CORA Cork Open Research Archive
Cartlann Taighde Oscailte Chorcaí

Title	Nurses', physicians' and radiographers' perceptions of the safety of a nurse prescribing of ionising radiation initiative: A cross-sectional survey
Authors	Hyde, Abbey;Coughlan, Barbara;Naughton, Corina;Hegarty, Josephine;Savage, Eileen;Grehan, Jennifer;Kavanagh, Eoin;Moughty, Adrian;Drennan, Jonathan
Publication date	2016-01-30
Original Citation	Hyde, A., Coughlan, B., Naughton, C., Hegarty, J., Savage, E., Grehan, J., Kavanagh, E., Moughty, A. and Drennan, J. (2016) 'Nurses', physicians' and radiographers' perceptions of the safety of a nurse prescribing of ionising radiation initiative: A cross-sectional survey', International Journal of Nursing Studies, 58, pp. 21-30. doi: 10.1016/j.ijnurstu.2016.01.004
Type of publication	Article (peer-reviewed)
Link to publisher's version	10.1016/j.ijnurstu.2016.01.004
Rights	© 2016 Elsevier Ltd. All rights reserved. This manuscript version is made available under the CC-BY-NC-ND 4.0 license. - https://creativecommons.org/licenses/by-nc-nd/4.0/
Download date	2026-10-06 17:53:42
Item downloaded from	https://hdl.handle.net/10468/5283

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Preprint

Hyde A, Coughlan B, Naughton C, Hegarty J, Savage E, Grehan J, Kavanagh E, Moughty A, and Drennan J (2016) Nurses', Physicians' and Radiographers' Perceptions of the Safety of a Nurse Prescribing of Ionising Radiation Initiative: A Cross-Sectional Survey. *International Journal of Nursing Studies.*

Accepted for publication 19th January 2016

NURSES', PHYSICIANS' AND RADIOGRAPHERS' PERCEPTIONS OF THE SAFETY OF A NURSE PRESCRIBING OF IONISING RADIATION INITIATIVE: A CROSS-SECTIONAL SURVEY

Abstract

Background: A new initiative was introduced in Ireland following legislative changes that allowed nurses with special training to prescribe ionising radiation (X-ray) for the first time. A small number of studies on nurse prescribing of ionising radiation in other contexts have found it to be broadly as safe as ionising radiation prescribing by physicians. Sociological literature on perceptions of safety indicate that these tend to be shaped by the ideological position of the professional rather than based on objective evidence.
Objectives: To describe, compare and analyse perceptions of the safety of a nurse prescribing of ionising radiation initiative across three occupational groups: nursing, radiography and medicine.
Design: A cross-sectional survey design.
Settings: Participants were drawn from a range of clinical settings in Ireland.
Sample: Respondents were 167 health professionals comprised of 49 nurses, 91 radiographers, and 27 physicians out of a total of 300 who were invited to participate. Non-probability sampling was employed and the survey was targeted specifically at health professionals with a specific interest in, or involvement with, the development of the nurse prescribing of ionising radiation initiative in Ireland.
Methods: Comparisons of perspectives on the safety of nurse prescribing of ionising radiation across the three occupational groups captured by questionnaire were analysed using the Kruskal Wallis H test. Pairwise post hoc tests were conducted using the Mann Whitney U test.
Results: While the majority of respondents from all three groups perceived nurse prescribing of ionising radiation to be safe, the extent to which this view was held varied. A higher proportion of nurses was found to display confidence in the safety of nurse prescribing of ionising radiation compared to physicians and radiographers with differences between nurses' perceptions and those of the other two groups being statistically significant.
Conclusion: That an occupational patterning emerged suggests that perceptions about safety and risk of nurse prescribing of ionising radiation are socially constructed according to the vantage point of the professional and may not reflect objective measures of safety. These findings need to be considered more broadly in the context of ideological barriers to expanding the role of nurses.

Pre-proof

Key words: Ionising radiation; Ireland; medicine; nurse prescribing; professions; expanded role.

Background

The extension of the nursing roles in recent years has sometimes cross-cut the area of expertise of other health professions such as medicine, pharmacy and radiography. A recent initiative in Ireland legitimated the prescribing of medical ionising radiation (X-rays) by specially prepared nurses and expanded their role by allowing them to prescribe X-rays, but not to interpret them (Health Service Executive 2009). In terms of professional boundary transitions, it straddled into what was previously a medical role since physicians had heretofore exclusive prescribing authority in this realm. The initiative 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 two documents, namely, *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)* (Health Service Executive 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.

The nurse prescribing of ionising radiation initiative referred to above was recently subjected to audit and evaluation (NPIRIEval) (Authors[1] *et al.* 2014), including a survey of key stakeholders' perspectives on the initiative. In this article, we report on a component of this survey, namely, the extent to which nurses, physicians and radiographers deemed the prescribing of ionising radiation by nurses to be safe. Before reviewing what is known already about the safety of nurse prescribing of ionising radiation, including *perceptions* of safety and risk, we first synthesise literature on professional role boundaries, since our analysis focuses on comparing perceptions of risk and safety across three occupational groups with implications for professional roles and disciplinary knowledge.

Early classical sociological work on professions by Freidson (1970) focused on medicine's monopoly over the diagnosis and treatment of illness that afforded it a dominant position in the clinical division of labour. Freidson identified medicine as a dominant profession in view of its freedom to self-regulate and to control and monitor the work of others. Nursing by contrast was viewed as a 'semi-profession', a term coined by Etzioni (1969) in her classic analysis of professionals, to reflect nursing's lacking of authority, autonomy and a discrete body of knowledge vis-à-vis medicine. However, since the 1970s, a plethora of conceptualisations has emerged on the erosion of medicine's professional power. 'Deprofessionalisation' (loss of autonomy, monopoly over knowledge, and public respect) (Haug, 1973) and 'proletarianisation' (regulation by state control akin to other workers) (Oppenheimer, 1973) are among the most prominent of these theorisations to mediate sociological analyses of professions (see Elston and Gabe 2013). A more recently emerging

[1] Anonymised for the review process.

