctor to request their radiographic examination with approximately sixty per cent stating that they have no preference on which health professional requests their investigation.

Table 6.1 Patients' Attitudes Towards Nurse Prescribing of Ionising radiation¹

<i>Item</i>	<i>Percentage Disagreement %</i>	<i>Percentage Agreement %</i>
Nurses should be able to request X-Rays for patients	0.0	93.9
I would prefer a doctor to request my X-Ray	61.7	6.2
I would prefer a nurse to request my X-Ray	2.6	45.5
I have no preference whether a doctor or nurse prescribes my X-Ray	11.0	63.4

¹No opinion responses are omitted

Figure 6.3 outlines the response to the statement: 'I would prefer a doctor to order my X-Ray'. The vast majority of respondents disagreed or strongly disagreed (61.7%) with the statement with approximately a third expressing no opinion; six per cent of respondents reported that they would have preferred to have received the request for a radiographic examination from a doctor.

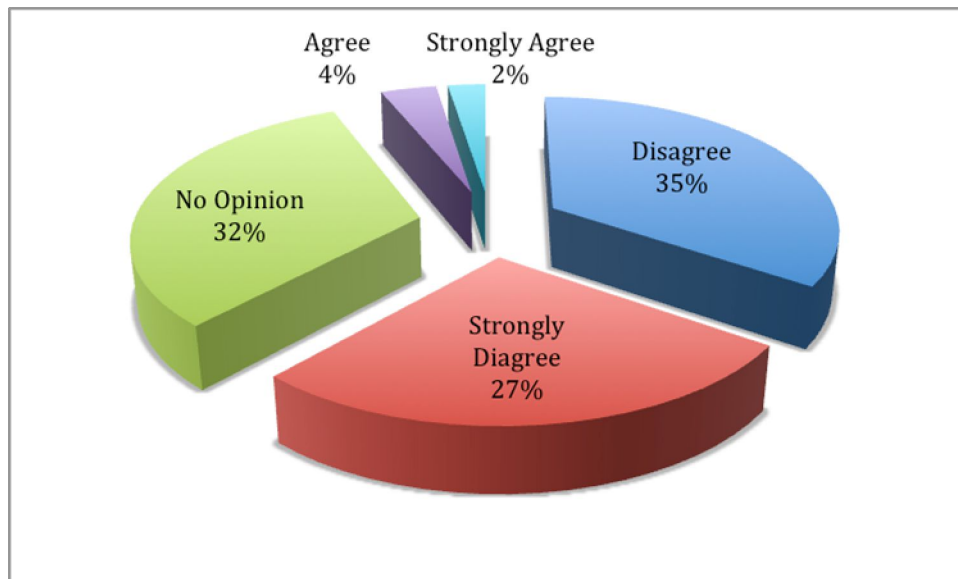


Figure 6.3 Patient's Level of Agreement/Disagreement to the Statement 'I Would Prefer a Doctor to Order my X-Ray'

Patients' overall positive attitudes towards, and acceptance of nurse prescribing ionising radiation were also highlighted in the comments provided by respondents to the survey. There was a sense that the level of care was comprehensive and patients reported that their overall experience was positive:

I was very impressed by the way I was treated from the start to finish. I think this is a very good idea to make use of the many skills of our nurses (Patient 027).

I think nurses should be given more opportunity to use the experience they have especially versus inexperienced junior doctors (Patient 077).

I liked the system in A&E where nurses deal with minor injuries, leaving more time for doctors to deal with serious illness (Patient 049).

6.4 Patients' Evaluation of the Education and Advice Received from a Nurse Prescriber of Ionising Radiation

Patients were asked a number of questions regarding the level of advice received from a nurse prescriber of ionising radiation (Table 6.2). Respondents were in agreement that the nurse provided comprehensive education and advice regarding the imaging process. The vast majority, approximately ninety per cent of respondents, agreed that they had been provided with time to clarify questions about their radiographic examination, that they had been provided with information regarding the type and purpose of radiographic examination requested and that they had been provided with information on what to do after the radiographic examination. One aspect of education and advice, although positive,

fell below the levels of agreement associated with the other items in this domain; this related to the statement, 'I would like have received more information from the nurse about my X-Ray'. Although the majority disagreed with the statement, approximately seventeen per cent of respondents identified that they would have preferred to receive further information.

Table 6.2 Patients' Evaluation of the Education and Advice Received from a Nurse Prescribing Ionising Radiation¹

<i>Item</i>	<i>Percentage Disagreement %</i>	<i>Percentage Agreement %</i>
The nurse gave me time to clarify questions I may have had about my X-Ray	2.4	89.1
The nurse provided me with information about the type of X-Ray requested	8.4	89.1
The nurse provided me with information on the purpose of the X-Ray	3.6	95.2
The nurse explained what to do after my X-Ray	4.9	89.0
I would have liked to have received more information from the nurse about my X-Ray	63.0	17.2

¹No opinion responses are omitted

The vast majority of patients (88%) were in agreement that receiving a prescription for an radiograph from a nurse had reduced their waiting time while approximately six per cent of patients disagreed or strongly disagreed that it had reduced their waiting time (see Figure 6.4).

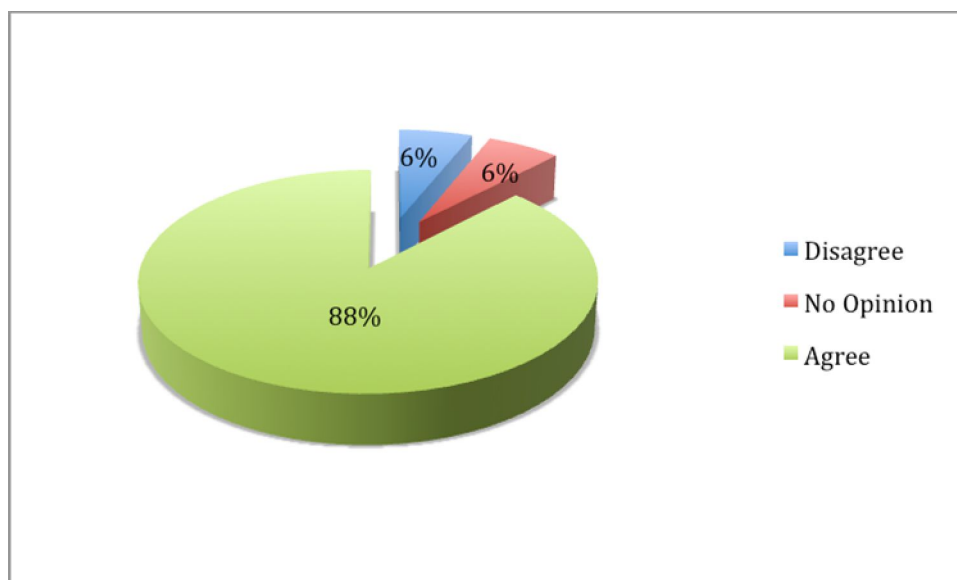


Figure 6.4 Patients' Level of Agreement to the Statement: 'Receiving a Request for an X-Ray from a Nurse Reduced my Waiting Time'

A number of patients provided open-ended comments on the survey relating to waiting times; the majority that did so referred to the positive impact that receiving a prescription for ionising radiation from a nurse had had on their waiting time:

It's great having nurses order x-rays; it reduced my waiting time significantly and improved [my] hospital experience (Patient 001)

[Nurse prescribing of ionising radiation] definitely a positive as waiting time was cut by hours, also the nurse explained everything and spent time doing so (Patient 012).

We were very happy with the speed with which we were dealt with (Patient 017)

I was surprised to be dealt with by a nurse but I was in a lot of pain and he made it all easier and quicker for me to leave the emergency department (Patient 043).

A small number of patients, however, commented that their time waiting to be treated, especially patients waiting to be treated in emergency departments was not positively impacted upon:

I thought by the nurse ordering my x-ray [it] would have reduced the waiting time for my visit; 'not so', only 4 people in A&E on that day and each person waited 3-4 hours – it's the same as usual (Patient 86).

Waiting time [was] too long!! (Patient 023).

6.5 Information Sought from Patients by the Prescriber of Ionising Radiation

Patients who received a prescription for ionising radiation from a nurse were asked to identify if they were asked for information on the following areas: previous and current medical history, current medications, known allergies, family history and the last time the respondent had a radiographic examination. The results are outlined in Table 6.3. Approximately seventy per cent of respondents reported that they were asked information on their previous and current medical history, current medications and known allergies, with approximately a fifth reporting that they were not asked for information in these areas. Information on family history was the least frequently requested information with forty seven per cent reporting that they were asked, compared to forty-one per cent stating that information was not sought in this area.

Table 6.3 Information Sought by Nurses from the Patients' Perspective Prior to Receiving a Prescription for Ionising Radiation

<i>Item</i>	<i>Yes %</i>	<i>No %</i>	<i>Don't Know %</i>
Did the nurse look for information on your previous and current medical history?	71.1	22.9	6.0
Did the nurse look for information on your current medications?	69.9	22.9	7.2
Did the nurse look for information on your known allergies?	73.2	20.7	6.1
Did the nurse look for information on your family history?	47.0	41.0	12.0

Patients were also questioned on whether they were asked by the nurse prescribing ionising radiation to state the last time they had an X-Ray (see Figure 6.5). The majority (63%) of respondents reported that they had been asked for this information with approximately a third stating that they had not been requested by the nurse to provide information on the last time they had an X-Ray.

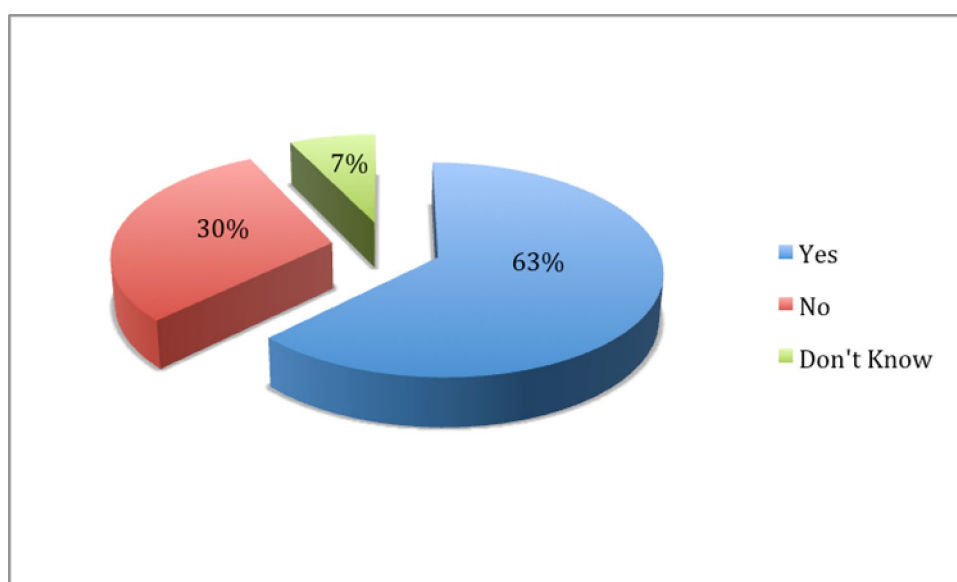


Figure 6.5 Patients' Response to the Statement: 'Did the Nurse ask you for Information on the Last Time you had an X-Ray?'

6.6 Patient Satisfaction with the Consultation Process

This section of the evaluation reports on patients' level of satisfaction with the consultation they had with the nurse who presented them with a prescription for ionising radiation. Satisfaction with the process was measured using the *Consultation Satisfaction Questionnaire* (CSQ); this instrument measured three constructs: patients' level of satisfaction with the professionalism of the care they received (this was operationalised using the 'professional care' subscale of the CSQ); patients' level of satisfaction with the amount of time they were afforded during the consultation (this was operationalised

using the 'perceived time' subscale of the CSQ) and; patients' overall level of satisfaction (this was operationalised using the 'general satisfaction' subscale of the CSQ).

There were high levels of agreement amongst respondents that they had received a professional level of care in their interaction with the nurse prescriber of medical ionising radiation. Over ninety per cent were in agreement that the nurse had checked everything associated with their care, had been given advice they could trust, and listened to them. The majority were also in agreement that the nurse was interested in them as a person and explained the reasons for the advice given. There were also relatively high levels of satisfaction with the time patients spent with the nurse who prescribed their ionising radiation. However, levels of satisfaction within this domain were lower than other constructs. Approximately 1 in 5 of respondents were in agreement that the time they spent with the nurse was a bit too short; however, three-quarters of the respondents disagreed that the time they spent with the nurse was not long enough to deal with everything they wanted. In addition, one in four patients surveyed expressed a wish that they would have liked more time in the consultation. However, in total, overall levels of satisfaction with the consultation process were high with ninety-nine per cent of respondents agreeing or strongly agreeing that they were satisfied with the consultation process.

Table 6.4 Patients' Level of Satisfaction with Professional Care, Perceived Time and Overall Satisfaction¹

<i>CSQ Item</i>	<i>Percentage Disagreement %</i>	<i>Percentage Agreement %</i>
Professional Care		
This nurse was very careful to check everything when carrying out my care	1.2	90.9
I will follow this nurse's advice because I think she/he is right	0.0	98.7
The nurse explained the reasons for the advice given	4.9	85.3
The nurse listened very carefully to what I had to say	0.0	92.8
I thought the nurse took notice of me as a person	1.2	87.9
I understand my treatment much better after seeing this nurse	3.8	70.0
The nurse was interested in me as a person, not just my illness	4.9	84.0

Perceived Time		
The time I was able to spend with this nurse was a bit too short	61.3	17.9
The time I was able to spend with this nurse was not long enough to deal with everything I wanted	74.1	12.3
I wish it had been possible to spend a little longer with the nurse	40.7	27.1
Overall Satisfaction		
I am not completely satisfied with the advice received from this nurse	88.9	6.2
Some things about the consultation with the nurse could have been better	70.4	12.4
Overall I was satisfied with the consultation from this nurse	0.0	98.8

¹No opinion responses are omitted

The items that comprise the CSQ were summated into three scales that provide overall scores for the patients' level of satisfaction with professional care, time available for the consultation and overall satisfaction (see Table 6.5). To aid interpretation the scale scores are reported from 0 to 100 with higher scores indicating greater levels of satisfaction within that domain. The results demonstrated that respondents highly rated all aspects of the consultation process during their interaction with a nurse prescriber of ionising radiation. The highest level of satisfaction was with the level of professional care received followed by overall satisfaction with the consultation with the prescriber of ionising radiation. Respondents were also satisfied with the time spent with the prescriber of ionising radiation but to a somewhat lesser extent than that found in the other domains.

Table 6.5 Mean Scores of the Scales of the Consultation Satisfaction Questionnaire*

<i>Scale</i>	<i>Minimum</i>	<i>Maximum</i>	<i>Mean</i>	<i>SD</i>
Professional care	35.71	100.0	85.21	14.97
Perceived Time	0.00	100.0	62.60	25.31
Overall Satisfaction	33.33	100.0	82.40	16.71

*Scores range from 0 to 100. Higher mean scores indicate satisfaction; lower mean scores indicate dissatisfaction.

Figure 6.6 outlines respondents' level of satisfaction with professional care, time allowed for consultation and overall satisfaction according to health status. There was very little difference between cohorts' levels of satisfaction with the professionalisation of care and their overall levels of satisfaction; this identified that patients perceived that they were

overall satisfied with the consultation process, satisfied with the advice given and that they were listened to by the nurse providing their care; however, patients who described their health as poor or fair had significantly lower levels of satisfaction with the time they were afforded in the consultation than those respondents who described their health as good, very good or excellent. In effect, respondents with poorer levels of health were least satisfied with the time spent with the nurse during the consultation process associated with the prescribing of ionising radiation.

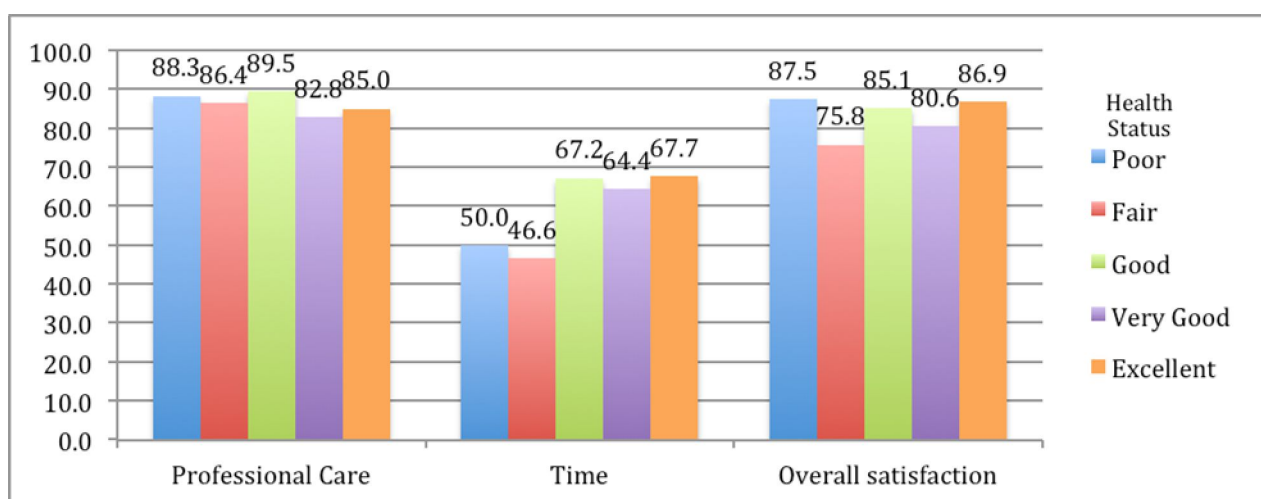


Figure 6.6 Respondents' Mean Level of Satisfaction with their Consultation with the Nurse Prescriber by Health Status (Scores range from 0 to 100; higher scores indicate greater levels of satisfaction within that domain, lower scores indicate levels of dissatisfaction).

Of the three domains measured, professionalisation of care, time provided for consultation and, overall satisfaction, patients were least satisfied with the time they had to consult with the nurse who prescribed their ionising radiation. A number of comments from patients alluded to this aspect of their care and identified issues that arose as they were receiving treatment:

I believe the nurse did not have the time to properly consult [with] me, as the amount of patients to be seen was very high. I also understood the reason for my X-Ray so there was no need to question. However, if I did want a consultation the time was insufficient (Patient 069).

Overall, patients' comments were reflective of the results of the survey; with comments relating to the professionalisation of the care received from the nurses who prescribed ionising radiation and the positive impact it had on their experience of the healthcare setting overall. One patient comprehensively outlined his/her individual experience:

It was great to be treated as a person rather than a number due to long waiting times and over-crowding in A&E. Without being disrespectful to doctors, as they do great work, nurses, in my opinion, are more approachable and more information is passed to the patient rather than the doctor assessing and diagnosing minor injuries and illnesses or ordering x-rays etc. then passing the patient on to a nurse to complete the treatment and discharge etc. This is definitely a positive... (Patient 002).

6.7 Conclusion

Patients surveyed were highly satisfied with the care they received from nurses who prescribed ionising radiation and all patients surveyed were of the opinion that nurses should be involved in the requesting of radiographic examinations; the majority of patients reported that they has no preference whether a doctor or nurse prescribed their ionising radiation. Patients also reported that they received comprehensive education and advice from the nurse on the radiological process; however, just under a fifth reported that they would like to have received more information on the radiographic examination that was requested. Waiting time was also perceived by respondents to have been positively impacted upon with the vast majority of patients reporting that it had reduced their waiting time for treatment. The majority of respondents also reported that they were asked for information prior to their radiographic examination on their medical history, current medications and allergies; however, a proportion of respondents reported that they were not asked for information on their family history.

Overall satisfaction with the consultation process was high with the majority of patients surveyed of the opinion that the nurse who prescribed their ionising radiation was comprehensive in their care, listened to their concerns and treated them as a person. Patients were also generally satisfied with the time the nurse spent with them during the consultation process; however some patients, especially those reporting poorer health, would liked to have had more time with the nurse. Overall there were high levels of support for the prescribing initiative with the vast majority of patients in favour of nurses prescribing ionising radiation. Patients were also highly satisfied with the care and advice provided by prescribers of ionising radiation.

6.8 Summary: Key Findings from Patients' Evaluation of Nurse Prescribing Ionising Radiation

- The vast majority of patients surveyed were in favour of nurses prescribing ionising radiation.
- The majority of patients surveyed had no preference whether a doctor or nurse requested their radiographic examination.