Pre-proof

concept to explain the replacement of physicians' traditional decision-making autonomy with procedural rules is 'professional mutation' (Adler and Kwon 2013).

Along with challenges to medicine's authority over the past few decades there has been an increasing fluidity in the healthcare division of labour in many Western countries prompting analyses of role boundaries in healthcare (King *et al.* 2015). This fluidity has, as happened in the case of the nurse prescribing of ionising radiation initiative that we report here, been enabled by government policies and initiatives that facilitate a redefinition of roles and responsibilities of those in allied health professions (King *et al.* 2015) to enhance patient care and reduce the public cost of healthcare (Fairman *et al.* 2011, Department of Health 2011). The re-definition of occupational boundaries has involved the allied health occupations taking on roles formerly undertaken by physicians. Martin *et al.*(2009) note that attempts to modernise the National Health Service in the United Kingdom (UK) through role reconfigurations have encountered resistance from professions keen to defend their territory, invoking legitimacy claims about their established knowledge and role. Role realignments are to a degree dependent on a willingness on the part of one occupation to straddle traditional boundaries and another to concede a component of its jurisdiction, which has in the past been found to lead to boundary disputes and role negotiation (Salhani and Coulter 2009).

Most of the literature on boundary shifts in the healthcare division of labour have focused on relations between medicine and nursing, eliciting various responses from these groups (Annandale 2014). In spite of some local opposition from medicine, the perspective emerging is that although medical dominance does appear to have moderated over time, it continues to have an impact and a relevance (Nugus *et al.* 2010 and Currie *et al.* 2010, Bacon and Borthwick 2013). Others have drawn attention to diversity *within* medicine, problematizing medical dominance as an overarching category by proposing that not all physicians exercise power to the same degree (Long *et al.* 2006). In a sociological analysis of empirical and theoretical scholarship on changing relations within healthcare Annandale (2014 p.185) has noted that physicians are 'happier to shed work that is considered mundane or uninteresting' such as task based duties. Notwithstanding some opposition, medicine's general acceptance of nurses taking on selected roles may have to do with the fact that the governance and the parameters of these new roles continue to be framed by senior levels within medicine (see Carmel and Baker-McClearn (2012) Currie *et al.* (2010) with reference to the UK context, and Iglehart (2013) with reference to that in the USA).

Like nursing, radiography is subject to control by medicine and is considered to be a semi-profession (Nixon 2001); however, radiography has rarely been the subject of inter-professional analyses and so very little is known on its relations with others in the healthcare division of labour. However, as far as broad directions in which the professional discourse of the radiography is moving, radiographers are being actively encouraged by their professional leaders to embrace extending their roles to respond to healthcare needs (Society of Radiographers 2013); indeed in the UK, a cohort of radiography practitioners is already undertaking supplementary prescribing of ionising radiation (Society and College of Radiographers 2012).

Preproof

One of the concerns expressed by the medical profession almost a decade ago when extended nurse prescribing (of medication rather than X-rays) was mooted in the UK, a few years ahead of the nurse prescribing initiative in Ireland (Drennan *et al.* 2009), was that of safety and risk. As Avery and Pringle (2007, p.1154) noted, the British Medical Association 'responded with dismay.' Key among the Association's concerns was that of safety about prescribing without training in diagnosis. Similar reservations about safety have been voiced by national medical organisations in the USA (Iglehart 2013) and Australia (Elsom *et al.* 2009) in relation to expanding the role of nurses into areas such as prescribing that were previously the preserve of physicians. However, the few studies comparing the safety and appropriateness of nurses' decisions in prescribing medication with those of physicians demonstrated similar or improved prescribing practices by nurse prescribers (Venning *et al.* 2000, Miles *et al.* 2002, Carey *et al.* 2008, Jones *et al.* 2011).

Returning to the issue of safety and appropriateness of nurse prescribing of *ionising radiation* (rather than the prescribing of medication), inappropriate prescribing of ionising radiation (as with medicinal prescribing) has morbidity implications for patients and cost implications for health services. It is therefore important that prescribing of ionising radiation is appropriate (and by implication safe). In measuring the appropriateness of nurse prescribing of ionising radiation, important factors to be considered are the quality of the post-registration education on ionising radiation that the nurse receives as well as the degree of seniority of the physician with whom his/her competency is being compared. A limited number of studies have been conducted internationally that provide evidence as to how nurses fare in this regard, virtually all of which have focused on emergency department nurses (Free *et al.* 2009). Sakr *et al.'s* (1999) randomised controlled trial in a UK setting compared nurses and junior physician's requests for radiography in relation to 1453 clinical cases whose decisions about radiography prescribing were subsequently reviewed by a senior emergency physician. Nurses in this study were described as 'nurse practitioners', all senior in rank and experience, and were pursuing the formal qualification for autonomous nursing practice that prevailed in England at that time. No significant differences between the groups (senior nurses and junior doctors) were found regarding the appropriateness of prescribing X-rays; however in 13% of clinical cases, nurses' requests for radiography exceeded those of an experienced physician, as did a similar proportion of the requests by junior physicians.

Other studies, albeit with smaller sizes (Benger *et al.* 2002, Fry 2002), concur with the findings of Sakr *et al.*'s (1999) research that adequately trained nurses prescribe ionising radiation to a comparable standard as emergency physicians. In a more recent study in an Australian context (Considine *et al.* 2013) the appropriateness of X-ray prescribing by nurses who had undergone a structured nurse-initiated X-ray educational programme was compared to that of nurses with no such specialist training. Results were favourably disposed to nurses who had undergone the structured training who demonstrated superior standards of documentation of patient assessment and greater accuracy and appropriateness in prescribing radiography compared to their nursing colleagues without specialist training in X-ray. This highlights the significance of factoring in the specialist education of nurses when researching the competency of nurses in prescribing X-rays.

Pre-proof

Alongside attempts at objective measures of safety and appropriateness of nurse prescribing is research into *perceptions* of risk. This research is relevant because as particular health occupations extend the boundaries of their role to undertake work requiring new knowledge and expertise, issues of boundary tension may manifest themselves as patient safety concerns. Perceptions of safety appear to be associated with the vantage point of those assessing the risk. In Cooper *et al*.'s (2008) qualitative study of nurse and pharmacists' extended prescribing (of medication), several participants reported that pharmacists' understanding of pharmacology might lend itself to safer prescribing; however, others proposed that nurses' diagnostic training enabled safe prescribing.

Perceptions of safety are also important to analyse because, as theorists De Vries and Lemmens (2006) demonstrated in relation to midwifery and obstetrics, beliefs that an occupation may have about the safety of a neighbouring profession's practices may not be rooted in unbiased 'objective' measures at all, but rather may be socially and culturally shaped by preconceived ideas about that profession or the potential threat that it poses. (De Vries and Lemmens' analysis went further in problematising the objectivity of scientific evidence by demonstrating that ostensibly unbiased researchers happen to report and frame risk in terms of what suits their own profession's ideological position.) Indeed, Freidson (1970, p.79) had earlier noted that in terms of status, 'power and persuasive rhetoric are of greater importance than the objective character of knowledge, training, and work.' This suggests that how persuasive an occupation is in convincing litigation-conscious health service managers, policy-makers, and indeed the general public that its practices are safe while those of a neighbouring occupation are less safe can give the former occupation a privileged position.

To summarise what is known already on the topic, nurses have been expanding their role into a medical jurisdiction for a number of decades, and in spite of some opposition, their expanded role has largely been accepted by medicine. Commentators have noted that medicine still has a great deal of control over the governance of the skills that junior members of its profession have shed to nurses including the skills of prescribing. Virtually no literature has been published on relations between radiographers and other health occupations. Objective measures of safety in relation to nurse prescribing of medication, and of nurse prescribing of ionising radiation have found that appropriately trained nurses fare no different from physicians as far as safe prescribing is concerned. There is also a small volume of literature that problematises notions of safety and risk; in this literature it is argued that perceptions of risk and safety are socially constructed and are framed by discourses propagated by an occupational group and have more to do with that group's ideological position than with an unbiased scientific approach. This leads us to our research question as to the extent to which nurses, physicians and radiographers deemed the prescribing of ionising radiation by nurses to be safe and whether perceptions of the safety of nurse prescribing of ionising radiation varied by virtue of one's occupational group. Before considering this question in depth, a brief account of the wider study of which the substance of this article is a part is provided for the purposes of clarity and context.

The context of the study

Pre-proof

Following the introduction of nurse prescribing of ionising radiation in Ireland in 2009, a multiphase evaluation of the initiative was conducted in 2013, funded by the Health Service Executive. The evaluation, published in a report to the funding body (Authors *et al.* 2014) comprised of:

1. A profile of nurse prescribers of ionising radiation in Ireland.
2. An evaluation of the educational preparation programme for nurse prescribing of ionising radiation.
3. An audit of nurse prescribing of ionising radiation for its appropriateness.
4. Patients' evaluation of nurse prescribing ionising radiation.
5. Stakeholders' evaluation of the nurse prescribing of ionising radiation initiative.
6. Nurses' evaluation of their role related to the prescribing of ionising radiation.

This article focuses on the fifth of these phases, namely an evaluation of the nurse prescribing of ionising radiation initiative from the perspective of professional stakeholders. This (fifth) component of the evaluation was conducted using a survey in which a range of (stakeholder) respondents' perceptions associated with nurse prescribing of ionising radiation were measured, namely their perceptions of: regulation and guidance; educational preparation; factors facilitating and inhibiting the prescribing of ionising radiation by nurses; monitoring processes; patient safety; teamwork and communication; the impact of the initiative on the work of other health professionals, quality of care and overall merit of the initiative. (Details about sample selection and instrument are provided in a later section further on.)

In order to achieve depth in the analysis, we have chosen to focus in this article on one aspect of the stakeholders' questionnaire, namely, patient safety of the initiative, captured through five items on the questionnaire. It should be noted that results in relation to the safety of the initiative cohere well with those of other domains measured by the stakeholders' questionnaire. Overall, across the range of domains measured in addition to perceptions of the safety of the initiative, 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, in keeping with results that we present forthwith about perceptions of the safety of the initiative, there was variability in levels of support for the initiative at a broad level according to the professional group surveyed.

Methods

Aims

This article aims to describe, compare and analyse perspectives on the safety of the nurse prescribing of ionising radiation initiative according to occupation affiliation of the respondent (nursing, radiography or medicine).

Sample selection

Inclusion criteria for the stakeholders' evaluation of the nurse prescribing of ionising radiation initiative was that participants be professionals with a specific interest in, or

Pre-proof

involvement with, the development of the nurse prescribing of ionising radiation initiative in Ireland with a role either in clinical practice, education, management or policy. The sample was identified by stakeholder lists held by the Health Service Executive who managed the prescribing initiative, and through contacts in the clinical area suggested by members of the Prescribing of Ionising Radiation Steering Committee. In addition, contact with key stakeholders in clinical practice also provided details of potential participants. The overall sample of stakeholders surveyed included nurses, radiographers, physicians, academics, health service managers and administrators, along with key stakeholders in each of the nursing regulatory and policy bodies.