- Respondents were in agreement that the nurse gave them comprehensive education and advice regarding the imaging process.
- A minority of respondents would like to have received more information about their radiographic examination and the imaging process.
- The vast majority of patients surveyed were in agreement that receiving a request for a radiographic examination from a nurse had reduced their waiting time.
- There was variability in the extent to which respondents reported being asked for information on family history prior to be prescribed ionising radiation; however, the majority of patients reported that they were asked information on their previous and current medical history, current medications and known allergies.
- The majority of respondents reported that the nurse had asked them for information on the last time they had a radiographic examination; however, approximately a third stated that they had not been requested to provide this information.
- There were high levels of agreement amongst respondents that in their interaction with a nurse prescriber of medical ionising radiation they were dealt with in a highly professional manner.
- There were relatively high levels of satisfaction with the time patients spent with the nurse who prescribed their ionising radiation. However, overall levels of satisfaction within this domain were lower than other constructs, especially in the responses from patients who reported poorer levels of health.
- Overall levels of satisfaction with the consultation process were high with the vast majority of respondents agreeing or strongly agreeing that they were satisfied with the consultation process.

Chapter VII

Evaluation of Stakeholders' Perceptions of Nurse Prescribing of Ionising Radiation

7.1 Introduction

This section of the report outlines the evaluation of the nurse prescribing of ionising radiation initiative from the perspective of key stakeholders. Stakeholders were identified as all those who had contact with, or would have good knowledge of, nurse prescribing of ionising radiation and included those working in clinical practice, education, policy and regulation. Key stakeholders were surveyed on their attitudes towards the introduction of nurse prescribing of medical ionising radiation, the impact of the initiative on patient care, the perceived safety of the initiative, the need for nurse prescribing of medical ionising radiation and their level of knowledge of the initiative. In addition, those key stakeholders whose work brought them into day-to-day contact with nurse prescribers of ionising radiation were further surveyed on their perceptions of the impact the initiative had on patient care and how the initiative impacted on their workload. The first part of this chapter reports on the demographic profile of the stakeholders, this is followed by a presentation of results from the survey of attitudes towards the introduction of nurse prescribing of ionising radiation. Finally, the results from the survey of stakeholders who have close clinical contact with prescribers of ionising radiation and those who are members of healthcare providers Local Implementation Groups are reported.

7.2 Demographic Profile of Stakeholders

Approximately 300 stakeholders were surveyed, 199 responded resulting in a response rate of 66.3%. Figure 7.1 outlines the demographic profile of respondents. Approximately half of the sample were radiographers with approximately twenty-seven per cent identifying their profession as nursing; fifteen per cent of the sample were medical practitioners and approximately 1 in 10 respondents were either academics or were involved in policy or regulation (Nursing and Midwifery Board of Ireland, Health Service Executive, Department of Health).

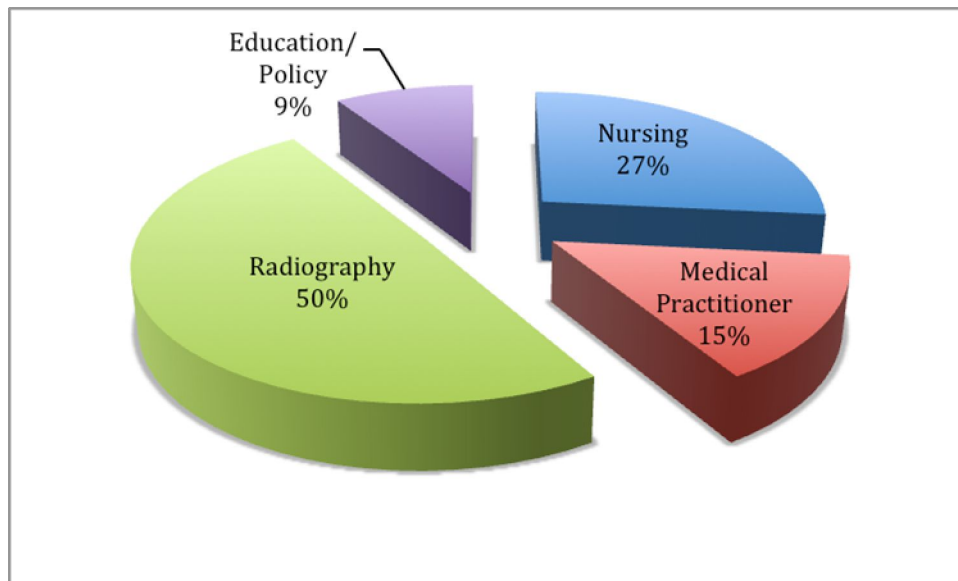


Figure 7.1 Demographic Profile of Stakeholders Surveyed

The majority of stakeholders (56.6%) reported that they were involved or very involved with nurse prescribing of medical ionising radiation initiative with 43.4% reporting little or no involvement. Approximately forty per cent of respondents were members of their organisation's Local Implementation Group.

7.3 Stakeholders' Attitudes towards Nurse Prescribing of Ionising Radiation

This section of the evaluation reports on the survey of attitudes towards the introduction of the prescribing initiative from the perspective of key stakeholders. For the purpose of the evaluation stakeholders were divided into four groups: 1) nursing; 2) radiographers 3) medical practitioners and, 4) respondents involved in the area of policy, regulation and education.

7.3.1 Stakeholders' Attitudes towards the Impact of the Initiative on Patient Care

Overall, the vast majority of stakeholders surveyed were of the opinion that extension of prescribing medical ionising radiation to nurses provided a good service for patients, had a positive impact on patient care and met the needs of patients (see Table 7.1).

Although the vast majority of professional groups surveyed (nursing, medical, radiography and academic/policy/regulation) were positive regarding the impact nurse prescribing of ionising radiation had on patient care, there was variation in the reported levels of agreement by professional group. Table 7.1 outlines the differences in attitudes between the four cohorts. The highest levels of agreement was amongst nurses surveyed

with the majority of medical practitioners, radiographers and those working in education, policy and regulation also in agreement that the initiative impacted positively on patient care; approximately eight per cent of medical practitioners and twenty per cent of radiographer respondents disagreed that nurse prescribing of medical ionising radiation provided a good service for patients. A similar proportion of medical practitioners (8.0%) with twenty-nine per cent of radiographers also disagreed that the initiative had a positive impact on patient care. In addition, although the vast majority of respondents were in agreement that nurse prescribing of medical ionising radiation met the needs of patients, approximately sixteen per cent of medical practitioners and twenty-seven per cent of radiographers disagreed. Respondents working in the areas of education, regulation or policy reported overall positive views of the initiative.

Table 7.1 Stakeholders' Attitudes Towards the Impact of the Nurse Prescribing of Ionising Radiation on Patient Care

<i>Item</i>	<i>Percentage Agreement Overall</i>	<i>Percentage Agreement Nurses</i>	<i>Percentage Agreement Medical Practitioners</i>	<i>Percentage Agreement Radiographers</i>	<i>Percentage Agreement Academic/Regulation/Policy</i>
Nurse prescribing of medical ionising radiation provides a good service for patients	77.8%	100.0%	72.0%	67.8%	82.3%
Nurse prescribing of medical ionising radiation has a positive impact on patient care	70.6%	95.8%	80.0%	56.7%	68.8%
Nurse prescribing of medical ionising radiation meets the needs of the patients	67.4%	97.9%	68.0%	50.1%	85.8%

7.3.2 Stakeholders' Attitudes towards the Safety of Nurse Prescribing of Ionising Radiation

This section reports on key stakeholders' attitudes towards the perceived safety of nurse prescribing of ionising radiation in relation to patient care. The majority of respondents were of the opinion that nurse prescribing of medical ionising radiation was safe with approximately two thirds in agreement that nurses would prescribe ionising radiation correctly. The vast majority of respondents were also in agreement that nurses had the knowledge to correctly prescribe ionising radiation and had received adequate training for their role. Furthermore, two thirds of the respondents disagreed with the statement: 'nurse prescribing of ionising radiation would increase the risk of incorrect treatment received by patients'.

Table 7.2 Stakeholders' Attitudes Towards the Safety of Nurse Prescribing of Ionising Radiation¹

<i>Item</i>	<i>Percentage Disagreement</i>	<i>Percentage Agreement</i>
Nurse prescribing of medical ionising radiation increases the risk of incorrect treatment	66.0%	22.5%
I trust nurses to prescribe medical ionising radiation correctly	24.3%	64.6%
I am worried that nurses do not have the necessary knowledge to prescribe medical ionising radiation	61.6%	32.1%
Nurses receive adequate training for their role	22.1%	55.3%

¹No opinion responses are omitted

When results related to safety of the initiative were examined according to professional discipline, the vast majority of respondents within each discipline were in agreement that they trusted nurses to correctly prescribe ionising radiation and that they had the necessary knowledge and training for the role; in addition, the majority of respondents disagreed that nurse prescribing of medical ionising radiation increased the risk of incorrect treatment. It should be noted that there was variability in responses according to the professional group surveyed. In relation to the statement 'I trust nurses to prescribe medical ionising radiation correctly', all nurses surveyed, eighty-eight per cent of those respondents from the areas of education/regulation/policy and seventy-two per cent of medical practitioners were in agreement. In comparison, while the majority of radiographer respondents (42%) were in agreement that they trusted nurses to prescribe

ionising radiation correctly, thirty-seven per cent disagreed. It should be noted that approximately a fifth of radiographers expressed no opinion (see Figure 7.2).

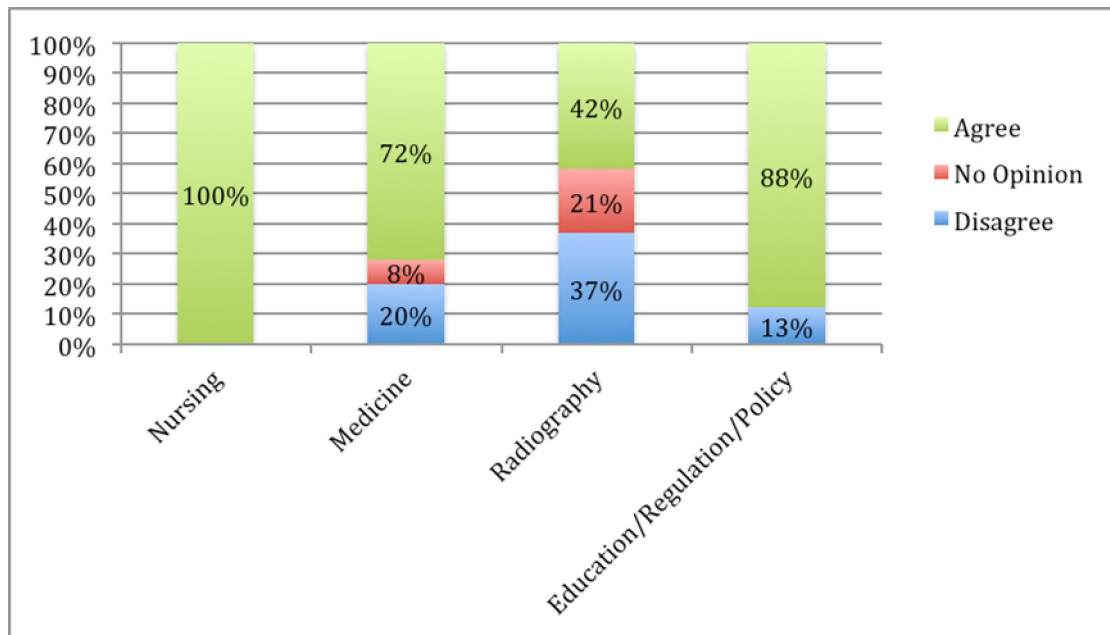


Figure 7.2 Attitudes to the statement: 'I trust nurses to prescribe medical ionising radiation correctly' by professional group.

The vast majority of respondents from the nursing and medical professions and those from education/regulation and policy disagreed with the statement: 'I am worried that nurses do not have the necessary knowledge to prescribe ionising radiation'. However, there was variability in responses from radiographers with the majority (50%) in agreement compared to forty-two per cent disagreeing with the statement. It should be noted that a fifth of medical practitioners were also in agreement with the statement: 'I am worried that nurses do not have the necessary knowledge to prescribe ionising radiation' (see Figure 7.3).

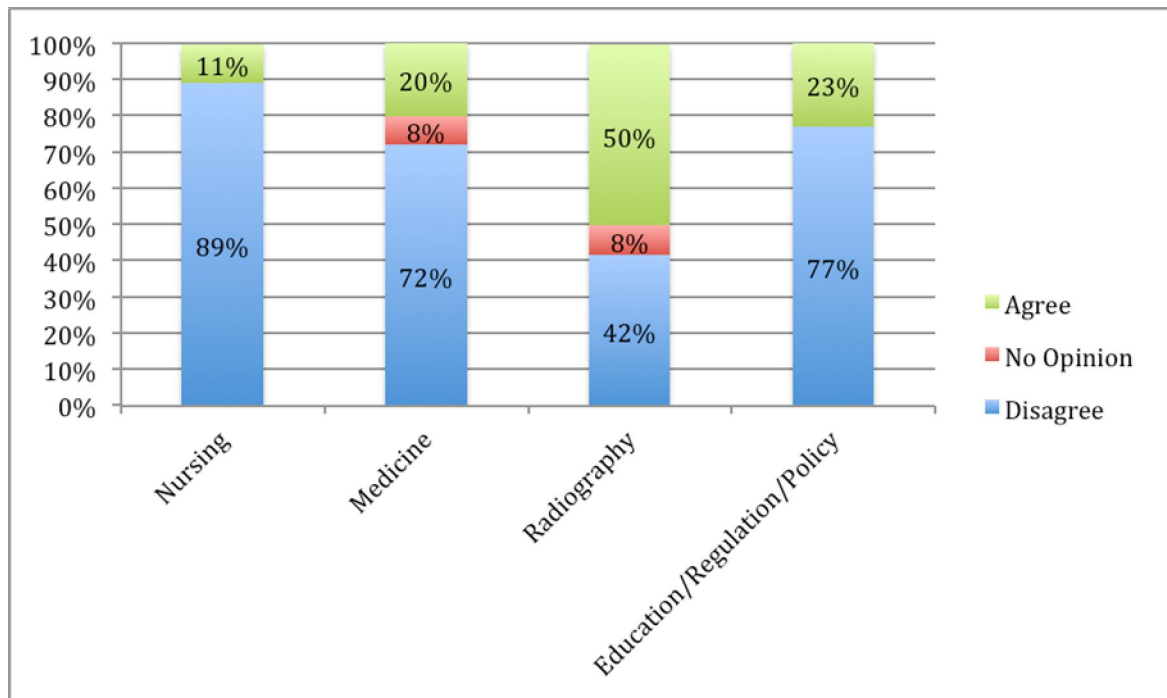


Figure 7.3 Attitudes towards Statement: 'I am Worried that Nurses do not have the Necessary Knowledge to Prescribe Medical Ionising Radiation' by Professional Group.

7.3.3 Stakeholders' Attitudes to the Overall Merit of Nurse Prescribing of Ionising Radiation

This section of the evaluation reports on stakeholders' overall perceptions of the merit of nurse prescribing of ionising radiation initiative. The survey explored key stakeholders' attitudes towards the need for nurses to prescribe ionising radiation, stakeholders' knowledge of the initiative, stakeholders' perceptions of the impact on the health service in terms of cost and, attitudes towards the overall success of the implementation of the initiative (see Table 7.3).

The vast majority of clinical stakeholders were positive about the initiative and were in agreement that nurses had a role in the prescribing process and that there was a need to extend the requesting of radiographic examinations beyond the remit of the medical profession. The majority of respondents were also of the opinion that nurse prescribing of ionising radiation would save time for doctors and that it was a necessary service for the quality provision of healthcare. There was also a level of support for increasing the numbers of prescribers with approximately fifty-five per cent of respondents in agreement that the numbers should be increased. The vast majority of respondents were also in agreement that nurse prescribing of medical ionising radiation would not lead to increased healthcare costs.

When responses were examined by professional group, there was variability amongst stakeholders in relation to the levels of support for the initiative overall. Generally, the majority of respondents from each of the professions disagreed that only doctors should undertake the prescribing of ionising radiation. Of those that did agree to the statement, the lowest levels of agreement were expressed by nurses (4.2%) and those from the areas of education/regulation/policy (5.9%). In comparison, twelve per cent of the medical profession and twenty-eight per cent of radiographers were in agreement that doctors should only undertake the prescribing of ionising radiation. However, the majority of respondents from each of the professions surveyed agreed with the statement: 'nurses should be allowed to prescribe ionising radiation' with over eighty per cent of nurse, medical practitioner and education/regulation/policy respondents in agreement compared to approximately fifty-five per cent of radiographers surveyed. It should be noted that although the majority (57.3%) of respondents from radiography reported that they supported nurse prescribing of ionising radiation, levels of support were lower in comparison to other professions. In addition, while the majority of nursing, medical and education/regulation/policy respondents were in agreement that there was a need for more nurse prescribers of medical ionising radiation, the majority of radiographer respondents (56.2%) disagreed.

There was general consensus amongst respondents from each of the professional groups surveyed that the prescribing of ionising radiation by nurses will advance the nursing profession and would not lead to extra healthcare costs; however, as in previous responses, there was variability in attitudes according to the respondent's professional group.

Table 7.3 Stakeholders' Attitudes Towards Prescribing Initiative

<i>Item</i>	<i>Percentage Agreement Overall</i>	<i>Percentage Agreement Nurses</i>	<i>Percentage Agreement Medical Practitioners</i>	<i>Percentage Agreement Radiographers</i>	<i>Percentage Agreement Academic/Regulation/Policy</i>
Prescribing of ionising radiation should only be undertaken by doctors	17.7%	4.1%	12.0%	28.1%	5.9%
Nurse prescribing of ionising radiation saves time for doctors	78.1%	83.0%	76.0%	76.6%	76.5%
Nurse prescribing of ionising radiation is unnecessary, patients can have their X-Ray requested by a doctor	21.6%	4.5%	16.0%	33.3%	12.5%
Nurses should be allowed to prescribe medical ionising radiation	71.3%	93.7%	80.0%	55.4%	88.2%
I support nurse prescribing of medical ionising radiation	72.7%	93.7%	84.0%	57.3%	82.4%
I fully understand nurses' roles as prescribers of medical ionising radiation	79.2%	97.6%	92.0%	64.4%	87.3%
There is a need for more nurse prescribers of medical ionising radiation	54.5%	89.6%	68.0%	26.9%	75.0%
The prescribing of medical ionising radiation by nurses will advance the nursing profession	83.1%	91.7%	80.0%	81.1%	87.5%
Nurse prescribing of ionising radiation leads to extra healthcare costs	14.6%	0.0%	12.0%	21.1%	11.8%

The variability in responses according to the profession surveyed is outlined in Figure 7.4 in relation to the statement: 'overall the introduction of nurse prescribing of medical ionising radiation has been a success'. Overall, the majority of respondents in each of the professions surveyed were in agreement that the introduction of the initiative had been a

success. Levels of agreement were highest in the nursing and medical professions followed by respondents in education/policy and regulation. Lower levels of agreement were evident in respondents from radiography.

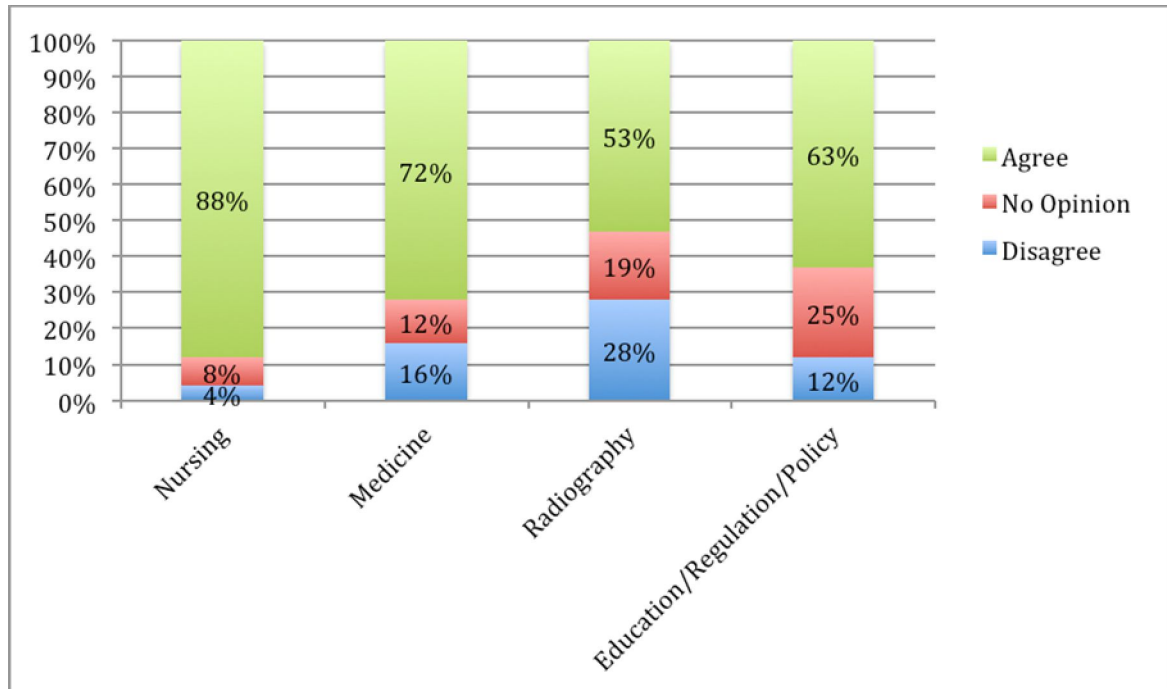


Figure 7.4 Key Stakeholders Response to the Statement: 'Overall the Introduction of the Nurse Prescribing of Medical Ionising Radiation has been a Success'

A number of key stakeholders provided open-ended comments on the survey on the need or otherwise for nurses to prescribe ionising radiation. Of those who were in favour, there was a general consensus that the role should be implemented and rolled out to other clinical sites following the identification of a need for the role at clinical level:

Nurse prescribing of ionising radiation is overall a positive development in my opinion. It is important not to lose sight that a service need is an essential element to this role development (Medical Practitioner 067).

The initiative needs be extended to all acute hospitals, particularly the emergency departments, to facilitate the timely and efficient assessment and management of patients, minimise undue delay, and ensure efficient and effective use of medical resources (Academic 001).

A number of clinical stakeholders who worked closely with nurse prescribers of ionising radiation also reported on the benefits the implementation of the initiative had on patient care:

The nurse prescribing initiative should be widely implemented and supported as it is extremely beneficial to the service in terms of patient outcomes (treatment/satisfaction) and workflow within the service (Radiographer 060).

There are a number of nurse prescribers [of ionising radiation] in my hospital. They are well trained and write a better, more informative requests than many of the doctors (Radiographer 015).

A number of radiographer respondents also highlighted the quality of radiographic requests produced by nurse prescribers of ionising radiation:

The clinical details supplied by nurse prescribers are much better than those supplied by doctors, and nurses are more specific about areas requiring X-Rays. [The] quality of requests is better...(Radiographer 045).

However, a number of respondents questioned the need for nurses to prescribe ionising radiation or for the initiative to be expanded to other clinical sites. This perception was due to a number of reasons, not least the fear that it may lead to the overprescribing of ionising radiation and the extent to which nurses had the requisite skills and knowledge to take on this expanded role:

I disagree with the introduction of nurses prescribing ionising radiation. I cannot understand why the College of Radiologists and Radiographer's professional body approved this initiative. In my experience patients express frustration and disquiet when not examined by a doctor. Currently there are a few nurses requesting examinations, how will the service cope when or if that number increases? There should be a policy to reduce the need for ionising radiation rather than increasing the number of prescribers (Radiographer 050).

Other comments that questioned the benefits of the introduction of the initiative referred to increased 'workloads' for doctors and radiographers, as well as querying the level of training received by nurses who prescribe ionising radiation:

I feel that nurse prescribers add to everyone's workload. My experience is that they are not sufficiently well trained and supported, and although the patient may perceive that they are getting a better service, in fact they are not. The patients are subjected to increased radiation exposure and they still end up waiting for review of their radiographs by doctors. The patient also needs to be examined by a doctor so I feel there is very little use for this service (Radiographer 112).

7.4 Perceptions of Clinical Stakeholders with a Nurse Prescriber of Ionising Radiation in their Organisation

This section of the evaluation reports on the survey of attitudes towards the introduction of the nurse prescribing of medical ionising radiation from the perspective of key stakeholders who have a nurse prescriber employed within their organisation (n = 161). For the purpose of this report these respondents are referred to as clinical stakeholders. The aim of this section of the evaluation was to measure the outcomes of the initiative from the perspective of those who worked directly with nurse prescribers of ionising

radiation. This section reports on a number of areas including respondents' perceptions of the impact of nurse prescribing of medical ionising radiation on patient care, the impact of the initiative on the workload of nurses, doctors and radiographers, and the level of communication between prescribers and other members of the healthcare team. The sample was split between the nursing profession (30.2%), the medical profession (15.8%) and radiography professions (54.0%) for comparative purposes.

7.4.1 Impact on Patient Care

Clinical stakeholders were in agreement that the introduction of nurse prescribing of medical ionising radiation had directly benefitted patient care (see Table 7.4). The majority of respondents were in agreement that the introduction of the initiative had reduced delays in initiating the treatment of patients and that it had reduced the number of healthcare professionals a patient must interact with; it should be noted, however, that approximately a third of clinical stakeholders disagreed that the latter had occurred.

The highest levels of agreement among clinical stakeholders were in relation to the extent to which nurse prescribing of ionising radiation was perceived as being more convenient for patients (76% agreement) and that it enabled patients access treatment quicker (76% agreement). A small majority (42%) of clinical stakeholders were also in agreement that the introduction of the initiative had had a positive effect on patient satisfaction with the care they received.

Table 7.4 Clinical Stakeholders' Perceptions of the Impact of Nurse Prescribing of Medical ionising Radiation on Patient Care¹

<i>Item</i>	<i>Percentage Disagreement %</i>	<i>Percentage Agreement %</i>
The introduction of the nurse prescribing of medical ionising radiation has reduced delays in initiating patient treatment	23.0	60.3
The introduction of the nurse prescribing of ionising radiation has reduced the number of healthcare professionals a patient must interact with	34.8	52.1
The introduction of the nurse prescribing of ionising radiation is more convenient for patients	13.7	75.7
The introduction of the nurse prescribing of ionising radiation has enabled patients to access treatment quicker	15.0	75.7
The introduction of the nurse prescribing of	10.6	42.2

ionising radiation has increased patient satisfaction levels

¹No opinion responses are omitted

In relation to clinical stakeholders' responses to the item 'the introduction of the nurse prescribing of medical ionising radiation has reduced delays in initiating patient treatment' approximately seventy-three per cent of nurses agreed or strongly agreed whereas approximately forty-three per cent of medical practitioners and forty-seven per cent of radiographer respondents were in agreement. Thirty-five per cent of medical practitioners and thirty-seven per cent of radiographers disagreed that the introduction of the initiative had reduced delays in initiating the treatment of patients (see Figure 7.5).

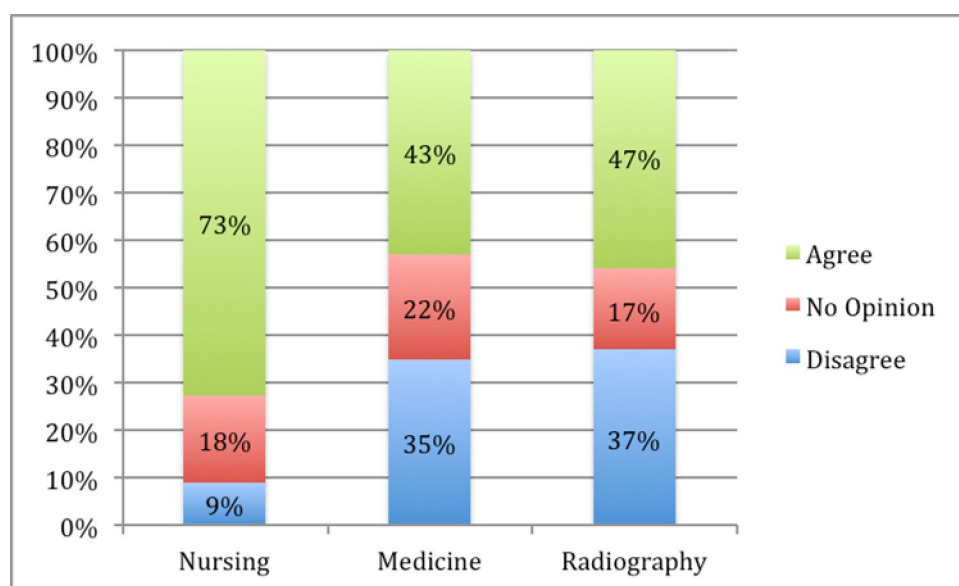


Figure 7.5 Clinical Stakeholders' Attitudes Towards the Statement: 'The Introduction of the Nurse Prescribing of Medical Ionising Radiation has Reduced Delays in Initiating the Treatment of Patients' by Professional Group

There were high levels of agreement between the three groups of key clinical stakeholders that nurse prescribing was more convenient for patients (93.5% of nurses, 65.2% of medical practitioners and 68.4% of radiographers) (see Figure 7.6) and that the initiative has enabled patients to access treatment quicker (93.2% of nurses, 69.6% of medical practitioners and 67.1% of radiographers) (see Figure 7.7).

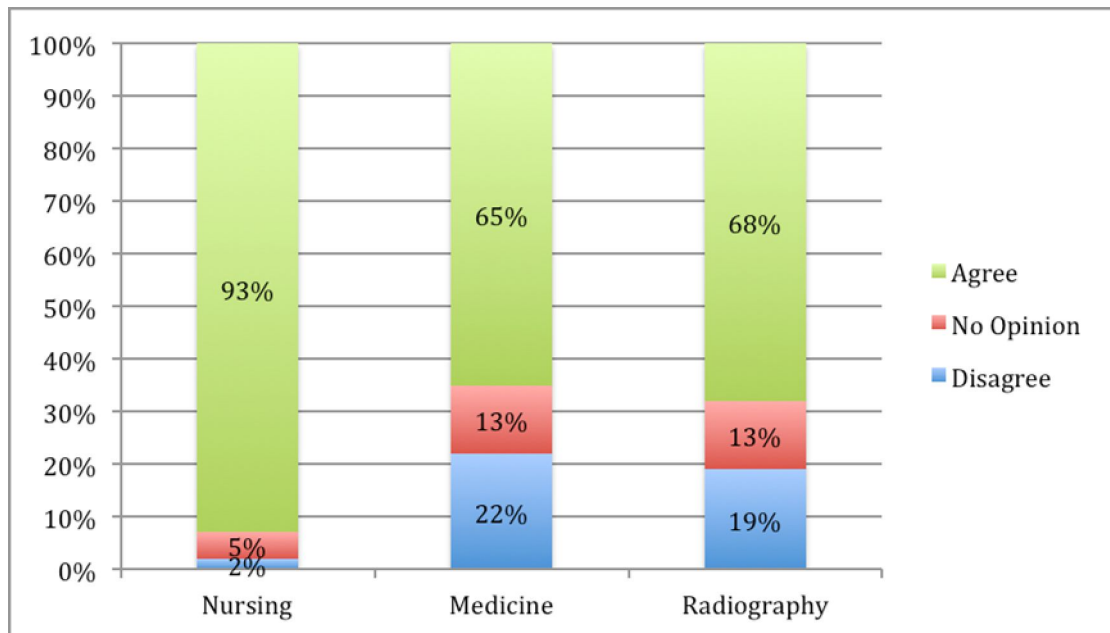


Figure 7.6 Clinical Stakeholders' Attitudes Towards the Statement: 'The introduction of the nurse prescribing of ionising radiation is more convenient for patients' by Professional Group.

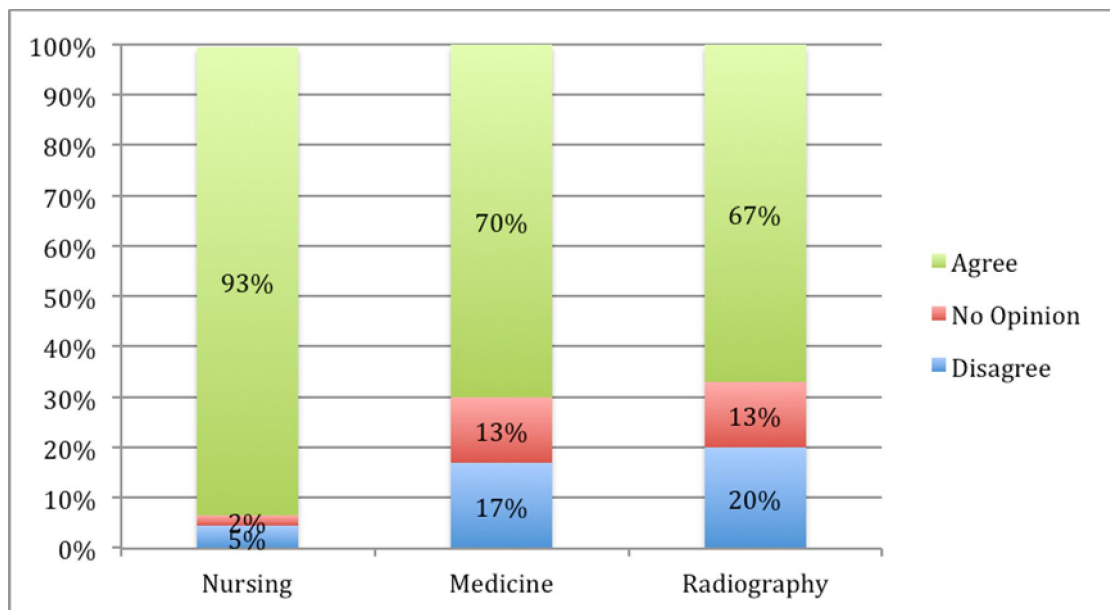


Figure 7.7 Clinical Stakeholders' Attitudes Towards the Statement: 'The introduction of nurse prescribing of ionising radiation has enabled patients to access treatment quicker' by Professional Group

7.4.2 The Impact of the Prescribing Initiative on the Workload of Nurses and Doctors

Clinical stakeholders responded to a number of statements that measured attitudes towards the impact the prescribing initiative on the workload of nurse prescribers of ionising radiation and the health professionals with whom they worked. The results are outlined in Table 7.5. The majority of clinical stakeholders disagreed that prescribing took up too much of nurses' time, with two thirds of respondents identifying that it had freed up doctors' time. Attitudes towards the extent that the initiative had freed up doctors'

time were relatively equal among doctors and nurses; 68.2% of nurses and 73.9% of medical practitioners agreed or strongly agreed that nurse prescribing of ionising radiation had freed up doctors' time.

The majority of medical practitioners (56.5%) and nurses (69.8%) surveyed did not perceive that supervising a nurse prescriber of medical ionising radiation was an added burden to their workload; however, approximately a quarter of medical respondents reported that supervision was an extra burden. Responses from radiographers were variable; approximately thirty per cent of radiographers disagreed with thirty per cent agreeing that supervising a nurse prescriber of ionising radiation was a burden to their workload.

Table 7.5 Clinical Stakeholders' Perceptions of the Impact of the Nurse Prescribing of Medical Ionising Radiation on Nurses' and Doctors' Workloads¹

<i>Item</i>	<i>Percentage Disagreement %</i>	<i>Percentage Agreement %</i>
Nurse prescribing of medical ionising radiation takes up too much of the nurse prescriber's time	55.6	9.7
The introduction of the nurse prescribing of medical ionising radiation initiative has freed up doctors' time	12.4	66.5
Supervising a nurse prescriber of medical ionising radiation is a burden to my workload	43.6	23.0

¹No opinion responses are omitted

Stakeholders who worked closely with nurse prescribers of ionising radiation made a number of comments on the impact of the initiative of the workload of prescribers. One common theme in the comments was the workload associated with the *National Nurse Prescribing Ionising Radiation (X-Ray) Minimum Dataset*. This system was viewed by a number of respondents as being 'laborious' and resulted in prescribers having to make 'multiple data entries across varying data systems'. An academic working closely with the initiative suggested a solution to the perceived excessive workload in entering data on the system:

Perhaps the NIMIS, when implemented nationwide, could eliminate the need for the *National Nurse Prescribing Ionising Radiation (X-Ray) Minimum Dataset* (Academic 001).

The workload involved in implementing the initiative in clinical sites was also commented upon. There was some uncertainty amongst a number of respondents as to the overall benefit the investment required would have on patient care and that maybe there was a need to explore other models of requesting radiographic examinations. One comment from a director of nursing summed up the challenges they had in preparing to implement the role in practice:

The current education programme and time commitment is excessive. Significant investment is required to facilitate nursing staff to attend training and the requirement to back-fill within the clinical setting involves additional funding that simply is not available. 'Requesting' ionising radiation procedures (rather than 'prescribing') that is governed by hospital protocol, is an alternative option worth considering (Director of Nursing 005).

7.4.3 Clinical Stakeholders' Perceptions of Communication, Support and Collaboration

Overall, the majority (56.9%) of clinical stakeholders surveyed were in agreement that the introduction of nurse prescribing of ionising radiation had had a positive effect on inter-professional relationships; approximately a quarter of respondents (22.8%) overall were in disagreement. Nurses were more likely to be in agreement (86.3%) when compared to their medical (45.8%) and radiographer colleagues (45.6%); however, it should be noted that a substantial proportion of medical practitioners reported that they had no opinion (41.7%) to the statement whereas a third of radiographers disagreed that the initiative has had a positive impact in inter-professional relationships (Figure 7.8).

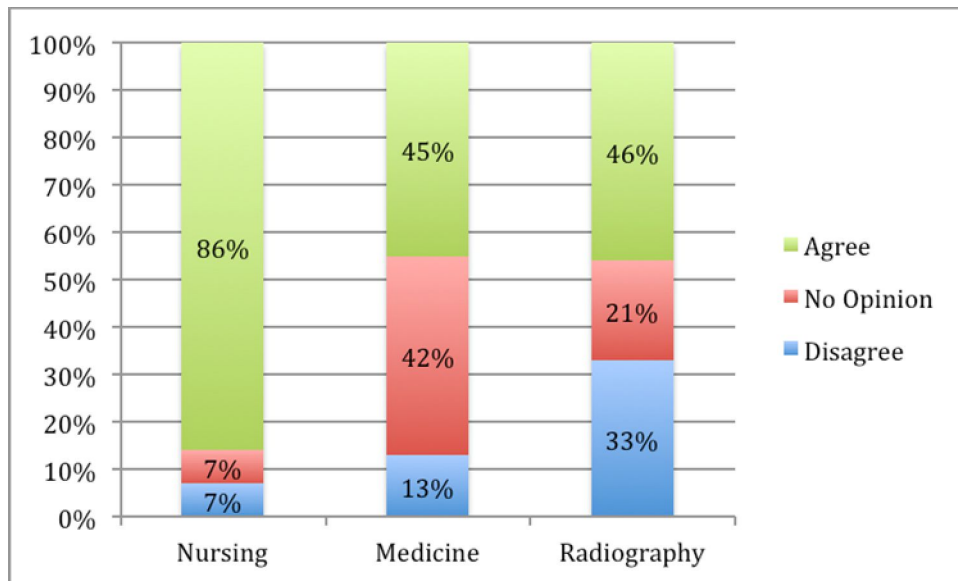


Figure 7.8 Clinical Stakeholders' Attitudes Towards the Statement: 'The introduction of the nurse prescribing of medical ionising radiation has had a positive impact on inter-professional relationships' by Professional Group.

A further statement explored the extent to which key stakeholders perceived that medical practitioners and radiographers supported nurse prescribers of medical ionising radiation in their role. Overall, approximately fifty-three per cent of clinical stakeholders identified that doctors were supportive of nurse prescribers of ionising radiation in their role with approximately sixteen per cent in disagreement. The vast majority of nurses surveyed (89%) were in agreement that nurse prescribers of ionising radiation were supported in their role by their medical colleagues compared to fifty-four per cent of medical practitioners and thirty-five per cent of radiographers. It should be noted that a significant proportion (29%) of medical practitioners and radiographers (46%) had no opinion (see Figure 7.9).

The support of medical practitioners for the initiative was highlighted in comments received from stakeholders who responded to the survey. An academic highly involved in the roll out of nurse prescribing of ionising radiation commented on the positive support for prescribers provided by medical colleagues:

Medical consultants who have taken on the clinical supervisor role to date are most supportive of the nurses undertaking the programme of education [for nurse prescribing of ionising radiation] and many go over and above what's required in terms of their inputs. Registrars are also to be commended for their support of the nurses and the provision of additional education sessions on site (Academic 001).