Three hundred key stakeholders were surveyed to which 66% (n=199) responded; of those who responded 84% (n=167) clearly identified themselves as nurses, physicians and radiographers. Because the analysis reported here is concerned with the relationship between perceptions on the safety of nurse prescribing of ionising radiation and specific occupational affiliations, only those who clearly identified themselves as a member of either the nursing, medical or radiography professions (N=167) were included in the analysis in this article.

The instrument

Data on health professionals' perceptions of the safety of the nurse prescribing of ionising radiation was gleaned through a self-administered questionnaire designed to evaluate stakeholders' perceptions of the initiative. Questionnaires were distributed either by post or through online administration in 2013. The postal distribution was used in cases where the research team did not have access to the email addresses of stakeholders. Online administration was facilitated through an online survey platform; respondents were emailed a hyperlink through which to complete the survey. Postal and online versions of the questionnaire were identical. The questionnaire design was based on a previous evaluation of health professionals involved in an earlier initiative (in 2009) of nurse and midwife medicinal prescribing in Ireland (Drennan *et al.* 2009; Drennan *et al*. 2011). Pretesting of the questionnaire to ascertain the face and content validity of the instrument involved cognitive interviewing (Drennan 2003) and best practice in the design and distribution of questionnaires (Dillman 2000; Edwards *et al.* 2009). Items developed for the questionnaire were the same for each of the occupational groups surveyed allowing responses from each group of health professionals to be compared.

The questionnaire was designed to elicit respondents' views on the nurse prescribing of ionising radiation initiative by asking respondents to choose among five possible options on a Likert scale: 'strongly disagree'; 'disagree', 'no opinion'; 'agree'; 'strongly agree'. There were three sections to the questionnaire: Section One comprising 22-items was completed by all of the professionals surveyed and evaluated distinct but interrelated areas of nurse prescribing of ionising radiation including, as indicated earlier, 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 nurse prescribing of ionising radiation. After completing Section One of the questionnaire, respondents who had experienced day-to-day contact with nurse prescribers

Pre-proof

(e.g. hospital consultants, non-consultant hospital physicians, radiographers and nurses) and were therefore in a position to answer questions based on their perceptions of the actual impact of the initiative within their organisation were invited to proceed to Section Two. Section Two comprised of 17 items that focused on the impact of nurse prescribing of ionising radiation on patient care, on the role of the nurse, and on the role of other healthcare teams. The final section of the questionnaire, Section Three, collected the demographic and professional profile of the stakeholders. This included the post currently held, their extent of involvement in the nurse prescribing of ionising radiation initiative and their involvement with health care providers' Local Implementation Group, that is, a group with a role in local implementation and governance of the nurse prescribing of ionising radiation at hospital level.

Since our concern in this article is on respondents' perspectives on the safety of the nurse prescribing of ionising radiation initiative, the analysis predominantly relates to five statements on the questionnaire designed to capture this construct and to which respondents were requested to indicate their level of agreement, namely:

1. Nurse prescribing of ionising radiation increases the risk of incorrect treatment;
2. I trust nurses to prescribe ionising radiation correctly;
3. I am worried that nurses do not have the necessary knowledge to prescribe ionising radiation;
4. Nurses receive adequate training for their role;
5. Nurse prescribing of ionising radiation is safe.

Principal components analysis of the five items identified one component with an eigenvalue greater than 1 which accounted for 72.1% of the variance; all factor loadings exceed .70. This suggested that these five items measured one factor: respondents' perspectives of the safety of nurse prescribing of ionising radiation. A reliability test of the five items that made up the safety scale identified that they had an acceptable level of internal consistency with a Cronbach's Alpha of 0.90.

Statistical tests

Data presented in this article were analysed using the software package SPSS version 21.0 (IBM Corp. 2012). Comparisons of perspectives on the safety of nurse prescribing of ionising radiation across the three occupational groups (nursing, radiography and medicine) were analysed first by using the Kruskal Wallis H-test to determine if there were statistically significant differences to responses to the selected items according to occupational affiliations in combination. The choice of the Kruskal Wallis H-test was based on the fact that the distribution was not normal and the level of the items (ordinal) required a non-parametric test. On determining that there were indeed statistically significant differences across the groups, pairwise post hoc tests were conducted using Mann Whitney U for each of the possible dyads of relationships (nursing and medicine; nursing and radiography; radiography and medicine) to identify where the significant differences arose. The post hoc test level of significance was 0.017 following a Bonferroni adjustment. Effect sizes are also reported and were calculated using Pearson's correlation coefficient. Effect sizes of r = .10 were considered small; of r = .30 were considered medium and of .50 large (Cohen 1988).

Pre-proof

Results

Description of the sample

The response rate for the overall study was 199 of whom 167 clearly identified themselves as nurses, physicians or radiographers when asked on the questionnaire to indicate their role in the nurse prescribing initiative. The 32 respondents who did not clearly identify themselves as either nurses, physicians or radiographers but rather as having roles in policy/ regulation or education were excluded from this particular analysis because of its focus on comparing the perceptions of the different health professions by virtue of their occupation. Of the 167 who were included in the present analysis, the number of respondents from each occupation was as follows: 49 from nursing, 91 from radiography, and 27 from medicine.

Comparison of perceptions across three occupational groups: descriptive statistics

A five-point Likert scale (strongly disagree, disagree, no opinion, agree, strongly agree) was collapsed into two categories 'agree' or 'disagree'. An overview of these results is presented in Table 1.