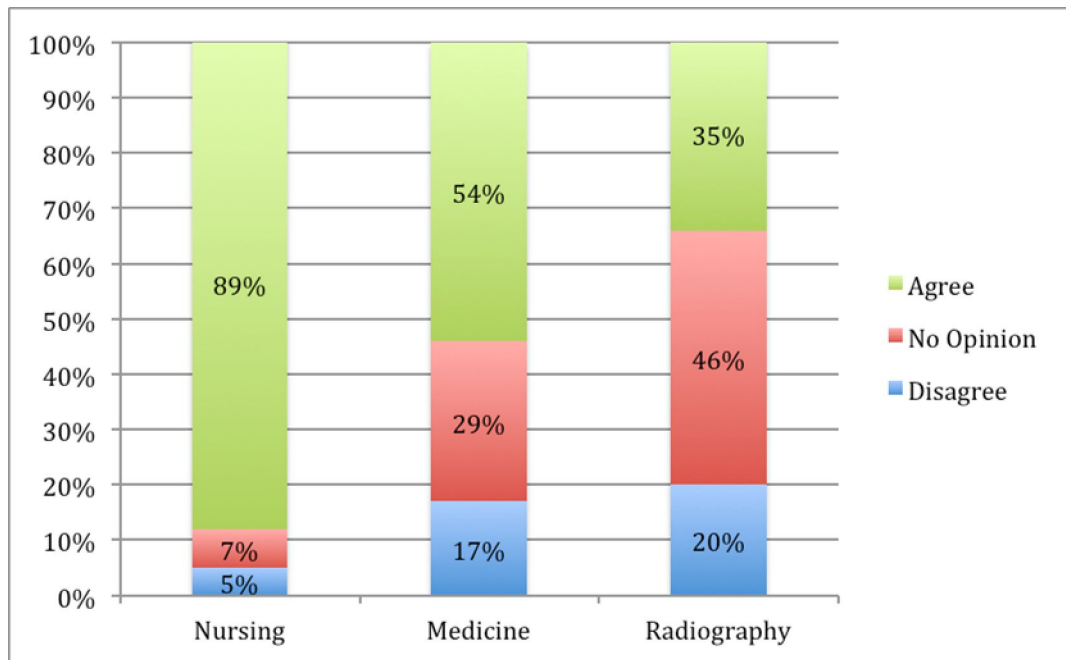


Figure 7.9 Clinical Stakeholders' Attitudes Towards the Statement: 'Nurses are supported in their role as prescribers of medical ionising radiation by doctors' by Professional Group.

Overall, the majority of respondents (62.6%) reported that radiographers supported nurse prescribers of ionising radiation in their role with approximately a quarter in disagreement. Approximately three quarters of nurses reported that nurse prescribers of ionising radiation received support from radiographers with fourteen per cent disagreeing that this occurred. Overall the majority of medical practitioners (50%) were in agreement that nurses were supported in their prescribing role by radiographers with seventeen per cent disagreeing. It should be noted however, that approximately a third of medical practitioners expressed no opinion (see Figure 7.10).

Where respondents reported that the introduction of nurse prescribing of ionising radiation had been 'successfully' introduced into the clinical area, high levels of effective communication and multidisciplinary collaboration were identified as the key factors:

In our site the prescribing was implemented successfully because of the collaboration of the Local Implementation Group and the excellent communication between radiology and the nursing representatives. The only drawback from radiology is the time to train the prescribers is not resourced. It certainly has been a positive experience from radiology on this site (Radiographer 044).

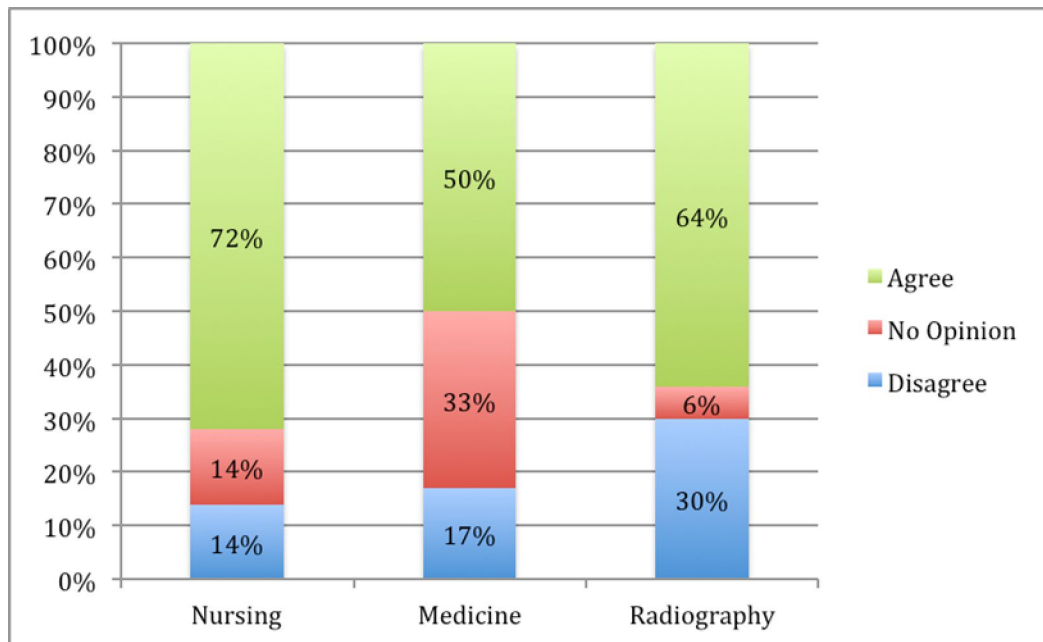


Figure 7.10 Clinical Stakeholders' Attitudes Towards the Statement: 'Nurses are supported in their role as prescribers of medical ionising radiation by radiographers' by Professional Group.

7.5 Perceptions of Key Stakeholders who are members of their Organisation's Local Implementation Group

Further analysis was undertaken to explore the association between stakeholders' attitudes towards nurse prescribing of ionising radiation and whether or not respondents were members of their healthcare providers' Local Implementation Group (LIG). A number of key outcome variables that relate to the perceptions that the impact the initiative has had on patient care are reported in this section of the evaluation. The aim of this section was to identify if those working closely with the initiative through the LIG held different perceptions and attitudes than those who were not involved in the monitoring or the governance of nurse prescribing of medical ionising radiation at clinical level. Forty-one per cent of respondents who replied to the survey overall were members of their healthcare providers' Local Implementation Group. Figure 7.11 outlines the members of the LIG who responded to the survey by professional group.

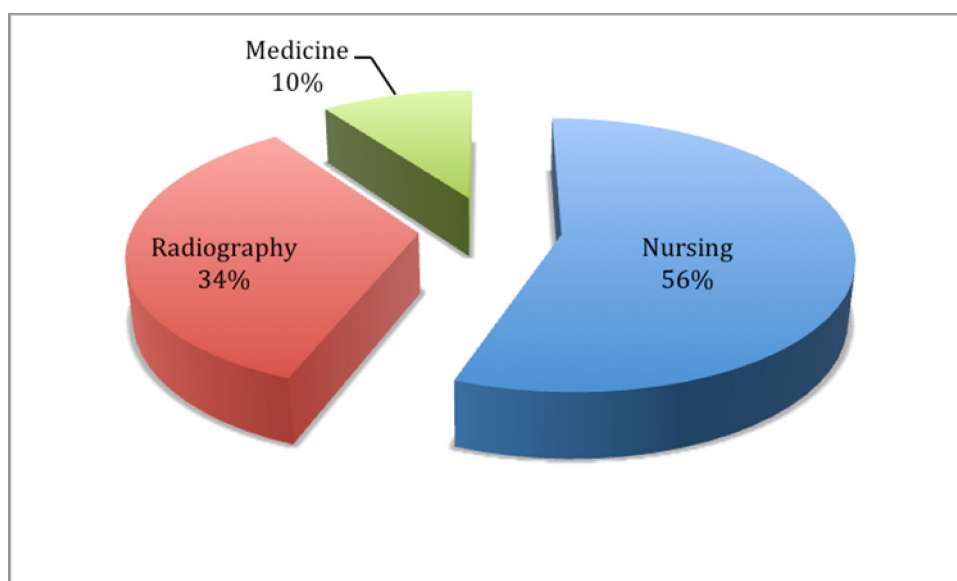


Figure 7.11 Members of the Local Implementation Group who Responded by Profession

Table 7.6 outlines the attitudes of members of healthcare providers' Local Implementation groups and non-members' attitudes towards the impact of nurse prescribing of ionising radiation on patient care. The majority of both cohorts agreed that the initiative impacted positively on the services available to patients; however, levels of positivity were higher amongst respondents from Local Implementation Groups than other stakeholder respondents. This was especially seen in the responses to the items; 'nurse prescribing of ionising radiation has a positive impact on patient care' and 'the introduction of nurse prescribing of ionising radiation has enabled patients to access treatment quicker'.

Table 7.6 Comparison of Members of Local Implementation Group and other Stakeholders' Attitudes towards the Impact of Nurse Prescribing Ionising Radiation on Patient Care¹

<i>Item</i>	<i>Percentage Disagreement Members of LIG</i>	<i>Percentage Agreement Members of LIG</i>	<i>Percentage Disagreement Non-Members of LIG</i>	<i>Percentage Agreement Non-Members of LIG</i>
Nurse prescribing of ionising radiation provides a good service for patients	7.7%	82.1%	16.2%	74.7%
Nurse prescribing of ionising radiation has a positive impact on patient care	12.8%	76.9%	18.5%	66.7%
The introduction of nurse prescribing of ionising radiation has enabled patients to access treatment quicker	10.4%	86.0%	18.5%	68.5%

¹No opinion responses are omitted

Responses to the statement 'overall the introduction of nurse prescribing of ionising radiation has been a success' are outlined in Figure 7.12; although both cohorts (members of LIG and non-members of LIG) agreed that the introduction of nurse prescribing of ionising radiation was a success, members of the LIG were more likely to agree (73%) compared to respondents who were not members of their healthcare provider's LIG (59%).

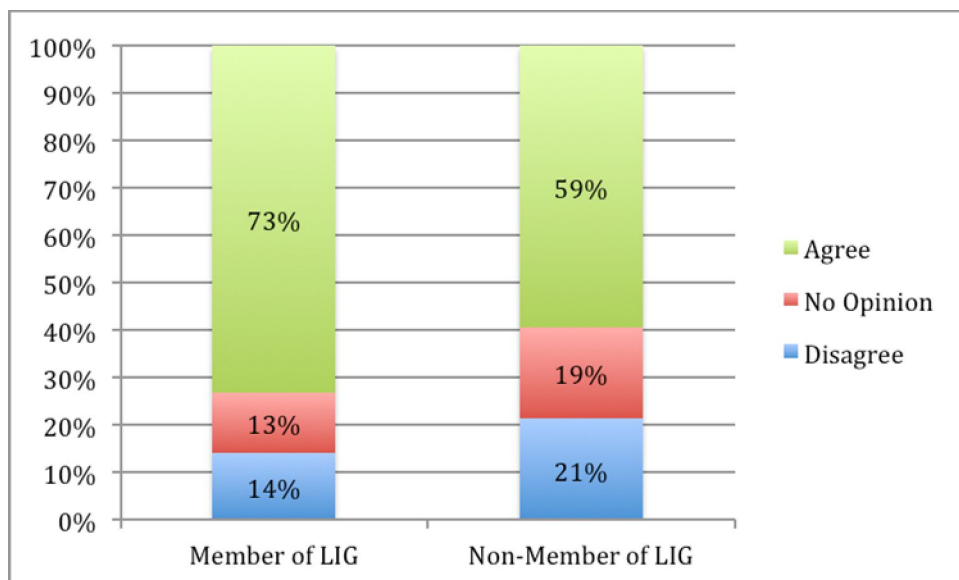


Figure 7.12 Members and Non-Members of Local Implementation Groups' Attitude to the Statement: 'Overall the Introduction of Nurse-Prescribing of Ionising Radiation has been a Success'.

7.6 Conclusion

Respondents to the clinical stakeholders' survey came from a wide variety of health professionals associated with, or expressing an interest in, nurse prescribing of ionising radiation. There were, generally, good levels of support for the initiative with the majority of respondents identifying that it had a positive impact on patient care and met the needs of patients; however, there was variability in levels of support according to the professional group surveyed. There was also overall support for the safety of the initiative with the majority of healthcare professionals and key stakeholders surveyed identifying that nurses had the knowledge to correctly prescribe ionising radiation and that they had received adequate training for their role. The vast majority of clinical stakeholders surveyed were also of the view that the prescribing of ionising radiation should be extended beyond the remit of the medical profession, that there was a need for more nurses to prescribe ionising radiation and that overall, the introduction of the initiative had been a success.

Although groups of healthcare professionals surveyed were overall supportive of the initiative, there were areas in which there was variation in the responses of the nursing, medical and radiography stakeholders. Nurses tended to hold stronger positive attitudes and little or no negative perceptions of nurse prescribing of ionising radiation when compared to their medical or radiography colleagues. There were differences of opinion between the cohorts in relation to the extent to which nurses had the knowledge to prescribe ionising radiation, the extent to which it met the needs of patients, and whether the prescribing of ionising radiation should only be undertaken by doctors. Medical practitioners, overall, were supportive of the initiative with the vast majority surveyed in favour of nurses prescribing ionising radiation as well as perceiving that nurses had the necessary knowledge to safely prescribe ionising radiation. In addition, the vast majority of medical practitioners reported that, overall, the introduction of the initiative had been a success. The level of support and attitudes towards nurse prescribing of ionising radiation were variable amongst respondents from radiography. Although the majority of radiographers surveyed were in agreement that the initiative had a positive impact on patient care and met the needs of patients, levels of agreement were significantly lower than other cohorts of healthcare professionals. In responses to statements related to the safety of nurse prescribing of ionising radiation, whereas the vast majority of nurse, medical practitioner and education/registration/policy respondents were in agreement that they trusted nurses to prescribe safely, a significant proportion of radiography respondents disagreed.

Respondents who worked closely with a nurse prescriber were specifically asked a number of questions pertaining to nurse prescribing of ionising radiation in clinical practice. Overall, clinical stakeholders reported that the introduction of nurse prescribing of ionising radiation had reduced delays in initiating the care of patients and that it enabled patients to access treatment quicker. However, it should be noted that while the majority of medical and radiographer respondents agreed that nurse prescribing of ionising radiation had reduced delays in initiating treatment for patients, approximately a third disagreed that this had occurred.

Clinical stakeholders were also of the opinion that nurse prescribing of ionising radiation impacted positively on patient satisfaction. There was also a consensus amongst clinical stakeholders that the extension of prescribing ionising radiation had freed up doctor's time and, in addition, the initiative did not impact negatively on nurse prescribers' time. Although the majority of medical practitioners perceived that supervising a nurse

prescriber of ionising radiation was not, overall, a burden on their workload, a quarter reported that supervision had added to their workload.

Overall, working relationships with prescribers of ionising radiation were perceived to be good by clinical stakeholders. The majority of respondents reported that medical practitioners and radiographers supported nurse prescribers of ionising radiation in their role. Nurses in particular reported that nurse prescribers of ionising radiation received high levels of support from other healthcare professions.

Levels of support for nurse prescribing of ionising radiation were high amongst members of healthcare providers' Local Implementation Groups. Members of the LIGs, overall, had higher levels of agreement on the positive impact of the initiative on patient care than non-members; however, it should be noted that both cohorts (members and non-members of LIGs) generally held positive views on the impact of nurse prescribing on patient care.

7.7 Summary – Key Findings from Stakeholders' Evaluation of the Nurse Prescribing of Ionising Radiation Initiative

- The majority of stakeholders were of the opinion that extension of prescribing of medical ionising radiation to nurses provided a good service for patients, had a positive impact on patient care, and met the needs of patients.
- The majority of healthcare professionals and key stakeholders surveyed were of the opinion that nurse prescribing of medical ionising radiation was safe with approximately sixty-five per cent in agreement that nurses would prescribe ionising radiation correctly.
- The majority of clinical stakeholders surveyed were positive about the initiative and were in agreement that nurses had a role in the prescribing of ionising radiation. The majority also agreed that there was a need to extend the requesting of radiographic examinations beyond the remit of the medical profession.
- Whereas the vast majority of stakeholders disagreed that doctors should only undertake the prescribing of ionising radiation, approximately twelve per cent of medical practitioners and twenty-eight per cent of radiographers compared with four per cent of nurses were in agreement that the prescribing of ionising radiation should only be undertaken by doctors.
- The majority of clinical stakeholders surveyed were in agreement that there was a need to further extend nurse prescribing of ionising radiation.

- The majority of clinical stakeholders surveyed agreed that, overall, the introduction of nurse prescribing of ionising radiation had been a success.
- Clinical stakeholders were in agreement that the introduction of nurse prescribing of medical ionising radiation had directly benefitted patient care.
- The majority of respondents were in agreement that the introduction of the initiative had reduced delays in initiating the care of patients and that it allowed patients access treatment quicker.
- The majority of clinical stakeholders disagreed that prescribing took up too much of nurses' time; in addition, the majority of respondents identified that it had freed up doctors' time.
- The majority of medical practitioners and nurses surveyed did not perceive that supervising a nurse prescriber of medical ionising radiation had added a burden to their workload; however, approximately a quarter of medical respondents reported that supervision was an extra burden.
- The majority of respondents were in agreement with the statement that the introduction of the nurse prescribing of medical ionising radiation has had a positive impact on inter-professional relationships.

Chapter VIII

Nurse Prescribers' Evaluation of their Role Related to the Prescribing of Ionising Radiation

8.1 Introduction

This chapter evaluates the nurses' perceptions of prescribing ionising radiation following the completion of the preparation programme to prescribe ionising radiation. To aid in the identification of facilitators and barriers to the prescribing of ionising radiation, the results are presented firstly from the perspective of nurses who, at the time of the survey, had commenced prescribing (n = 71) and secondly from the perspective of nurses who completed the prescribing preparation programme but who, when contacted to take part in the survey, had not yet initiated the prescribing of ionising radiation (n = 29); for the purpose of the evaluation this cohort will be referred to as 'nurses who are currently not prescribing'.

8.2 Evaluation of the Prescribing Initiative from the Perspective of Nurses who are Currently Prescribing Ionising radiation

This section of the evaluation presents the results from a survey of 71 nurses who were prescribing ionising radiation at the time of the study. All nurses who were actively prescribing ionising radiation at the time of the study were sent a questionnaire.

Firstly the current prescribing practices of nurses are outlined, this is followed by prescribers' evaluations of their current role including their perceptions of the safety of prescribing practice, the impact of the role on their professional practice and the impact of the role on patient care. The support received by nurses who prescribe ionising radiation from other healthcare professionals is also evaluated. The final section reports on the extent to which prescribers engaged in clinical professional development following the commencement of their prescribing role.

8.2.1 Current Prescribing Practices

The vast majority of prescribers identified themselves as frequent prescribers (84.8%), that is they were prescribing ionising radiation on at least a weekly basis with a minority reporting that they prescribed occasionally (12.1% - monthly) or infrequently (3.0% - less than once a month) (See Figure 8.1).

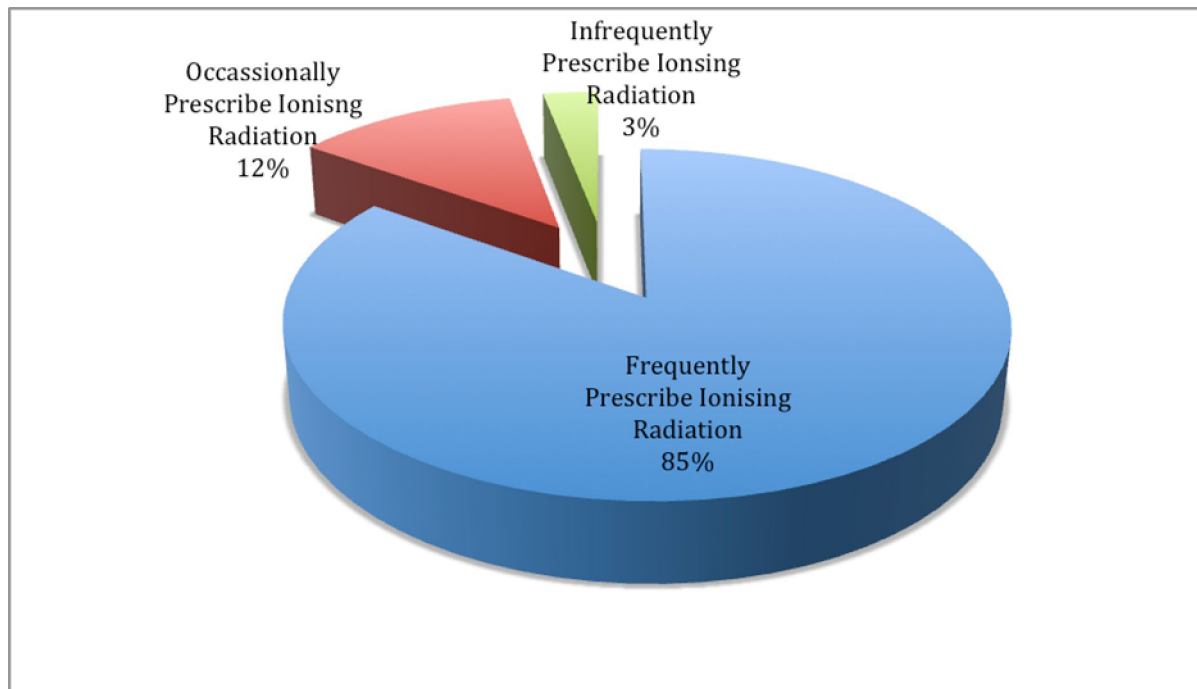


Figure 8.1 Frequency with which Nurses Prescribe Ionising Radiation

In total fifteen per cent of nurses reported their prescribing practice as 'occasional or infrequent'. A number of reasons for the infrequent prescribing of ionising radiation were identified; the main reason was limitations in anatomical sites that the nurse was permitted to request a radiographic examination for; this was principally related to respondents who were limited to prescribing ionising radiation for chest radiographs only. In addition, respondents identified workloads, the clinical area to which they were allocated or a move to a management position as reasons why prescribing practice was limited.

The number of prescriptions for ionising radiation requested by nurses per week ranged from 1 to 80. This level of prescribing equated to a mean of 19.73 (SD = 16.93) (median = 20.00, IQR = 25.00)¹¹ prescriptions written per week. Over half (51.5%) of nurse prescribers of ionising radiation reported that they prescribed 20 or more radiographs per week with 1 in 10 reporting that they prescribed 40 or more episodes of ionising radiation per week.

The majority of respondents (60%) reported that there were radiographic examinations they would like to prescribe in their practice but were unable to do so. Of those who reported that there were limitations in the radiographic examinations they could

¹¹ Due to the spread of data and the presence of outliers the median and the interquartile range offers a more accurate estimate of the average number of prescriptions written per week.

prescribe, the majority (44%) identified requesting radiographs for children was the greatest barrier to the further development of their practice. It was reported by a number of respondents that not being able to prescribe ionising radiation in this area was a great limitation to practice as, in some cases, the majority of patients seen by the nurse, were children. Nurses also identified that they were limited in prescribing ionising radiation for the imaging of facial bones, hips, shoulders and, in some cases, due to local policies, chest radiographs. Respondents at advanced nurse practitioner level also reported that they were limited in their practice due to the guidelines for nurse prescribing of ionising radiation only stipulating general radiography. Other forms of imaging that advanced practitioners would like to prescribe included: computerised tomography, ultrasound, and coronary angiography.

The limitation in relation to prescribing ionising radiation for children was commented upon by nurse prescribers of ionising radiation as well as a number of clinical stakeholders closely involved with the initiative. There was a sense among nurse prescribers that not being permitted to prescribe ionising radiation for children was a barrier to their professional practice and that there was a need to address the issue:

There is an urgent need for the introduction of nurse prescribing of ionising radiation into children's nursing. In my opinion the delay of such an introduction has caused inequitable services for children and causes long delays for children. It is long overdue and on no account should it have taken so long to be introduced...It is very frustrating for children's nurses and unfair to children (Nurse Prescriber 035).

I...feel quite strongly that we cannot prescribe for paediatrics - this really obstructs our work on a daily basis. I feel [that] with the correct education there is no reason that we cannot prescribe [for children] under protocol. I strongly believe that we are safe and conscientious practitioners and going forward this needs to be addressed (Nurse Prescriber 055).

Clinical stakeholders commented that nurses prescribing ionising radiation for children would enhance the services they were able to offer paediatric patients; in some cases nurse prescribers reported that the majority of patients they provided care for were children and the ability to prescribe ionising radiation would enhance the care provided for this cohort.

However, clinical stakeholders did identify the need to ensure that the correct structures were put in place prior to extending the prescribing of ionising radiation by nurses for children:

A full benefit analysis of the adult nurse prescribing should be conducted prior to expansion of this extended practice in particular in the area of paediatric prescribing, especially given the increased radiosensitivity of this population (Radiographer 005).

8.2.2 Nurse Prescribers of Ionising Radiation Assessment of the Safety and Ability of their Prescribing Role

A number of items were identified to measure nurse prescribers of ionising radiation perceptions of the safety of their prescribing practice. Overall, approximately a quarter of respondents agreed with seventy-five per cent strongly agreeing that they could prescribe ionising radiation safely and effectively. In addition, ninety-three per cent of respondents were in agreement that they had the necessary skills and training to fulfil their role as a prescriber; with three per cent in disagreement. A majority were also aware of the conditions that they could prescribe for within their scope of practice with a small minority (4.3%) expressing some uncertainty in this area. Although fifty per cent of respondents were in agreement that they were able to request the radiographic examinations they needed to do their job, forty-eight per cent were in disagreement. In addition, over 60% reported that they were limited in their prescribing practice.

Table 8.1 Prescriber's Assessment of the Safety of their Prescribing Role¹

<i>Item</i>	<i>Percentage Disagreement %</i>	<i>Percentage Agreement %</i>
I can prescribe ionising radiation safely and effectively	0.0	100.0
I fear making an incorrect request in my prescribing of ionising radiation	71.4	21.5
The issue of accountability is never far from my mind when prescribing ionising radiation	12.9	82.8
I feel anxious about prescribing ionising radiation	78.6	8.6
I feel I have all the necessary skills and training to fulfil my role as a prescriber of ionising radiation	2.9	92.9
I fear litigation in my prescribing practice	62.3	26.1
I am uncertain about which conditions I am allowed to prescribe ionising radiation for	95.7	4.3
I am able to order all the X-Rays I need in order to do my job	48.6	50.0
I am limited in my prescribing of ionising radiation practice	34.3	61.5

¹No opinion responses are omitted

8.2.3 Impact of Nurse Prescribing of Ionising Radiation on Professional Practice

This section of the report evaluates the impact of the prescribing of ionising radiation on the role of the nurse. It reports on respondents' perspectives of the impact of the role on patient care, nurses' professional development and the overall benefit of extending prescribing of ionising radiation to the nursing profession. In most areas the evaluation found that the prescribing initiative has had a positive impact on the professional development of nurses, the care that can be offered to patients and respondents' overall levels of job satisfaction. The majority of nurses reported that the ability to prescribe ionising radiation had positively impacted on respondents' confidence, had increased their professional autonomy and had resulted in increased levels of job satisfaction. However, the majority of respondents perceived that the extension of prescribing ionising radiation to their role had led to increased workloads. In addition, approximately a fifth of respondents reported that they felt pressure to prescribe; however, it should be noted that the majority (67.1%) disagreed that this was the case. In addition, the ability to prescribe ionising radiation was perceived as providing better use of respondents' skills and furthermore was not perceived by the majority of respondents as shifting their focus from their core nursing skills.

Table 8.2 Impact of the Initiative on the Professional Role of Nurse Prescribers of Ionising Radiation¹

<i>Item</i>	<i>Percentage Disagreement %</i>	<i>Percentage Agreement %</i>
Prescribing of ionising radiation has increased my confidence as a nurse	2.9	84.3
Now that I can prescribe ionising radiation, I feel pressure to prescribe	67.1	18.6
Prescribing ionising radiation brings with it an increased workload	28.6	67.2
Prescribing of ionising radiation ensures better use of my skills	8.6	80.0
I welcome the responsibility that prescribing of ionising radiation brings	1.4	81.5
I have increased my autonomy since I commenced prescribing ionising radiation	7.1	80.7
The ability to prescribe ionising radiation improves the quality of care I am able to offer patients	0.0	94.3
Prescribing of ionising radiation has shifted my focus from my core nursing skills	77.1	14.3
The introduction of this initiative has increased my level of job satisfaction	7.2	76.8

¹No opinion responses are omitted

One area connected with nurse prescribing of ionising radiation that was perceived as negatively impacting on workloads was the *National Nurse Prescribing Ionising Radiation Minimum Dataset*. Prescribers reported that using the system was ‘onerous’ and ‘time consuming’. One nurse prescriber highlighted the duplication of work that arose from using the system:

The HSE site [minimum dataset] is...a waste of time on two counts: 1. The PACS/NIMIS system is rolling out nationwide yet the data cannot be transferred to the HSE site [*National Nurse Prescribing Ionising Radiation Minimum Dataset*]. I don’t have the time or inclination to duplicate my work. 2. The site merely collects numbers, type of x-ray, time etc. But what about the important stuff like missed fractures, outcomes and relevance of the initial request. It’s done locally but not nationally (Nurse Prescriber 067).

Nurse prescribers in comments received also perceived that the *National Nurse Prescribing Ionising Radiation Minimum Dataset* was ‘cumbersome’, ‘inefficient’ and, at times, difficult to keep the dataset up-to-date:

Updating the database is extremely time consuming...we get no protected time to do it and there is no legal requirement to do it. I am nearly a year behind in updating mine (Nurse Prescriber 053).

Filling in the database takes quite a long time and its often difficult during a busy shift to find time to enter cases. Although I understand that this makes audit of statistics very convenient, I question its contribution to practice (Nurse Prescriber 065).

One respondent highlighted the paperwork and recording of data that was associated with the role of prescribing ionising radiation:

At present, for each completed care episode, I complete: patient notes (handwritten), x-ray request on NIMIS, prescription (handwritten), minimum data set for nurse prescribing of medications (online), x-ray minimum data set (online), GP discharge letter (handwritten) [and] local Excel spread-sheet of the patient's scan (Nurse Prescriber 072).

There was a sense amongst respondents that the level of bureaucracy associated with the role was negatively impacting on the clinical time that they could provide to patients and that due to the workload, data was not being accurately or comprehensively recorded.

The impact on professional practice of extending prescribing of ionising radiation to nurses was also commented upon by a number of respondents. There was a sense that the initiative was introduced not only to alleviate the workload of the medical profession, but also to allow nurses to comprehensively provide care to patients within the health services as well as improving the patient experience:

This is not about saving the doctor's time...this is about advancing nursing, thorough patient assessment and the application of justification rules. It's about quality and patient safety in exposure to ionising radiation. It's about nurses applying evidence based practice, making more efficient use of x-ray services and improving patient flow (Nurse Prescriber 033).

The theme of enhancing and streamlining patients' experience of healthcare through the timely prescribing of ionising radiation was also commented upon by another nurse prescriber of ionising radiation:

The ability to prescribe ionising radiation within my clinical area has allowed me more freedom to schedule appointments for our patients...and eliminate delays in commencing treatments; it has enhanced our service (Nurse Prescriber 044).

8.2.4 Prescribers' Evaluation of the Impact of their Role on Patient Care

Nurse prescribers of ionising radiation were overall in agreement that the introduction of the initiative had directly benefitted patient care. Respondents identified convenience for patients, reduced delays in initiating treatment and enabling patients to access care quicker as the most positive outcomes of nurse prescribing of ionising radiation. Approximately ninety-seven per cent of respondents agreed or strongly agreed that nurse prescribing of ionising radiation had enabled patients to be treated quicker. The majority of respondents also reported that the introduction of nurse prescribing of ionising radiation had increased patients' level of satisfaction with the care they received and had reduced delays in the discharge of patients. There was some variability in responses from respondents on the extent to which nurse prescribing of ionising radiation had reduced the number of healthcare professionals a patient had to deal with; the majority of respondents (55.0%) were in agreement; however approximately a third disagreed that this outcome had occurred as a result of the initiative.

Table 8.3 Prescribers' Perceptions of the Impact of the Prescribing Initiative on Patient/Client Care¹

<i>Item</i>	<i>Percentage Disagreement %</i>	<i>Percentage Agreement %</i>
The introduction of nurse prescribing of ionising radiation has reduced delays in the discharge of patients	10.1	75.4
The introduction of nurse prescribing of ionising radiation has reduced delays in initiating inpatient treatment	4.3	91.3
The introduction of nurse prescribing of ionising radiation has reduced the number of healthcare professionals a patient must interact with	30.4	55.0
The introduction of nurse prescribing of ionising radiation is more convenient for patients	1.4	94.2
The introduction of nurse prescribing of ionising radiation has enabled patients to be treated quicker	2.9	97.1
The introduction of nurse prescribing of ionising radiation has increased patient satisfaction levels with the care they receive	4.3	72.4
Nurse prescribing of ionising radiation enhances patient compliance with care	17.4	55.0
Patients are supportive of nurse prescribing of ionising radiation	1.4	88.4

¹No opinion responses are omitted

Overall there was a high level of agreement that the extension of a prescribing remit to nurses had a positive impact on patient care with over ninety-five per cent of prescribers agreeing or strongly agreeing with the statement: 'overall the introduction of nurse prescribing of ionising radiation has had a positive impact on patient care' (see Figure 8.2).

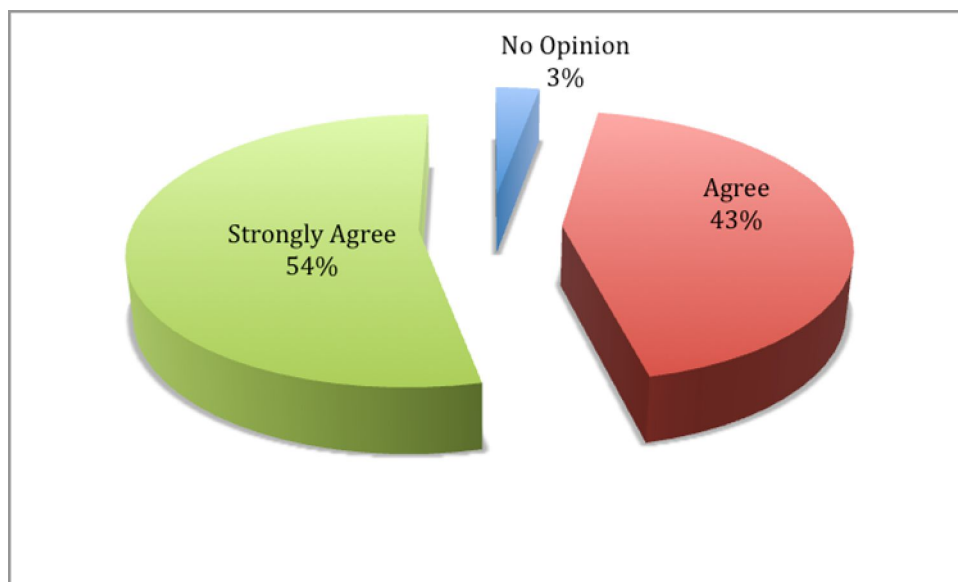


Figure 8.2 Prescribers' Level of Agreement to the Statement: 'Overall the Introduction of Nurse Prescribing of Ionising Radiation has had a Positive Impact on Patient Care'.

8.2.5 Comparison of Prescribers of Ionising Radiation with Key Stakeholders

A comparison of prescribers of ionising radiation evaluation of the impact of the initiative on patient care was compared with that of the responses of clinical key stakeholders. The aim was to identify the extent to which perceptions of the impact of the initiative were comparable.

The highest level of agreement from both nurses who prescribe ionising radiation and clinical stakeholders was that nurse prescribing of ionising radiation enabled patients to access treatments quicker (Figure 8.3) and that it was more convenient for patients (Figure 8.4).

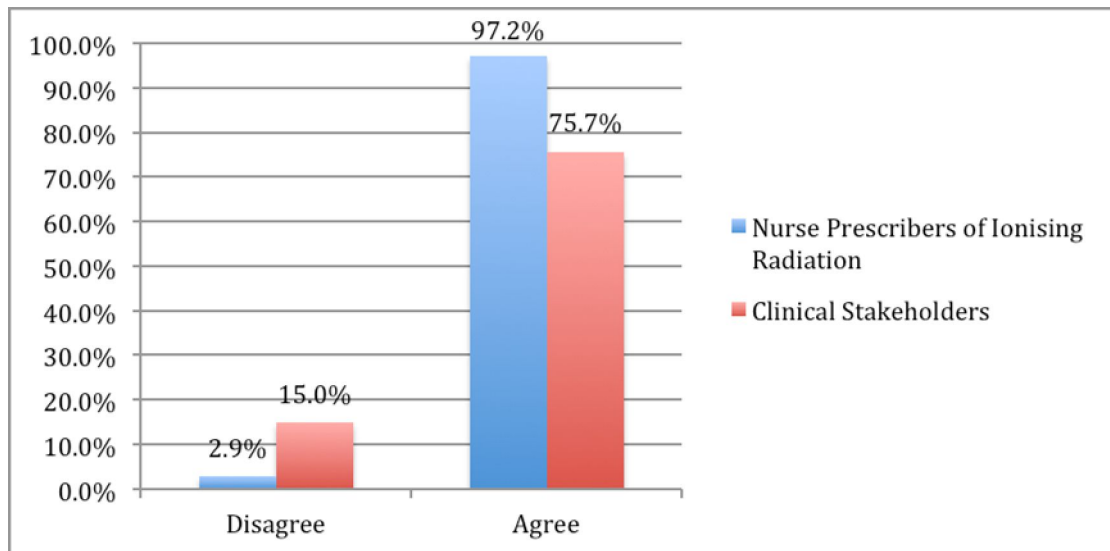


Figure 8.3 Comparison of Stakeholders' and Prescribers' Attitudes to the Statement: 'The Introduction of Nurse Prescribing of Ionising radiation has Enabled Patients to Access Treatment Quicker'. (Note, 'no opinion' responses are omitted)

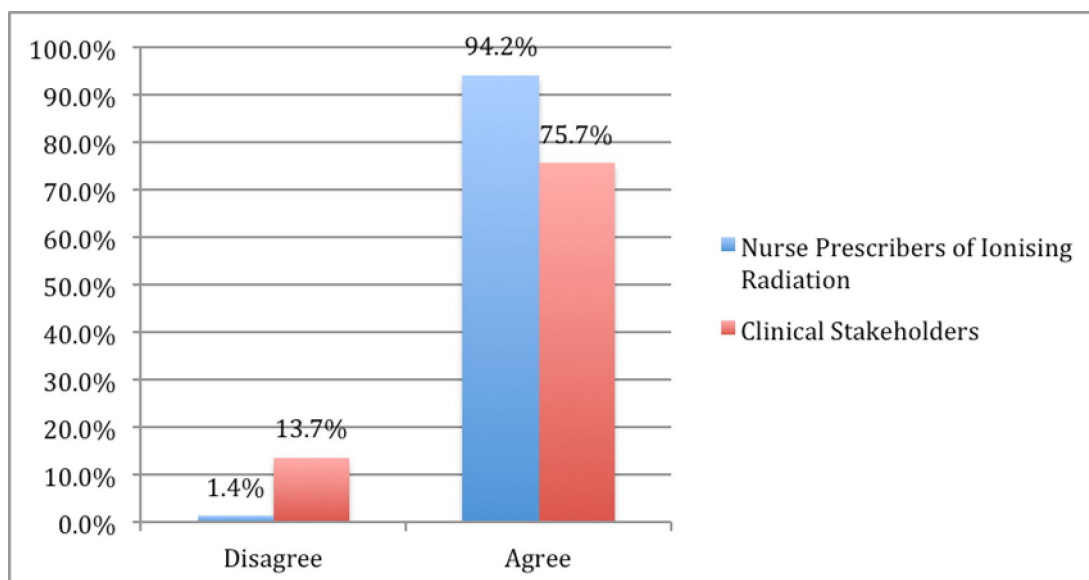


Figure 8.4 Comparison of Stakeholders' and Prescribers' Attitudes to the Statement: 'The Introduction of Nurse Prescribing of Ionising radiation is More Convenient for Patients'. (Note, 'no opinion' responses are omitted).