When the results were examined as a whole, the majority of respondents from the three occupations combined were found to disagree with the statement that nurse prescribing of ionising radiation increased the risk of incorrect treatment (73%, n=107) and with the statement that they worried that nurses did not have the necessary knowledge to prescribe ionising radiation (64%, n=97). There was overall agreement that nurses could be trusted to prescribe ionising radiation correctly (73%, n=102); that nurses receive adequate training for the role (73%, n=90); and that nurse prescribing of ionising radiation was safe (77%, n=100). However, it should be noted that there was variability in responses according to the professional group surveyed. For each of the five statements, nurses reported greater confidence in the safety of, and preparation for, nurse prescribing of ionising radiation, radiographers expressed the most reservations, and medical respondents expressed opinions in between. While almost two-thirds (62%, n=42) of radiographers agreed that nurse prescribing of ionising radiation is safe, only about half (53%, n=37) reported that they trusted nurses to prescribe ionising radiation correctly. Over half (54%, n=44) indicated that they worried that nurses did not possess the necessary knowledge to prescribe, and only just over half (54%, n=32) agreed that nurses received adequate training for the role.

Table 1 Perspectives on the safety of the nurse prescribing of ionising radiation initiative overall and by occupational group*

Item		***Percentage Disagreement***	***Percentage Agreement***
Nurse prescribing of ionising radiation increases the risk of incorrect treatment	**Overall**	**73.3% (n=107)**	**26.7% (n=39)**
	Nurses	95.7% (n=45)	4.3% (n=2)

Pre-proof

	Physicians	66.7% (n=14)	33.3% (n=7)
	Radiographers	61.5% (n=48)	38.5% (n=30)
I trust nurses to prescribe ionising radiation correctly	**Overall**	**27.1%** (n=38)	**72.9% (n=102)**
	Nurses	0% (n=0)	100.0% (n=47)
	Physicians	27.7% (n=5)	78.3% (n=18)
	Radiographers	47.1% (n=33)	52.9% (n=37)
I am worried that nurses do not have the necessary knowledge to prescribe ionising radiation	**Overall**	**64.2% (n=97)**	**35.8% (n=54)**
	Nurses	89.4% (n=42)	10.6% (n=5)
	Physicians	78.3% (n=18)	21.7% (n=5)
	Radiographers	45.7% (n=37)	54.3% (n=44)
Nurses receive adequate training for their role	**Overall**	**27.4%** (n=34)	**72.6% (n=90)**
	Nurses	4.3% (n=2)	95.7% (n=44)
	Physicians	26.3% (n=5)	73.7% (n=14)
	Radiographers	45.8% (n=27)	54.2% (n=32)
Nurse prescribing of ionising radiation is safe	**Overall**	**23.1%** (n=30)	**76.9% (n=100)**
	Nurses	0% (n=0)	100.0% (n=44)
	Physicians	22.2% (n=4)	77.8% (n=14)
	Radiographers	38.2% (n=26)	61.8% (n=42)

*'No opinion' responses were omitted from the analysis.

Comparison of perceptions across three occupational groups

In the case of the item 'nurse prescribing increases the risk of incorrect treatment', significant differences in the responses across the three groups combined were identified (χ^2 (2, N= 163) = 57.5, p <.001). A post-hoc test demonstrated that there were statistically significant differences between nurses and physicians, and between nurses and radiographers. Nurses and physicians differed significantly (U=2015.5, z = -4.95, p = .001, r = - 0.579), with physicians (Md = 2, n = 25) showing greater agreement with the statement than nurses (Md = 1, n=48). When the responses of nurses were compared with those of radiographers, statistically significant differences were also found between the groups (U=562.0, z = -7.47, p < .001, r = -0.636), with radiographers (Md=2, n=90) more likely to concur with the statement. However when physician and radiographer responses were compared, the differences between the groups were not statistically significant (U=995.0, z = -.935, p =0.35, r = -0.087).

Statistically significant differences were also found among the three occupational groups in relation to the item measuring respondents' perceptions of their trust that nurses would prescribe ionising radiation correctly (χ^2(2, N= 161) = 72.797, p <0.001). Again, post-hoc tests returned statistically significant differences in responses between nurses and physicians (U= 290.5, z = -3.961, p < .001, r = -0.467), with a lower proportion of physicians (Md = 4, n=25) showing trust than nurses (Md =5 , n =47). Differences between nurses (Md = 5, n=47) and radiographers (Md =3 , n= 89) were also found to be statistically significant with a greater

Pre-proof

effect size than arose in the case of comparisons with physicians (U= 329.5, z = -8.36, p < .001, r = -0.716). In contrast to the previous item, for this item results showed that physicians (Md = 4, n=25) differed significantly from radiographers (Md =3 , n= 89) in their perceptions of trust in nurses to prescribe ionising radiation correctly (U= 661.00, z = -3.23, p =.001, r = -0.302), with the higher proportions of the latter signally reservations about trusting nurses to prescribe ionising radiation correctly. Thus, in comparing the three occupational groups, the analysis indicates that nurse respondents were more likely than those from the other professions to trust their nursing colleagues to give the right prescription for ionising radiation, and radiographers least likely to trust them, with medics positioned in between.