8.2.6 Prescribers' Evaluation of Support Received for their Role

This phase of the evaluation reports on the level of support received by nurses for the prescribing role from other nurses, nursing management, the medical and radiography professions, the Local Implementation Group, the National Coordinator of X-Ray Prescribing at the HSE and the Nursing and Midwifery Board of Ireland (NMBI). It is evident from the results presented that nurse prescribers of ionising radiation received high levels of support for their role at both local and national levels. Respondents were in

agreement that the highest levels of support came from doctors and consultants with whom they worked (90% agreement) radiographers (87% agreement), and nurses and clinical colleagues in the prescriber’s clinical area (87% agreement). Respondents were also in agreement that they were facilitated and supported in their role by their director of nursing (85% agreement), their organisation’s Local Implementation Group (83% agreement) and their prescribing of ionising radiation mentor. Although still expressing high levels of support, respondents’ levels of agreement were slightly lower when reporting the levels of support they received from their prescribing site coordinator (75% agreement) and other prescribers of ionising radiation (70% agreement). External to their organisation the majority of prescribers were in agreement that they were facilitated in their prescribing role by the National Coordinator X-Ray Prescribing Programme¹², Health Service Executive (69% agreement) and by the NMBI (70% agreement) (see Figure 8.5).

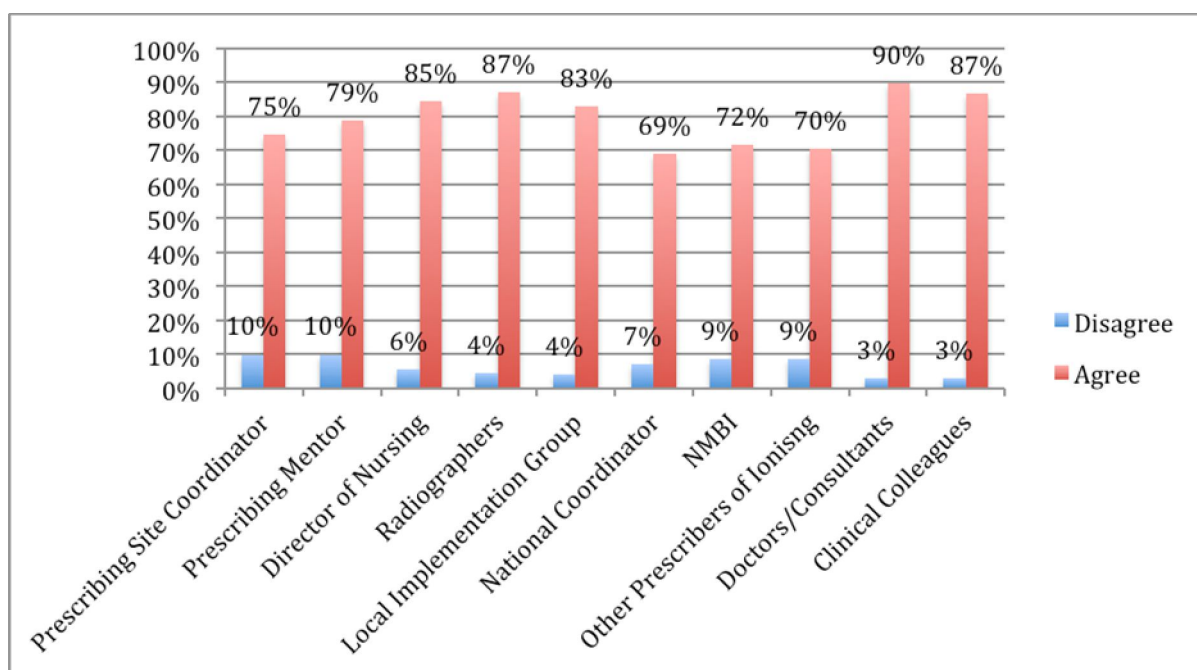


Figure 8.5 Levels of Support Received by Nurse Prescribers of Ionising Radiation in their Role at Local and National Levels

8.2.7 Nurse Prescribers Access to, and Experiences of, Continuing Professional Development

This section of the evaluation reports on respondents’ access to, and experiences of, continuing professional development (CPD) (e.g. workshops, study days, self study) since the commencement of their role in prescribing ionising radiation.

¹² It is important to note that 24% of respondents reported ‘no opinion’ when asked to identify the extent to which they were supported by the National Coordinator.

The majority (82.1%) of respondents surveyed stated that they undertook some form of self-directed CPD (it should be noted that approximately 18% of respondents reported that they did not undertake some form of informal CPD). The most cited form was keeping up to date through professional and academic journals and online resources; many respondents reported that they had access to journals through their hospital or partnered higher education institution. Other examples provided by prescribers included attendance at clinical teaching sessions and case reviews, networking with other prescribers of ionising radiation, informal sessions with medical consultants, and on-going clinical supervision sessions (see figure 8.6).

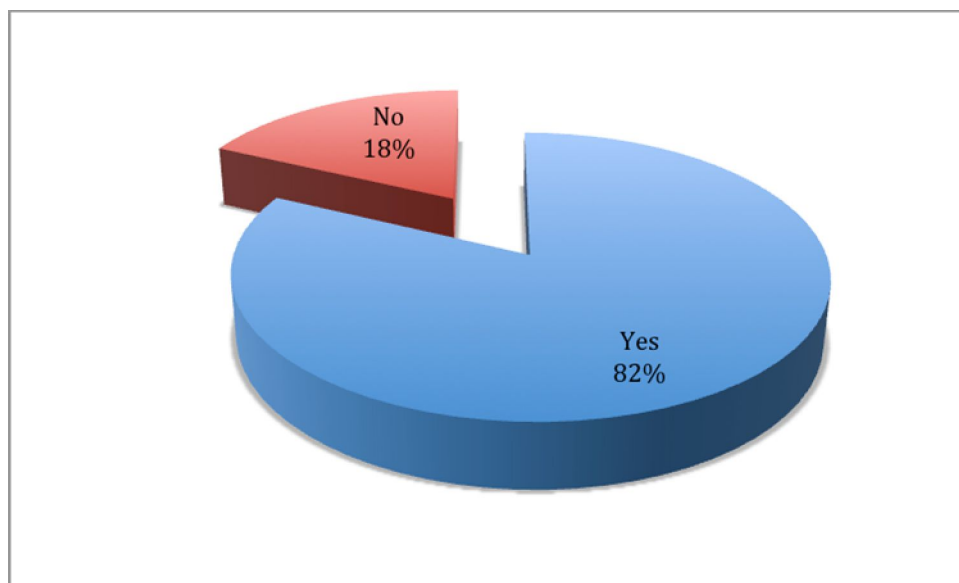


Figure 8.6 Proportion of Prescribers who have undertaken informal CPD relevant to nurse prescribing of ionising radiation

It was identified that over three-quarters of the respondents had not undertaken any formal continuing professional development with approximately a quarter identifying that they had undertaken formal CPD relevant to nurse prescribing of ionising radiation since the completion of their educational programme (see Figure 8.7).

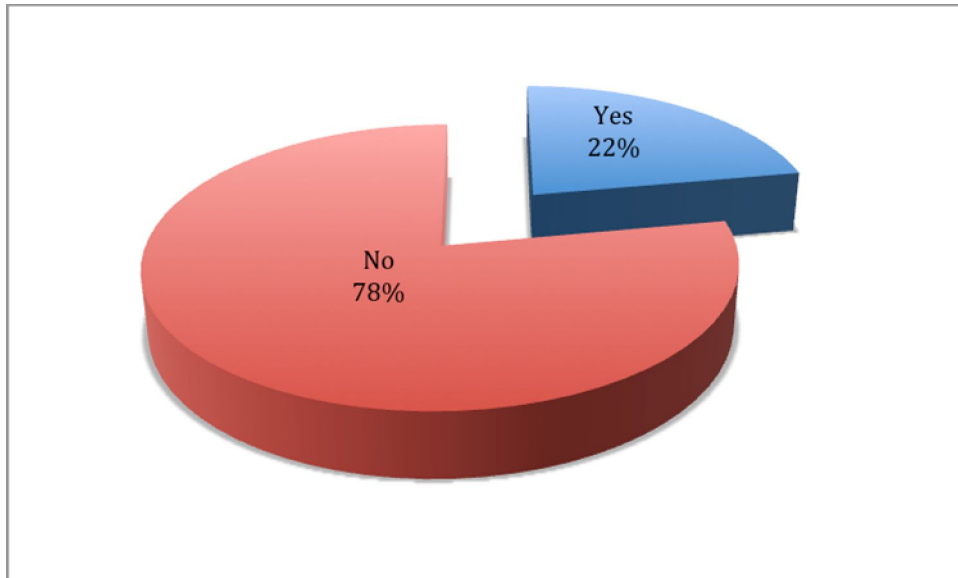


Figure 8.7 Proportion of prescribers who have undertaken formal CPD relevant to nurse prescribing of ionising radiation

Those who had undertaken some form of continuing professional development identified a number of activities; these included: in-house education sessions on ionising radiation, NCHR radiation study days, physical assessment modules, update safety sessions on ionising radiation, international conferences and training on the NIMIS system.

As part of the evaluation, prescribers of ionising radiation were asked to identify areas in which they required continuing professional development. The most frequently cited were related to advanced physical assessment and anatomy training; this was followed by the need for CPD in legislation related to the prescribing of ionising radiation and radiation safety. Other CPD initiatives that were highlighted to facilitate the professional development of prescribers of ionising radiation included updates on advances in imaging techniques, conferences related to the prescribing of ionising radiation, the setting up of local workshops and study groups, the development of a prescriber of ionising radiation network and more input into CPD related to ionising radiation from higher education institutions.

8.2.8 Limitations to the Role of Prescribing Ionising Radiation

Respondents were asked to identify if there were any barriers or limitations to the successful prescribing of ionising radiation as part of their professional role. Approximately fifty-five per cent of respondents identified limitations with forty-five per cent reporting no limitations to their practice. Of those that identified limitations, the most

frequently reported was the inability to prescribe ionising radiation for children; this was reported as being a limitation to practice by forty-four per cent of respondents. A number of respondents identified that a large proportion of patients that attended their clinical area were children and that the limitation on prescribing ionising radiation for this cohort was limiting the care they could provide. Other limitations identified by respondents on the prescribing of ionising radiation related to the radiographs a nurse was permitted to prescribe within their organisation. Although the An Bord Altranais (2008) document *Requirements and Standards* outlines a number of anatomical sites that nurses are permitted to prescribe a radiographic image for, a number of respondents identified that local policies put in place by the organisation for which they worked placed limitations on the sites that they could image. Comments from respondents identified that they were 'allowed to prescribe for extremities only: upper & lower limb' or that 'shoulder, humerus, hip were excluded' from their protocol, even though the respondent 'encountered a lot of patients' with these presentations. Other anatomical sites that respondents reported that they were excluded from prescribing ionising radiation for, but reported that this would enhance their practice included: shoulder, femur, humerus, hip, clavicle, facial bones and abdominal radiographs.

One respondent identified how a limitation in an anatomical site that they were permitted to prescribe ionising radiation for, restricted their practice:

I work in oncology and review a lot of metastatic patients with bowel obstructions or a need to out rule [obstructions] but cannot prescribe PFAs (Plain Film of Abdomens). This is okay until I need to order both CXR & PFA, which means I have to wait until a doctor is available.

In some cases respondents reported that they were only permitted to prescribe ionising radiation for very specific anatomical sites: 'from elbow to finger and knee to toe', 'mid-femur & below mid-humerus and below; I am unable to X-Ray shoulders', 'I am only permitted to order chest X-Rays'.

In addition, respondents were asked to identify if there were any situations in which they would feel uncomfortable prescribing ionising radiation. The vast majority (71%) reported that, in their current role, they did not feel uncomfortable prescribing ionising radiation. Of those that did report concerns (29%), the predominant response was requesting ionising radiation without examining a patient. Respondents reported that this might be an issue, especially when asked by colleagues:

[I am] uncomfortable when asked by colleagues to prescribe an X-Ray without examining a patient – I always refuse but explain why - sometimes others don't really understand why I would need to examine patient (Nurse Prescriber 016).

Sometimes staff approach you to ask you to prescribe an X-Ray for them; it is a very uncomfortable position to be in as you have to refuse them (Nurse Prescriber 028).

The possibility of a patient being pregnant was another concern expressed by respondents as was prescribing ionising radiation for a patient who presented with multiple problems. In relation to prescribing ionising radiation for a patient who was pregnant, respondents highlighted that they would discuss their care with a medical colleague or pass their care over to a doctor. In addition, if the prescribing of ionising radiation was to be expanded beyond the anatomical sites outlined in the *An Bord Altranais Requirements and Standards*, respondents identified that they would require further education in physical assessment skills.

Finally, respondents were asked to identify if there were 'other' barriers to the further development of their role. Approximately forty-six per cent of respondents reported other barriers or limitations to their role. These were varied and included the ability to have the appropriate skills in physical assessment, a lack of understanding amongst nursing, radiography and medical colleagues of the role, inter-professional tensions related to the role, workloads associated with the prescribing of ionising radiation and issues with the database for recording radiographs prescribed. In relation to inter-professional tensions, it was highlighted that initial misunderstanding about the role of nurses prescribing ionising radiation led to a lack of co-operation towards the introduction and/or further development of the role from some healthcare professionals; it was acknowledged that as the initiative became internalised into the health services, these issues were starting to be resolved; however, it was also reported by respondents that there was still further work to be done before there was full acceptance of the role among colleagues and other healthcare professionals.

Both in the evaluation of the educational component of nurse prescribing of ionising radiation and in the evaluation of prescribers' clinical practice, an issue that arose was both the variability in the ability of nurses to undertake physical assessment and the need for further education in this area. One comment from an academic involved in the co-ordination/delivery of the programme highlighted the variability in this area and the

impact that current education provision had on preparing prescribers for the physical assessment component of their role:

One of the strengths of the...programme is the requirement for nurses to undertake 100 hours of supervised practice in prescribing ionising radiation (X-Ray), under the supervision and direction of a medical consultant. I believe this needs to continue as the entry knowledge and skills of nurses commencing the programme are very diverse (staff nurses, clinical nurse specialists, advanced nurse practitioners) particularly in relation to conducting a clinical assessment and physical examination of the patient (Academic 001).

8.3 Evaluation of the Prescribing Initiative from the Perspective of Nurses who Completed the Education Preparation Programme but are Currently not Prescribing

This section of the chapter reports on the findings from the evaluation of nurses who completed the prescribing of ionising radiation preparation programme but at the time of the survey had not commenced prescribing practice. The aim of this phase of the evaluation was to identify reasons why they had not yet started prescribing ionising radiation and to identify their future plans in relation to developing their prescribing practice. At the time of the survey 29 respondents identified that they had completed the preparation programme but were not yet prescribing ionising radiation. The average time since completion of the programme was 26.57 months (SD = 23.9) with a range of between 1 month to 108 months (the median length of time was 24 months with an IQR of 21). This equates to, on average, respondents completing the course two years ago, however, they are currently not prescribing ionising radiation.

The reasons identified as delaying the initiation of prescribing practice were classified under three groups: 1) delays at hospital/Local Implementation Group level, 2) delays in prescribers receiving their personal identification number (PIN) to access the prescribing of ionising radiation database and, 3) other reasons (see Table 8.4). The majority of nurses (52%) who had completed the education programme but were not yet prescribing reported delays at hospital and Local Implementation Group level as the main barrier to initiating prescribing of ionising radiation practice. Respondents reported that, for a variety of reasons, the prescribing of ionising radiation had not been 'sanctioned' by their LIG. Reasons given for these delays included: no policy developed at hospital level, withdrawal of support at hospital level for nurses prescribing medical ionising radiation, resistance to the initiative from some healthcare professionals, including consultants and radiographers and 'disbandment' of the LIG. In relation to healthcare professionals blocking the development of the initiative, a number of respondents perceived that, in some cases, this was identified as an individual at hospital consultant level who did not

'approve' of nurses prescribing ionising radiation. Respondents in comments added to the survey identified examples of healthcare professionals resisting the introduction and/or development of nurse prescribing of ionising radiation. One nurse manager describes how support from consultant radiologists was key to the implementation and development of the role:

The introduction was entirely dependant on the views of the consultant radiologist. We initially had one (consultant) who only allowed one nurse at a time on the course. He has left and we now have a radiologist chairing the LIG who is very supportive (Nurse Manager 010).

Nurse prescribers also highlighted resistance to the role from various groups of health professionals that had led to a delay in the introduction of prescribing ionising radiation in practice:

Sometimes as an ANP prescribing [ionising] radiation you get a sense, occasionally from individual radiographers that you have less authority to prescribe radiation than that of a junior doctor, which can be frustrating; thankfully this is the exception rather than the norm (Nurse Prescriber 069)

On return to hospital base there was massive resistance to the nurse prescribing of x-rays by the radiologists - this led to delays in first prescribing x-rays (Nurse Prescriber 010).

The second issue in delaying the initiation of prescribing practice, which was identified by twenty-eight per cent of respondents, were administrative issues; in particular respondents highlighted delays in receiving their Personal Identification Numbers, this number is required to allow nurses access the prescribing of ionising radiation database.

Other reasons for the delay in initiating the prescribing of ionising radiation were reported by 20% of non-prescribers. These included issues related to illness, maternity leave and change of clinical role that does not require the prescribing of ionising radiation.

Table 8.4 Reasons Advocated for Delay in Initiating Prescribing of Ionising Radiation

<i>Reason</i>	<i>Percentage %</i>
Delays at Hospital/Local Implementation Group Levels	52.0
Administrative Issues	28.0
Other	20.0

Of those who identified that they were not currently prescribing ionising radiation, approximately three quarters reported that they intended to do so in the near future (see Figure 8.8). However, approximately twenty-two per cent had not been provided with a date in the future in which to commence their prescribing practice.

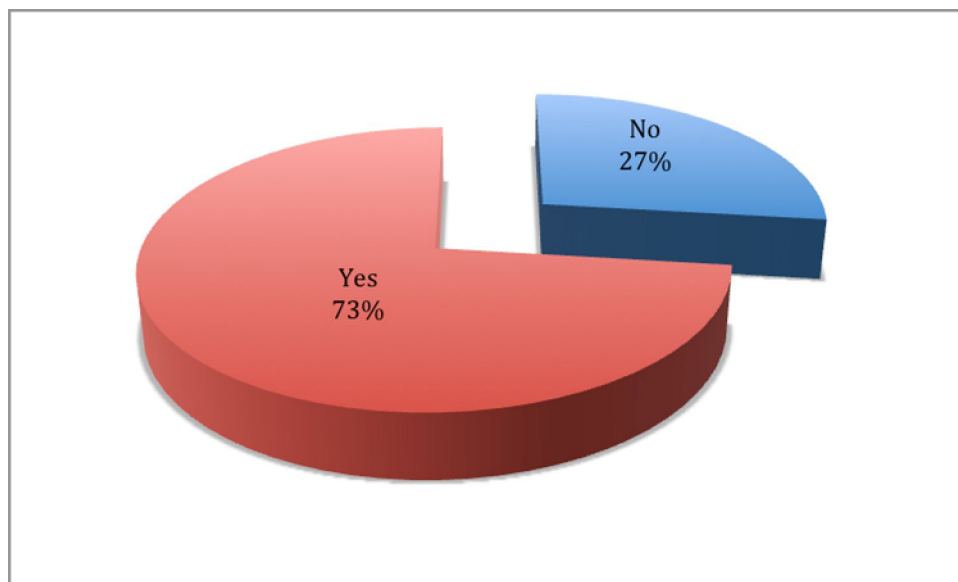


Figure 8.8 Respondents' Responses to the statement: 'Do you intend to commence prescribing ionising radiation in the near future?'

Of those that intend not to commence prescribing ionising radiation, the reasons advanced included: lack of support at hospital/LIG level, change of policy towards nurse prescribing of ionising radiation at hospital level, and other reasons such as maternity leave and change in professional role.

8.4 Conclusion

The majority of respondents, who had completed an educational programme preparing them to prescribe ionising radiation, described themselves as 'frequent' prescribers; only a small number of respondents reported that they were prescribing 'infrequently' (less than once a month). Those who were prescribing occasionally or infrequently reported limitations placed on their prescribing practice as reasons why the number of orders for radiographic examinations was low. Of those who were prescribing frequently over half were prescribing 20 or more episodes of ionising radiation per week with 1 in 10 prescribing 40 or more episodes.

The majority of respondents reported that they were limited in their practice of prescribing ionising radiation. The main limitation reported by prescribers related to

requesting ionising radiation for children. Other respondents were also restricted in the anatomical sites they could request radiographs for by local policies and guidelines. Respondents at advanced nurse practice level reported that they were also limited in their practice due to the requirements that only general radiography could be requested and identified other forms of imaging that they should be permitted to prescribe related to their advanced practice role.

The vast majority of respondents reported that they could prescribe ionising radiation safely and effectively and that they felt confident in the education and training they had received to practice effectively. Awareness of scope of practice was also high; however, a large proportion of respondents reported that the scope in which they were required to work limited their prescribing practice.

This element of the evaluation found that, overall, the prescribing initiative has had a positive impact on the care that can be offered to patients, respondents' overall level of job satisfaction and the professional development of nurses. In addition, respondents reported that the prescribing initiative had impacted positively on their professional autonomy; however, a majority of respondents also reported that undertaking the role of prescribing ionising radiation had led to increased workloads. Although workloads had increased, the majority of respondents reported that the prescribing of ionising radiation had led to a better use of their skills without negatively impacting on their core nursing role.

One area in particular highlighted in the responses of nurse prescribers of ionising radiation was the positive impact the initiative had on the access patients had to treatment and their overall care. Respondents identified convenience for patients, reduced delays in initiating treatment and enabling patients to access care quicker as the most positive outcomes.

Levels of support received by nurse prescribers of ionising radiation for their role from other healthcare professionals were reported as being high. In particular respondents were in agreement that they received particularly high levels of support from medical colleagues, radiographers and nursing colleagues. High levels of support were also noted as being provided by nursing management, the Local Implementation Group and their prescribing mentor.

The majority of respondents identified that they undertook informal forms of CPD such as keeping up-to-date through professional journals and informal sessions with clinical colleagues. The majority, however, reported that they had not undertaken some form of formal CPD since they completed their prescribing of ionising radiation preparation programme. The areas in which respondents identified that they required further, on-going education included: advanced physical assessment, anatomy training, legislation related to the prescribing of ionising radiation and radiation safety.

There was variability in the extent to which respondents reported the presence of barriers and limitations to the practice of prescribing ionising radiation, with fifty-five per cent reporting limitations and forty-five per cent identifying no barriers. Limitations identified included: the inability to prescribe ionising radiation for children and a restriction on the anatomical sites that nurses were permitted to request a radiographic image.

The evaluation also explored reasons why nurses who had completed the education programme were not currently prescribing ionising radiation. On average, respondents who were not prescribing were 2 years post completion of the preparation programme. Reasons for not prescribing were found under three main groups: 1) delays at hospital/Local Implementation Group level, 2) delays in prescribers receiving their PIN number to access the prescribing of ionising radiation database and, 3) 'other' reasons. The principal reasons at hospital/LIG level included: no policy developed at hospital level, withdrawal of support at hospital level for nurses prescribing ionising radiation, resistance to the initiative from other groups of healthcare professionals and disbandment of the LIG.

Overall, despite some issues at local levels, nurse prescribing of ionising radiation has been successfully implemented and is well supported by the nursing, medical and radiography professions. It is evident from the results of this section of the evaluation that nurse prescribing of ionising radiation is having a positive impact on professional practice and the quality of care that prescribers provide to patients.

8.5 Summary – Key Findings from Nurses' Evaluation of their Role Related to the Prescribing of Ionising Radiation

- The vast majority of prescribers identified themselves as frequent prescribers (84.8%); that is they prescribe ionising radiation on at least a weekly basis with a minority reporting that they prescribed occasionally (12.1% - monthly) or non-frequently (3.0% - less than once a month).

- Over half (51.5%) of nurse prescribers of ionising radiation reported that they prescribed 20 or more radiographs per week with 1 in 10 reporting that they prescribed 40 or more episodes of ionising radiation per week.
- The majority of respondents (60%) reported that there were radiographs that they would like to prescribe in their practice but were unable to do so.
- Nurse prescribers of ionising radiation reported that the prescribing initiative has had a positive impact on their professional development, professional autonomy, the care that can be offered to patients and respondents' overall level of job satisfaction.
- The majority of respondents reported that undertaking the role of prescribing ionising radiation had led to increased workloads.
- Nurse prescribers of ionising radiation were in overall agreement that the introduction of nurse prescribing of ionising radiation had directly benefitted patient care.
- Respondents identified the greatest impact of nurse prescribing of ionising radiation was that it had resulted in convenience for patients, reduced delays in initiating treatment and enabled patients to access care quicker.
- Nurse prescribers of ionising radiation received high levels of support for their role at both local and national levels. Respondents were in agreement that the highest levels of support came from doctors and consultants with whom they worked (90%) radiographers (87%), and nurses and clinical colleagues in the prescriber's clinical area (87%).
- It was identified that 78% respondents had not undertaken any formal continuing professional development with 22% identifying that they had undertaken formal CPD relevant to nurse prescribing of ionising radiation since completion of their educational programme.
- The majority (82.1%) of respondents surveyed stated that they undertook some form of self-directed CPD; 18% of respondents reported that they did not undertake informal CPD.
- Approximately 55% of respondents identified limitations to their prescribing of ionising radiation practice with 45% reporting no limitations.
- At the time of the survey, 29 respondents identified that they had completed a preparation programme but were not yet prescribing ionising radiation.

- The average time since completion of the programme but still not prescribing ionising radiation was 26.57 months (SD = 23.9) with a range of between 1 month to 108 months (the median length of time was 24 months).
- Of those who identified that they were not currently prescribing ionising radiation, approximately three quarters reported that they intended to do so in the near future.
- Approximately twenty-two per cent of respondents who were not currently prescribing ionising radiation had not been provided with a date in the future in which to commence their prescribing practice.

Chapter IX

Discussion, Conclusion and Recommendations

9.1 Introduction

Prescribing of medical ionising radiation (X-Ray) was extended to nurses following the publication of *Statutory Instrument No. 303 European Communities (Medical Ionising Radiation Protection) (Amendment) Regulation 2007*. As well as legislation, the prescribing of ionising radiation by nurses is guided by the documents *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation* (An Bord Altranais 2008) and the *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray)* (HSE 2009). This is the first major study of the initiative since its inception and this chapter discusses the results from the various phases of the evaluation and identifies key recommendations that arise as a result of the findings of the study.

9.2 Overall Evaluation of Nurse Prescribing of Ionising Radiation

This is the first major evaluation completed nationally or internationally of nurse prescribing of ionising radiation. Through using a number of methods including audit and review of patient records as well as measuring the initiative from the perspective of key stakeholders including patients, nurse prescribers of ionising radiation, members of the medical, nursing and radiography professions and relevant policy and regulation bodies, a comprehensive picture of the operationalisation of nurse prescribing of ionising radiation in practice was ascertained.

When the results of the evaluation are taken together, it was identified that overall patients and health professionals are accepting of nurses taking on a role that was previously the domain of the medical profession. Patients in particular were overwhelmingly positive of the initiative. The results from the patient and stakeholders' surveys and the audit of patient notes and radiographs requested found that nurse prescribers of ionising radiation were comprehensive in the care they provided, prescribed ionising radiation appropriately and impacted positively on the experience patients had of the care they received when in contact with the health service. In particular, clinical stakeholders and patients were in agreement that waiting times were positively impacted upon as the initiative enhanced the patient journey through the healthcare system. It was also evident from the evaluation that the foundation for nurses to prescribe ionising radiation appropriately and safely was based on the comprehensive

preparation received from their education programmes. These programmes were, overall, positively evaluated and prepared nurses for their role in prescribing ionising radiation in clinical practice.

9.3 Profile of Nurses who Prescribe Ionising Radiation

It was identified that nurses who prescribe ionising radiation had extensive clinical and, in most cases, academic experience. Respondents were, on average, qualified for approximately 20 years, in addition, the majority were at advanced nurse practice grade with a significant proportion of prescribers of ionising radiation at staff nurse and clinical nurse manager grades. The vast majority of nurse prescribers of ionising radiation held a third level qualification, in particular, nearly half the sample had completed studies at master's level. The majority of nurse prescribers were working in emergency or urgent care with approximately a third working in a variety of other settings. Respondents completed their prescribing programme through a variety of routes; the greatest proportion had completed the Certificate in Nurse Authority to Prescribe Ionising Radiation.

9.4 Safety and Competency of Nurses to Prescribe Ionising Radiation

All of the radiological investigations requested by nurse prescribers were judged by independent expert reviewers, with extensive clinical experience, to be appropriate based on the patient's history and/or physical examination documentation collected as part of the audit. Similarly the identification of the site for radiographic imaging, provisional diagnosis and clinical information supplied to radiographers were identified as being of a high standard in the vast majority of request forms reviewed. Patient management plans were generally well articulated; this was especially the case in plans reviewed that were written by nurses working in advanced practice roles.

The expert reviewers in the audit phase of the evaluation, based on the records reviewed, did not identify any radiographs that should not have been requested by nurse prescribers of ionising radiation. There were two cases where amendments to the radiology request may have been required (for example, additional radiographic images). Other evaluations in this area have identified inappropriate ionising radiation prescribing rates ranging from 1.5% to 13.2% (Benger *et al.* 2002, Sakr *et al.* 1999). The variation in the error rates in previous studies compared to this evaluation may be due to methodological differences used in the evaluation as well as the range of radiographic examinations assessed. This study is the only evaluation that we know of to use paired

reviewers who are also active in the real-world clinical environment and, it is argued, represents a reliable evaluation of nurse prescribing of ionising radiation embedded in clinical practice.

This audit also included a review of the treatment plans written by nurses working in advanced roles who have responsibility for managing and treating patients within their speciality. Although in Ireland, it is beyond the scope of practice for nurse prescribers to interpret radiographic examinations to inform treatment plans, internationally this is normative practice and part of the education preparation for people working in advanced practice roles (Lee *et al.* 2013, Sakr *et al.* 199, 2002, Free *et al.* 2008). A number of international studies have examined the ability of nurse practitioners to provisionally interpret radiological investigations following appropriate education. All these studies concluded that nurse practitioners were as competent as junior doctors or radiologists in correctly interpreting radiographic examinations. The interpretation error rate identified internationally ranged from 0.7% to 9% (Benger *et al.* 2002, Sakr *et al.* 2002, Free *et al.* 2009, Lee *et al.* 2013). In the current evaluation the ability to interpret radiological investigations was not assessed; however, treatment plans written by practitioners working in advanced roles were deemed appropriate in 85% of patient records reviewed. There was only one record where the advice given was queried as being appropriate; in the remaining cases there was insufficient information available to allow the reviewers to make a decision on the appropriateness or otherwise of the care plan.

The majority of documented patient consultations were assessed as being of a good quality. There were a very small proportion of consultations (n = 13) where the rationale justifying the prescribing decision was not well articulated. In these cases nurse prescribers of ionising radiation did not distinguish between the patient history and the purpose of the radiographic examination; for example the nurse prescriber provided details of a fracture without clarifying the need to check alignment following surgical intervention; in another case reviewed the patient's general diagnosis was given rather than the specific reason for the radiographic examination. Other inaccuracies identified related to inappropriate use of abbreviations, spelling and grammatical errors and use of lay language when describing anatomical sites. The detail recorded by triage and other nurses was variable, especially in relation to the physical examination and anatomical detail of the trauma site documented in both the health care records and radiological request forms. Sakr *et al.* (1999), in one of the few high quality studies in this field using a randomised control trial identified that 76% of nurse patients consultations were

accurate compared to 55% of junior doctors consultations; however, junior doctors made fewer important errors in physical examination (2.7%) compared to nurses (3.7%). No studies were identified from Ireland where nurse and doctor consultations are compared. It was also identified that there was variability in the extent to which pregnancy status of women of childbearing years was recorded on the radiology request forms. It is recommended that the importance of recording pregnancy status of women, regardless of the radiographic examination prescribed, be highlighted in preparation education programmes and audit of prescribing of ionising radiation practice. As S.I. No. 478/2002 - European Communities (Medical Ionising Radiation Protection) Regulations (Government of Ireland 2002) states:

In the case of a female of childbearing age, the prescriber, the practitioner the radiographer... shall inquire whether she is pregnant, or breast feeding if relevant, and shall record her answers in writing.

In addition, educational preparation programmes and audits should highlight the importance of recording the last menstrual period of a woman of childbearing years when radiographic examinations are prescribed between the diaphragm and symphysis pubis (RPII 2010).

It is recommended that the errors and inaccuracies identified in a small number of patient consultations and radiology request forms completed by nurse prescribers of ionising radiation should be addressed through education and on-going reviews of practice. Documentation completed by nurse prescribers of ionising radiation should clearly reflect the rationale and purpose of radiological investigation prescribed. Abbreviations in prescriptions for ionising radiation should be avoided as much as possible. It is recommended that in education programmes preparing nurses to prescribe ionising radiation, course participants are referred to the HSE (2010) document: *Health Service Executive Code of Practice for Healthcare Records: Abbreviations*.

Therefore, it is recommended that Local Implementation Groups will identify and support expanding the scope of nurse prescribing of ionising radiation to include the implementation of audit of prescribing practice, at agreed intervals, as a means of quality and safety assurance and improvement.

The competency of nurses in taking a patient history, conducting a physical assessment and documenting care is an important requirement for patient safety. Nurses who prescribe ionising radiation may have varying degrees of competency in these areas

depending on their clinical background and prior education, which may have included specific advanced patient assessment skills. This heterogeneity in physical assessment skills needs to be reflected in the education preparation programmes for all expanded roles including ionising radiation. The *National Independent Evaluation of the Nurse and Midwifery Prescribing Initiative* (Drennan *et al.* 2009) included recommendations for additional supports and on-going competency development in the area of enhancing the skills of physical assessment.

Therefore, it is recommended that all providers of preparatory educational programmes for prescribing practice will enhance the content and experiential learning related to physical assessment in educational programmes with due recognition of prior learning and level of clinical experience of nurses on the programme.

In addition to standardised baseline competencies in areas such as patient history taking, physical assessment and documentation, expanded roles, such as nurse prescribing of ionising radiation, need to be supported by on-going continuing professional development and regular audits of practice. Opportunities for multidisciplinary education and review of practice with input from the radiology department should be a central part of practice to ensure patient safety and high quality care as well as supporting inter-professional communication (Freij *et al.* 1996, Lee *et al.* 2013, Rowe *et al.* 2011).

The audit identified a number of areas that require clarification and guidance. The unique prescriber identifier was difficult to detect on some electronic records audited. It is recommended best practice that the consultant physician with overall responsibility for patient management is identified on the radiology request form (HSE 2009); however, the actual prescriber also needs to be clearly identifiable. Radiology request forms need to ensure this information is captured to avoid practices whereby a prescriber may prescribe ionising radiation using another colleague's (usually a medical practitioner's) unique prescribing number. In all instances, the person responsible for prescribing ionising radiation should be identifiable on radiology request forms, both handwritten and electronic. Practices whereby a nurse prescriber may prescribe ionising radiation using another colleague's unique prescribing number should be reviewed.

Therefore it is recommended that the National Advisory Group Engage with key stakeholders to ensure that Radiology Information Systems (RIS) support the identification of nurse prescribers of ionising radiation.

There were a small proportion of cases reviewed where no documentation of the nurse-patient consultation was identified. This mainly occurred in OPD follow-up clinics where the radiological investigation had been pre-identified by the initial treating medical physician. It is not clear if nurses prescribing under these circumstances can be truly considered 'autonomous' and perhaps prescribing under protocol arrangements may more accurately reflect their current practice. At the very least there is a need to clarify the minimum expected documentation required by nurses working in such clinics.

The lowest rate of documentation completion concerned the recording of whether the patient had previously had a radiographic examination; this information tended not to be recorded in both the patient consultation documentation and radiology request forms. This is an important step in justification of the prescribing decision and a specific legal requirement relating to clinical responsibility of prescribers 'providing existing radiological information and/or records to other practitioners and/or prescribers' (Legislation SI478, Government of Ireland 2002). The audit findings suggest that documenting this information needs to be emphasised in education preparation programmes as part of a patient history. It is also possible that radiology request forms, especially electronic forms, can be redesigned to ensure the compulsory capture of this information.

Through conducting pre-audit site preparation visits and communication with potential eligible sites as well as confirmed by the results of this evaluation, there was variability in the operationalisation of nurse prescribing of ionising radiation by different healthcare providers. This variability was seen in local operational policies that regulated whether or not nurses could become active prescribers following completion of the prescribing course and the range of body sites nurses were allowed to prescribe ionising radiation for. A number of hospital implementation committees adopted HSE guidelines while others imposed a more restrictive range of sites that nurses were allowed to prescribe ionising radiation for, even among ANP/CNS practitioners.

Another feature of the administration of this initiative identified by pre-site visits and confirmed by the results of this evaluation was the role and cost-benefit of the national

ionising radiation prescribing database. The database provides information on overall number of nurse prescribers and the volume of activity. However, it is time consuming for front-line practitioners to accurately maintain. The introduction of the national NIMIS electronic system may negate the need for an alternative monitoring system. The administration burden on front line staff and the impact on patient services should be examined, especially for nurses with dual ionising radiation and medicine prescribing authority; this requires prescribers to manually enter their activity on two separate national databases.

Therefore it is recommended that the National Advisory Group will consider amalgamating the governance and administration of all nurse and midwife prescribing initiatives i.e. medicinal products and X-Ray prescribing and specifically review the continued use of the database considering the national rollout of NIMIS.

9.5 Evaluation of the Professional Practice of Prescribers of Ionising Radiation

The majority of respondents, who had completed an educational programme preparing them to prescribe ionising radiation, described themselves as 'frequent' prescribers; only a small number of respondents reported that they were prescribing 'infrequently' (less than once a month). Those who were prescribing occasionally or infrequently reported limitations placed on their prescribing practice as reasons why the numbers of requests for radiographic imaging was low. Of those who were prescribing frequently over half were prescribing 20 or more episodes of ionising radiation per week with 1 in 10 prescribing 40 or more episodes.

The majority of respondents reported that they were limited in some areas in the extent to which they could prescribe ionising radiation. The main limitation reported by nurses related to prescribing ionising radiation for children. Other respondents were also restricted in the anatomical sites they could request X-Rays for due to restrictions placed on their practice by local policies and guidelines. Respondents at advanced nurse practice level reported that they were also limited in their practice due to the requirements that only general radiography could be requested and identified other forms of imaging that they should be permitted to prescribe related to their advanced practice role.

The vast majority of respondents reported that they could prescribe ionising radiation safely and effectively and that they felt confident in the education and training they had received to practice effectively. Awareness of scope of practice was also high; however, a large proportion of respondents reported that the scope in which they were required to work limited their prescribing practice.

In most areas the evaluation found that the prescribing initiative has had a positive impact on the care that could be offered to patients, the professional development of nurses and respondents' overall level of job satisfaction. In addition, respondents reported that the prescribing initiative had impacted positively on their professional autonomy; however, a majority of respondents also reported that undertaking the role of prescribing ionising radiation had led to increased workloads. Although workloads had increased, the majority of respondents reported that the prescribing of ionising radiation had led to a better use of their skills without negatively impacting on their core nursing role.

One area in particular highlighted in the responses of nurse prescriber of ionising radiation was the positive impact the initiative had on the access patients had to treatment and their overall care. Respondents identified convenience for patients, reducing delays in initiating treatment and enabling patients to access care quicker as the most positive outcomes of nurse prescribing of ionising radiation.

Levels of support received from nurse prescribers of ionising radiation for their role from other healthcare professionals was reported as being high. In particular respondents were in agreement that they received particularly high levels of support from medical colleagues, radiographers and nursing colleagues. High levels of support were also noted as being provided by nursing management, the Local Implementation Group and their prescribing mentor.

The majority of respondents identified that they undertook informal forms of CPD such as keeping up-to-date through professional journals and informal sessions with clinical colleagues. In relation to formal continuing professional development, the majority of nurse prescribers of ionising radiation reported that they had not undertaken formal CPD since they completed their prescribing of ionising radiation preparation programme. The areas in which respondents identified that they required further, on-going education included: advanced physical assessment, anatomy training, legislation related to the prescribing of ionising radiation and radiation safety. All nurse prescribers should

maintain their professional competence in prescribing of ionising radiation on an on-going basis. Nurse prescribers of ionising radiation should also keep a record of all formal and informal continuing professional development activities associated with their role. National and local education initiatives to support formal CPD in ionising radiation prescribing, especially in relation to radiation safety updates should also be considered.

Therefore, it is recommended that nurse prescribers of ionising radiation will identify their continuing professional development needs and access relevant education/development activities (local or national) that will maintain and enhance their competence as prescribers. The National Advisory Group will arrange for nurse prescribers to identify continuing professional development needs and facilitate the provision of relevant education where it is not available locally. In addition, nurse prescribers of ionising radiation will maintain records of continuing professional development relevant to their role in prescribing ionising radiation as they do for other areas of practice.