Turning to responses to the statement 'I am worried that nurses do not have the necessary knowledge to prescribe ionising radiation,' statistically significant differences for the groups combined again manifested themselves (χ2(2, N= 161) = 45.113, *p*=.000). Post hoc tests revealed that the pattern that had emerged in relation to the previous item presented above was sustained here: nurses (Md = 1, n= 47) were less likely than physicians (Md =2 , n = 25) to agree with the statement 'I am worried that nurses do not have the necessary knowledge to prescribe' (U= 302.500, z = -3.650 , p <.001, r = -0.430). The gap between nurses and radiographers (U= 752, z = -6.337 , p <.001, r = -0.543) in terms of reporting anxiety about nurses not having the necessary knowledge to prescribe ionising radiation was even more marked than that between nurses and physicians. When physicians (Md =2, n = 25) and radiographers (Md =3 , n= 89) were compared in relation to this item, statistically significant differences were also found between these two groups, though with a more modest effect size (U=711.000 , z = -2.891, p =.004 , r = -0.270).

As far as perceptions about the adequacy of the training that nurses receive for the role is concerned, again statistically significant differences were found among the groups overall (χ^2(2, N= 163) = 47.710, *p* <.001). When the groups were disaggregated, nurse respondents (Md =4 , n=48) were more likely than were physicians (Md =4 , n= 25) to affirm that the training nurses received to undertake their role in nurse prescribing of ionising radiation was adequate with the differences between the groups statistically significant (U= 282.000, z = -3.993, p <.000, r = -0.467). In keeping with the emerging pattern manifested in the previous items, differences between nurses and radiographers (U= 716.000, z =-6.697, p <.000, r =-0.570) were also found to be statistically significant. However, differences between physicians and radiographers (Md = 3, n=90) were not (U=896.500, z =-1.614, p =.106, r = -0.150). Following suit with the general shape of findings from the other items, the greatest effect size differences were between nurses and radiographers.

Results from analysing the final item on safety, 'Nurse prescribing of ionising radiation is safe' manifested a similar set of relationships to the previous item. Statistically significant differences were found for the groups combined (χ^2(2, N=149) = 58.414 , *p* <.001), and while differences were found in post hoc tests between nurse respondents (Md =5, n=44) and each of the other two groups (nurses and physicians (U=244.000, z = -4.000, p =.000, r = -0.485); nurses and radiographers (U=380.00 , z = -7.676, p =.000, r = -0.686) comparisons between the responses of physicians (Md = 4, n= 24) and radiographers (Md = 4, n= 81) yielded differences that were not statistically significant (U= 731.000, z = -1.952 , p =.051, r = -0.190).

Pre-proof

Discussion

Results of this analysis of perceptions of the safety of nurse prescribing of ionising radiation indicate that while the majority of respondents from nursing, medicine and radiography perceived nurse prescribing of ionising radiation to be safe, the extent to which this view was held varied across occupations. Nurses were found to display a greater confidence in their own profession's competence in ionising radiation prescribing as far as safety is concerned compared to both physicians and radiographers. In relation to perceptions of safety and risk of nurse prescribing of ionising radiation, what these data tell us is that beliefs about safety and risk are socially constructed along occupational lines. In order to offer a plausible explanation as to why an occupational patterning emerged in findings we need to consider these findings with reference to what existing literature tells us about knowledge and inter-professional relations.

As indicated, radiographers in Ireland do not have prescribing authority, so the extension of the nurse's role to prescribing X-rays had no impact on the actual scope of the clinical work of radiographers. However, since ionising radiation is a prominent aspect of the core knowledge of radiographers, that over half reported that they were worried that nurses did not possess the necessary knowledge to prescribe, and only just over half agreed that nurses received adequate training for the role may spring from their sense that they possess a refined knowledge of radiography and thus have an acute understanding of the adverse consequences of inappropriate ionising radiation prescribing.

If we turn to the broad responses from physicians, the majority affirmed the safety of nurse prescribing of ionising radiation, but with a sizeable proportion indicating some reservations. This finding broadly reflects those of other studies that found that while some physicians were not content to transfer some aspects of their role to nurses on the whole they accepted expanding roles of nurses (Carmel and Baker-McClearn 2012). As indicated earlier, medicine continues to heavily control the governance and parameters of the expanded role of other health professions (Carmel and Baker-McClearn 2012; Currie *et al.* 2010) and thus its status is relatively secure even after years of shedding components of its role to allied professionals in healthcare.

The greatest contribution of findings from the analysis presented here is that it highlights the social patterning of perceptions of safety along occupational lines and bolsters the argument that attitudes to risk and safety may be influenced less by actual objective measures of safety and more by socially produced perspectives mediated by professional beliefs and values. This lends support to a social constructionist theorisation of risk (DeVries and Lemmens 2006), that is, that perceptions of risk are shaped by their cultural and social context (Flynn 2006). As Flynn (2006, p. 85) has observed:

> . . . risk assessment can never be wholly neutral and objective as it must be influenced by prevailing morals and values, and by different social interests . . . risk assessment – and perception – are always filtered through the prism of current belief systems and cultural practices.

Proof

That risk perception is socially shaped has come into sharp focus in recent years in debates and public discourses about expanding the role of nurses in Western countries to include clinical practices such as medication and X-ray prescribing previously undertaken by physicians. This is particularly evident in the USA where perceptions of safety and endangerment are at the heart of discourses about which health professional should provide services to meet the increase in demand for primary care in the context of the *Patient Protection and Affordable Care Act 2010* that governs the extension of health insurance to several million more US citizens (Iglehart 2013). Public opposition by elements of the medical profession in some US states to the expansion of the nursing role there has been framed with reference to concerns about the educational preparation of nurses to safely fulfil the role (Iglehart 2013). In a 'perspective' piece published in the *New England Journal of Medicine* following the introduction of the Act, Julie Fairman, a nursing professor, and her colleagues (Fairman *et al.* 2011, p.194) pointed to the lack of objective evidence to underpin restrictions on the nurse's role in some US states compared to others:

> The critical factors limiting nurse practitioners' capacity to practice to the full extent of their education, training, and competence are state-based regulatory barriers. States vary in terms of what they allow nurse practitioners to do, and this variance appears not to be correlated with performance on any measure of quality or safety. There are no data to suggest that nurse practitioners in states that impose greater restrictions on their practice provide safer and better care than those in less restrictive states or that the role of physicians in less restrictive states has changed or deteriorated.