The evaluation also explored reasons why nurses who had completed the education programme were not currently prescribing ionising radiation. On average, respondents who were not prescribing were 2 years post completion of the preparation programme. Reasons for not prescribing were found under three main areas: 1) delays at hospital/Local Implementation Group level, 2) delays in prescribers receiving their PIN number to access the prescribing of ionising radiation database and, 3) 'other' reasons. The principal reasons at hospital/LIG level included: no policy developed at hospital level, withdrawal of support at hospital level for nurses to prescribe ionising radiation, resistance to the initiative from individual healthcare professionals at hospital level and, disbandment of the LIG.

Therefore, it is recommended that Local Implementation Groups will put into place processes to ensure the timely introduction of nurse prescribers of ionising radiation into their healthcare organisation.

Overall, despite some issues at local levels, nurse prescribing of ionising radiation has been successfully implemented and is well supported by the nursing, medical and radiography professions. It is evident from the majority of nurses who are currently prescribing ionising radiation that it is having a positive impact on the quality of care they can deliver to patients and on their professional practice.

9.6 Limitations to the role of Nurses Prescribing Ionising Radiation

The evaluation identified that there is variability in how the initiative is being implemented in clinical sites and departments. This is leading to inconsistencies in how nurses are practicing in relation to the prescribing of ionising radiation. This is particularly the case in relation to the anatomical sites nurses are permitted to prescribe ionising radiation for. This was identified as limiting the effective operation of nurse prescribing of ionising radiation in a number of clinical settings. ANPs in particular identified that they would like to request other forms of ionising radiation and imaging above that outlined in the *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray)* (HSE 2009). These included computerised tomography, ultrasound, and coronary angiography.

Therefore, it is recommended that Local Implementation Groups will identify and support the expansion of the scope of nurse prescribing of ionising radiation to include an expanded list of additional imaging views guided by service need that may be requested by nurses already prescribing within their services. In addition, it is recommended that, where necessary, nurse prescribers of ionising radiation develop the evidence base to expand their scope of prescribing ionising radiation practice where there is a service need.

Another consistent limitation to practice was the ability of nurses to prescribe X-Rays for children. This, it was reported, was limiting the care that could be provided for children, especially those attending emergency departments. There is limited evidence on the safety of nurse prescribing of ionising radiation for children. One paper, published from an Australian study, concluded that nurses can safely and effectively request radiographic examinations for children with isolated limb injuries (Puckridge *et al.* 2010). Based on the results of this evaluation, there is a need to extend nurse prescribing of ionising radiation to children. This will require extra education and training for those taking on this role. It is envisaged that education programmes would encompass existing core education in addition to supplementary dedicated paediatric knowledge related to prescribing ionising radiation to those who have the care of children in their scope of practice.

Based on these findings, it is recommended that the National Advisory Group will expand the governance and education programme(s) to include the prescribing of ionising radiation for children guided by service need and by the *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising*

Radiation (X-Ray) (An Bord Altranais 2008). In addition, Local Implementation Groups will identify and support the expansion of the scope of nurse prescribing of ionising radiation to include the prescribing of ionising radiation for children guided by service need. It is further recommended that all providers of preparatory educational programmes for prescribing practice will incorporate education on prescribing of ionising radiation for children and facilitate additional preparation for nurse prescribing of ionising radiation for children for those nurses already prescribing for adults where it is required within their service.

Another barrier identified was the resistance of some healthcare professionals to nurse prescribing of ionising radiation being introduced and facilitated in healthcare settings. It was evident from the results of the stakeholder component of the evaluation that there is some resistance to nurse prescribing of ionising radiation from radiographers and, to a lesser extent, from the medical profession. In some cases this was found to be restricting the practice of nurses and the effective role out of the nurse prescribing of ionising radiation in clinical practice.

9.7 Prescribers of Ionising Radiation Evaluation of their Educational Programme

Overall, the educational programmes completed by nurses to prepare for the prescribing of ionising radiation were positively evaluated and courses were found to have impacted on respondents' overall ability to safely and appropriately prescribe ionising radiation. Respondents reported that they had gained significantly in ability and understanding in all areas of the programme that were measured. The greatest gains in terms of increased understanding and ability were noted in areas particular to ionising radiation such as understanding dosimetry, radiation biology and the principles of ionising radiation. In addition, respondents gained substantially on areas related to the legal and ethical aspects of prescribing.

Overall, nurses who completed the programmes reported high levels of satisfaction with the quality of the educational processes. Results were found to be comparable to a previous evaluation of educational programmes preparing nurses to prescribe medication (Drennan *et al.* 2009). In particular, areas that were highly evaluated included the level of support provided by the course participant's clinical mentor, the extent to which participants were prepared for prescribing practice, and the overall satisfaction with the programme of study. There was variability, however, in responses related to course participants' levels of satisfaction with feedback, assessment processes and workload.

In conclusion, the educational preparation programmes, guided by the An Bord Altranais *Requirements and Standards for Education Programmes for Nurse Prescribing of Ionising Radiation (X-Ray)* (2008), were positively evaluated, however there are areas where further work is needed, not least in providing students with feedback on their assessment process and the management of course workloads. It is evident that the education delivered through these programmes had a positive impact on student learning and led to substantial change in course participants' ability to prescribe ionising radiation. It is also evident from the overall findings that course participants received excellent clinical mentorship and that the education programmes were well designed and organised. Finally, the evaluation identified that the programmes met the guidelines outlined in the document *Requirements and Standards for Education Programmes for Nurse Prescribing of Ionising Radiation (X-Ray)* (An Bord Altranais 2008).

Therefore, it is recommended that all providers of preparatory educational programmes for prescribing practice will incorporate the implications of the findings of this national evaluation into their programmes to ensure continued best practice by those undertaking the programme.

9.8 Patients' Evaluation of Nurse Prescribing of Ionising Radiation

Patients surveyed were highly satisfied with the care they received from nurses who prescribed ionising radiation and all patients surveyed were of the opinion that nurses should be involved in requesting radiographic examinations. Patients also reported that they received comprehensive education and advice from the nurse on the radiological process; however a small proportion of respondents (17.2%) reported that they would like to have received more information on the radiographic examination that was requested. Waiting time was also perceived by respondents to have been positively impacted upon with the vast majority of patients reporting that it had reduced the time they spent waiting for treatment. Previous studies have also identified that nurse requesting of radiographic examinations, particularly in emergency departments, substantially reduces patients' waiting times (Kec *et al.* 2003, Free *et al.* 2009). Previous studies that have measured the impact of nurses requesting radiographic examinations in emergency departments have reported that waiting times have improved from between 19 minutes (Lee *et al.* 1996) to 46 minutes (Kelly *et al.* 1995). Although actual time of the patients journey through a department was not measured in this study, patients self-reports identified that their waiting times had been positively been impacted upon. The

majority of respondents also reported that they were asked for information by the nurse prior to their radiographic examination on medical history, current medications and allergies; however, 41% reported that they were not asked for information on their previous family history.

Overall satisfaction with the consultation process was high with the majority of patients surveyed of the opinion that the nurse who prescribed their ionising radiation was comprehensive in the provision of care, listened to their concerns and treated them as a person. Patients were also generally satisfied with the time the nurse spent with them during the consultation process; however some patients, especially those reporting poorer health, would like to have had more time with the nurse. Overall there were high levels of support for the prescribing initiative with the vast majority of patients in favour of nurses prescribing ionising radiation. Patients were also highly satisfied with the care and advice provided to them by nurse prescribers of ionising radiation.

Therefore, it is recommended that there should be public/patient involvement on the National Advisory Group. This will allow the public and patients bring their experience of healthcare to inform decision on services that will directly affect them and the care they receive from nurse prescribers of ionising radiation.

9.9 Stakeholders' Evaluation of Nurse Prescribing of Ionising Radiation

Stakeholders, who were identified as all those who have contact with or would have good knowledge of prescribing of ionising radiation, were surveyed on their attitudes and perceptions of the initiative. Stakeholders included nurses, medical practitioners, radiographers, academics and those working in policy and regulation.

Overall, there was a general consensus among stakeholders that the introduction of nurse prescribing of ionising radiation had had a positive impact on patient care and that the initiative was meeting the needs of patients in accessing care. There was also support for the safety of the initiative with the majority of healthcare professionals and key stakeholders surveyed identifying that nurses had the knowledge to correctly prescribe ionising radiation and had received adequate training for their role. The majority of stakeholders surveyed were also of the view that the prescribing of ionising radiation should be extended beyond the remit of the medical profession, that there was a need for

more nurses to prescribe ionising radiation and that overall the introduction of the initiative had been a success.

Although healthcare professionals and respondents from education, regulation and policy were overall supportive of the initiative, there was variability in responses according to the professional group of the respondent. Nurse respondents tended to hold stronger positive attitudes towards nurse prescribing of ionising radiation when compared to their medical or radiographic colleagues. Although the majority of all professional groups surveyed (nurses, medical practitioners, radiographers, education/regulation/policy respondents) were positive about the introduction of nurse prescribing of ionising radiation, levels of support were slightly lower amongst respondents from the medical profession and, in some areas, significantly lower among radiographer respondents. For example, while the vast majority of nurses and over two-thirds of medical practitioners were in agreement that nurse prescribing of ionising radiation met the needs of patients, only half of radiographers were in agreement. In addition, while the vast majority of nurses and medical practitioners reported that they trusted nurses to prescribe medical ionising radiation correctly, there was variability in the responses of radiographers with 42% in agreement compared to 37% disagreeing. Similarly, while the majority of nurses and medical practitioners agreed that nurses had the necessary knowledge to prescribe ionising radiation, there was a high level of variability in the responses from radiographers. The majority of radiographers disagreed that there was a need for more nurse prescribers of ionising radiation; however, the vast majority of nurse respondents and over two-thirds of medical practitioners were in agreement that there was a need to extend the prescribing of ionising radiation to more nurses. It should be noted that overall, respondents were generally in favour of the initiative, with the majority from each of the professions in agreement that the introduction of nurse prescribing of ionising radiation had been a success.

Respondents who worked closely with a nurse prescriber were specifically asked a number of questions pertaining to nurse prescribing of ionising radiation in clinical practice. Overall, clinical stakeholders reported that the introduction of nurse prescribing of ionising radiation had reduced delays in initiating the care delivered to patients, that it was more convenient for patients and that it enabled patients access treatment quicker. However, it should be noted that while the majority of medical practitioner and radiographer respondents agreed that nurse prescribing of ionising radiation had reduced delays in initiating treatment for patients, over a third of respondents from these

professional groups disagreed that this had occurred. However, there was a consensus amongst the majority of the three professional groups surveyed that the introduction of nurse prescribing of ionising radiation had enabled patients to access treatment quicker.

There was consensus amongst clinical stakeholders that the extension of prescribing ionising radiation to nurses had freed up doctors' time and, in addition, it did not impact negatively on nurse prescribers' time. Although the majority of medical practitioners perceived that supervising a nurse prescriber of ionising radiation was not, overall, a burden on their workload, a quarter reported that supervision had added to their workload.

Overall, the vast majority of nurses who worked closely with nurse prescribers of ionising radiation were in agreement that the introduction of the initiative had a positive impact on inter-professional relationships. The majority of medical practitioners and radiographers surveyed were also in agreement, however, levels of support were much lower compared to nurse respondents. In particular, a third of radiographers who worked closely with nurse prescribers of ionising radiation disagreed that the initiative had had a positive impact on inter-professional relationships. Despite this variation, the vast majority of nurses reported that nurse prescribers of ionising radiation were well supported in their role by medical practitioners and radiographers.

Finally, it was identified that respondents who were members of health care providers' Local Implementation Groups held strong positive attitudes towards the impact of nurse prescribing of ionising radiation on patient care. The vast majority agreed that the initiative provided a good service for patients, that it had a positive impact on patient care and, in particular that it enabled patients to access treatment quicker. Overall, three quarters of respondents who were members of Local Implementation Groups were in agreement that the introduction of nurse prescribing of ionising radiation had been a success.

From the results identified in the evaluation relating to the perceptions of clinical stakeholders towards nurse prescribing of ionising radiation, it is recommended that the National Advisory Group disseminate the results of the evaluation to key stakeholders in nursing, medicine, radiography, education, regulation and policy. This will provide stakeholders with an evidence base on the effectiveness of the initiative. It has been demonstrated that when healthcare professionals develop an understanding of new roles

in healthcare, it enhances the successful establishment of these roles (Hoskins 2011). It has further been identified that a lack of understanding of professional roles can lead to less effective patient outcomes and ineffective communication between healthcare professionals. The development of networks at local and national level of nurse prescribers of ionising radiation, medical practitioners and radiographers should also be formed to enhance collaborative working and develop an understanding of the roles of healthcare professionals involved in delivering ionising radiation for patient care. Engagement with healthcare professionals who are resistant to the introduction or development of nurse prescribers of ionising radiation should also be undertaken by key stakeholders within the HSE who are responsible for the governance of the nurse prescribing of ionising radiation initiative.

Therefore, it is recommended that the National Advisory Group will arrange for the national dissemination and communication of this report to relevant stakeholders.

9.10 Conclusion

The evaluation of the HSE (2009) *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray) in Ireland* used multiple methods and approaches to measure the effectiveness of the initiative in practice. This is the first major evaluation of nurse prescribing of ionising radiation published internationally as well as being the first to comprehensively undertake an evaluation of this role in nursing using multiple approaches.

The effectiveness of the practice of nurse prescribers of ionising radiation was highlighted in the results from the audit phase of the evaluation where it was found that the radiological investigations requested by nurse prescribers of ionising radiation were appropriate based on the patient's history and/or physical examination. There were some issues identified in a minority of prescriptions for ionising radiation such as the inappropriate use of abbreviations or inexact identification of anatomical sites; however, overall, ionising radiation prescribing decisions were appropriate and radiology request forms were accurately completed.

Patients who came into contact with a nurse prescriber of ionising radiation were highly satisfied with the care they received. There were high levels of agreement among patients who responded to the survey that nurses should be involved in prescribing

ionising radiation. In addition, patients reported that they received comprehensive education and advice and that receiving a request for a radiographic examination from a nurse had reduced the time they spent waiting for treatment. The majority of patients surveyed were also of the opinion that the nurse who prescribed their ionising radiation was comprehensive in their care, listened to their concerns and treated them as a person. This component of the evaluation found that patients reported that they were receiving care that was of a high quality and that nurse prescribing of ionising radiation had also facilitated their access to timely treatment and care.

A variety of stakeholders were surveyed from the nursing, medical and radiography professions. In addition, stakeholders from education, regulation and policy were also involved in the evaluation of the initiative. Overall there were good levels of support for the initiative with the majority of stakeholders reporting that the introduction of nurse prescribing of ionising radiation had had a positive impact on patient care as well as meeting the clinical the needs of patients. There was also support for the safety of the initiative with the majority of healthcare professionals and key stakeholders surveyed identifying that nurses had the knowledge to correctly prescribe ionising radiation and that they had received adequate training for their role. The majority of clinical stakeholders surveyed also reported that the prescribing of ionising radiation should be extended beyond the remit of the medical profession and that, overall, the introduction of the initiative had been a success. However, attitudes towards, and perceptions of nurse prescribing of ionising radiation were variable according to the professional group surveyed. Although radiographers surveyed were overall supportive of the introduction of nurse prescribing of ionising radiation, this cohort tended to report more negative views on aspects of the initiative when compared to the nursing or medical professions. Negative perceptions generally related to the extent to which nurses had the necessary knowledge to safely prescribe ionising radiation and the degree to which radiographer respondents trusted nurses to prescribe ionising radiation correctly. Although the majority of radiographer respondents agreed that the introduction of nurse prescribing of ionising radiation had been a success, levels of agreement were significantly lower than other health care professional cohorts surveyed. However, despite the variation amongst stakeholders on the merit of nurse prescribing of ionising radiation, the vast majority of nurse prescribers reported that they were well supported in their role by both medical and radiographer colleagues.

Overall the evaluation found that the educational programmes preparing nurses to prescribe ionising radiation were evaluated positively in terms of their adherence to An Bord Altranais *Requirements and Standards for Education Programmes for Nurse Prescribing of Ionising Radiation (X-Ray)* (2008). In effect, the evaluation found that the education programmes ensured that programme participants' were effectively and competently prepared to practice as nurse prescribers of ionising radiation.

It was evident from the results of the evaluation that the introduction of the initiative had had a positive impact on the professional role of nurse prescribers of ionising radiation. Nurses reported that they felt confident in their ability to prescribe ionising radiation and that it had greatly improved the quality of care they could provide to patients. In particular, respondents reported that their ability to prescribe ionising radiation had reduced delays in initiating treatment for patients as well as enabling patients to access care quicker.

Although the majority of nurses surveyed were actively prescribing, a number of respondents identified that there were limitations that were negatively impacting on their prescribing practice. The principal limitations to practice were identified as the inability to prescribe ionising radiation for children and a restriction on the number of anatomical sites that nurses were permitted to request imaging for.

In conclusion, the evaluation identified that the introduction of nurse prescribing of ionising radiation has had a positive impact on patient care. It is also evident that nurses have been well prepared for their role and are prescribing ionising radiation safely, and effectively. In addition, radiological investigations requested by nurse prescribers were identified to be appropriate based on the patient's history. Similarly the identification of the site for radiographic examination, provisional diagnosis and clinical information supplied to radiographers were identified as being of a high standard. Patient management plans were generally well articulated; especially the more extensive plans written by nurses working in advanced practice roles. There are issues in relation to the continuing development and expansion of the role, not least in relation to perceptions and barriers identified in this report. The greatest benefit of the initiative has been the impact it has had on facilitating patients access treatment and care in an equitable and timely manner. The results of this evaluation should be used to further develop and support nurse prescribing of ionising radiation.

9.11 Recommendations

Conclusive Finding and General Recommendation

This evaluation has found that overall nurse prescribing of ionising radiation is safe and that the prescriptions for ionising radiation were appropriate.

The evaluation recommends that the development and implementation of nurse prescribing of ionising radiation continue and be further supported and strengthened through the implementation of the recommendations outlined below.

Governance

1. The National Advisory Group will expand the governance and education programme(s) to include the prescribing of ionising radiation for children guided by service need and by the *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (X-Ray)* (An Bord Altranais 2008).
2. The National Advisory Group will consider amalgamating the governance and administration of all nurse and midwife prescribing initiatives i.e. medicinal products and X-Ray prescribing.

And specifically:

- a. Review the continued use of the database considering the national rollout of NIMIS.
 - b. Engage with key stakeholders to ensure that Radiology Information Systems (RIS) support the identification of nurse prescribers of ionising radiation.
3. The National Advisory Group will review the *Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray) in Ireland* to reflect the implications of findings and the recommendations of this evaluation report.
 4. The National Advisory Group will arrange for the national dissemination and communication of this report to relevant stakeholders.
 5. Local Implementation Groups will identify and support expanding the scope of nurse prescribing of ionising radiation to include:
 - a. Prescribing of ionising radiation for children guided by service need.
 - b. An expanded list of additional imaging views guided by service need that may be requested by nurses already prescribing within their services.
 - c. The implementation of audit of prescribing practice at agreed intervals as a means of quality and safety assurance and improvement.
 - d. Put into place processes to ensure the timely introduction of nurse prescribers of ionising radiation into their healthcare organisation.

Prescribing Practice

1. All nurses prescribing ionising radiation will incorporate the implications of the findings of this national evaluation into their practice.

And specifically:

- a. Regularly engage in audit of their practice of prescribing ionising radiation.
- b. Develop the evidence base to expand their scope of prescribing ionising radiation practice where there is a service need.

Educational Preparation for Prescribing Practice

1. All providers of preparatory educational programmes for prescribing practice will incorporate the implications of the findings of this national evaluation into their programmes to ensure continued best practice by those undertaking the programme.

This includes:

- a. Design and development of preparatory educational programme(s) that:
 - i. Incorporate education on prescribing of ionising radiation for children.
 - ii. Facilitate additional preparation for nurse prescribing of ionising radiation for children for those nurses already prescribing for adults where it is required within their service.
- b. Enhancing the content and experiential learning related to physical assessment in educational programmes with due recognition of prior learning and level of clinical experience of nurses on the programme.

Continuing Professional Development

1. Nurse prescribers of ionising radiation will identify their continuing professional development needs and access relevant education/development activities (local or national) that will maintain and enhance their competence as prescribers. Services will facilitate the provision of, and access to, relevant education and development activities.
2. Nurse prescribers of ionising radiation will maintain records of continuing professional development relevant to their role in prescribing ionising radiation as they do for other areas of practice.

Public/Patient Involvement

1. It is recommended that there should be public/patient involvement with the National Advisory Group. This will allow the public and patients bring their experience of healthcare to inform decision on services that will directly affect them and the care they receive from nurse prescribers of ionising radiation.

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