That ideological reasons based on hierarchal legacy that are socially shaped have impacted on legislative decisions in the USA was proposed earlier in a report in 2010 by the independent then entitled Institute of Medicine (now the National Academy of Medicine) (Institute of Medicine 2010) which was explicit in its views that overly restrictive scope-of-practice regulations in some states were unrelated to safety concerns associated with nurse practitioners but rather were based on political decisions (Iglehart 2013). (It should be noted that in spite of its title, the National Academy of Medicine is comprised of members from a diverse range of backgrounds with at least one quarter drawn from outside the health professions.) The Institute of Medicine report was well received by key nursing organisations in the US, namely the American Association of Colleges of Nursing, American Nurses Association, American Organization of Nurse Executives, and National League for Nursing, yet criticised by the American Medical Association because the recommended extension of nursing roles was to proceed without the oversight of a physician (Johnson *et al*. 2012). Iglehart (2013) located the 'skirmishes' (p.1939) and 'turf wars' (p.1940) between national nursing and medical organisations in the USA within the context of a healthcare market economy.

Other countries such as Australia have also witnessed medical opposition to expanding the nursing role in the area of prescribing in spite of evidence that it is safe in the context of appropriate educational preparation (Elsom *et al*. 2009). The thrust of Elsom *et al*.'s (2009) argument is that the challenge now is to convince medical practitioners of the safety and competence of specially educated nurses to engage in expanded practices, particularly in relation to prescribing. They propose a communication strategy that conveys to physicians

Pre-proof

the empirical evidence of the safety of such expanded practices, which in effect, is an attempt to re-shape physicians' ideologies and perceptions. Our analysis also signals the need to communicate object evidence about the safety and appropriateness of nurse prescribing of ionising radiation in Ireland to other health professionals in the clinical context so as to gain their trust that the endeavour is indeed safe.

Limitations of the study

A limitation of the study is that the sample size of each individual occupational group was uneven, limiting the scope for statistical analysis. Larger and more even numbers of respondents from each group would have enabled a more sophisticated analytical approach. In addition, since this survey did not use a random sample, the findings are therefore not generalizeable to the wider population of the professional groups involved. However, the sample was indicative of health professionals who had contact with nurses who were prescribing ionising radiation.

Conclusion

One may well question why an analysis of *perceptions* of safety and risk is important when arguably all that really matters is safety itself as objectively measured. Yet perceptions of safety are important to inter-professional relations, to decisions about the use of public funding in determining skills mix and to the confidence of the public in appropriate standards of safety in the health service. A belief that nurses are competent to practise safely in a range of new areas including the prescribing of ionising radiation is critical since it mediates contemporary debates in a range of countries and underpins legislative decisions about expanding the role of nurses with broad ranging implications for the future of nursing practice.

Acknowledgement

Funding: the study was funded by the Health Service Executive (HSE). A report was completed and submitted to the HSE on the completion of the study. Responsibility for the information and views set out in this publication lies entirely with the authors and not with the HSE.

References

Adler, P.S., Kwon S-W., 2013. The mutation of professionalism as a contested diffusion process: clinical guidelines as carriers of institutional change in medicine. *Journal of Management Studies,* 50(5), 930-962.

An Bord Altranais, 2008. *Requirements and Standards for Nurse Education Programmes for Authority to Prescribe Ionising Radiation (XRay) First Edition*. Dublin: An Bord Altranais (The Nursing Board).

Annandale, E., 2014. *The Sociology of Health and Medicine* (second edition). Cambridge: Polity Press.

Pre-proof

Avery, A.J., Pringle, M., 2007. Extended prescribing by UK nurses and pharmacists. *British Medical Journal,* 331, 1154-5.

Bacon, D., Borthwick, A.M., 2013. Charismatic authority in modern healthcare: the case of the 'diabetes specialist podiatrist.' *Sociology of Health & Illness,* 35(7), 1080–1094.

Benger JR, 2002 Can nurses working in remote units accurately request and interpret radiographs? *Emergency Medicine Journal,* 19, 68-70.

Carey, N., Courtenay, M., James, J., Hills, M., Roland, J., 2008 An evaluation of a diabetes specialist nurse prescriber on the system of delivering medicines to patients with diabetes. *Journal of Clinical Nursing,* 17, 1635–1644.

Carmel S., Baker-McClearn, D., 2012. Expert nurses and the division of labour in hospitals. *Health*, 16(3) 282–297.

Cohen, J., 1988. *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Erlbaum, Hillsdale, New Jersey.

Considine, J., Payne, R., Williamson, S., Currey, J., 2013. Expanding nurse initiated X-rays in emergency care using team-based learning and decision support. *Australasian Emergency Nursing Journal*. 16, 10-20.

Cooper, R., Anderson, C., Avery, T., Bissell, P., Guillaume, L., Hutchinson, A., Lymn, J., Murphy, E., Ratcliffe, J., Ward, P., 2008. Stakeholders' views of UK nurse and pharmacist supplementary prescribing. *Journal of Health Services Research & Policy.* 13(4), 215–221.

Currie, G., Finn, R., Martin, G., 2010. Role transition and the interaction of relational and social identity: new nursing roles in the English NHS. *Organization Studies,* 31 (7), 941-961.

Department of Health, 2011. *Strategic Framework for Role Expansion of Nurses and Midwives: Promoting Quality Patient Care*. Dublin: Department of Health.

De Vries, R., Lemmens, T., 2006. The social and cultural shaping of medical evidence: case studies from pharmaceutical research and obstetric science. *Social Science and Medicine*, 62, 2694-2706.

Dillman, D. A., 2000. *Mail and Internet surveys: The Tailored Design Method*. New York : John Wiley & Sons.

Drennan, J., Hegarty J., Savage E., Butler M., Naughton C., Coffey A., Griffins M., O'Connell R., Hyde A., Creedon R., Butler ML., Moughty A., Kavanagh E., Butler M., Sheridan A., Grehan J., Coughlan B. 2014 *An Evaluation Of The HSE Guiding Framework For The Implementation Of Nurse Prescribing of Medical Ionising Radiation (X-Ray) In Ireland*. University College Dublin and University College Cork.

Pre-Proof

Drennan, J., 2003. Cognitive interviews; verbal data in the development and pre-testing of questionnaires. *Journal of Advanced Nursing*. 42 (1), 57-63.

Drennan, J., Naughton, C., Allen D., Hyde, A., Felle, P., O'Boyle, K., Treacy, M.P., Butler, M., 2009. *National Independent Evaluation of the Nurse and Midwife Prescribing Initiative*. Dublin: University College Dublin.

Drennan, J., Naughton, C., Allen, D., Hyde, A., O'Boyle, K., Felle, P., Treacy, M., Butle,r M., 2011. Patients' level of satisfaction and self-reports of intention to comply following consultation with nurses and midwifes with prescriptive authority: a cross-sectional survey. *International Journal of Nursing Studies,* 48 (7), 808-817.

Edwards, P.J., Roberts, I., Clarke, M.J., DiGuiseppi, C., Wentz, R., Kwan, I., Cooper, R., Felix, L.M., Pratap, S., 2009. Methods to increase response to postal and electronic questionnaires. *Cochrane Database of Systematic Reviews*, Issue 3. Art. No.: MR000008. DOI: 10.1002/14651858.MR000008.pub4.

Elston, M.A., Gabe, J., 2013. Medical autonomy, dominance and decline. In Gabe Mythen and Sandra Walklate (Eds) *Key Concepts in Medical Sociology (Second Edition).* London: Sage.

Elsom, S., Happell, B. Manias, E., 2009. Nurse practitioners and medical practice: opposing forces or complementary contributions? *Perspectives in Psychiatric Care,* 45(1), 9-16.

Fairman, J.A., Row, J.W., Hassmiller, S., Shalala, D.E. 2011. Broadening the scope of nursing practice. *New England Journal of Medicine*, 364, 193-196.

Flynn, R., 2006. Health and risk. In Gabe Mythen and Sandra Walklate (Eds) *Beyond the Risk Society: Critical Reflections on Risk and Human Security*. Maidenhead: Open University Press.

Free B, Lee GA, Bystrzycki A 2009. Literature review of studies on the effectiveness of nurses ability to order and interpret X-rays. *Australasian Emergency Nursing Journal*. 12, 8-15.

Etzioni, A., 1969. *The Semi-professions and their Organization*. New York, NY: Free Press.

Freidson, E., 1970. *Professional Dominance: the Social Structure of Medical Care*. Chicago: Aldine.

Fry, M., 2002. Expanding the triage nurses's role in the emergency department: how will this influence practice? *Australian Emergency Nursing Journal*, 5(1), 32-36.

Haug, M., 1973. Deprofessionalization: an alternative hypothesis for the future. *Sociological Review Monograph*, 2, 195-211.

Proof

Health Service Executive, 2009. *A Guiding Framework for the Implementation of Nurse Prescribing of Medical Ionising Radiation (X-Ray) in Ireland*. Office of the Nursing Services Director, Dublin: Health Service Executive.

IBM Corp., 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.

Iglehart, J.K., 2013. Expanding the role of advanced nurse practitioners — risks and rewards. *New England Journal of Medicine,* 368, 1935-1941.

Institute of Medicine, 2010. *The Future of Nursing: Leading Change, Advancing Health*. Committee on the Robert Wood Johnson Foundation Initiative on the Future of Nursing, at the Institute of Medicine of the National Academies. Washington DC: The National Academies Press.

King, O., Nancarrow, S.A., Borthwick, A.M., Grace, S., 2015. Contested professional boundaries in healthcare: a systematic review of the literature. *Journal of Foot and Ankle Research*, 8, 2 , DOI 10.1186/s13047-015-0061-1.

Long, D., Forsyth, R., Iedema, R., Carroll, K., 2006. The (im)possibilities of clinical democracy. *Health Sociology Review*, 15, 5 506-519.

Martin, G.P., Currie, G., Finn, R., 2009. Reconfiguring or reproducing intra-professional boundaries? Specialistexpertise, generalist knowledge and the 'modernization' of the medical workforce *Social Science & Medicine*, 68 (2009) 1191–1198.

Jones, K., Edwards, M., While, A., 2011. Nurse prescribing roles in acute care: an evaluative case study. *Journal of Advanced Nursing,* 67, 117–126.

Johnson, J.E., Veneziano, T., Malast, T., Mastro,K., Moran, A., Mulligan, L., Smith, A.L., 2012. Nursing's future: What's the message? *Nursing Management,* 43(7), 36- 41.

Miles, K., Penny, N., Mercey, D., Power, R., 2002. Sexual health clinics for women led by specialist nurses or senior house officers in a central London GUM service: a randomised controlled trial. *Sexually Transmitted Infections,* 78, 93–97.

Nixon, S., 2001. Professionalism in radiography. *Radiography,* 7(1), 31–35.

Nugus, P. Greenfield, D., Travaglia, J., Westbrook, D., Braithwaite, J., 2010. How and where clinicians exercise power: Interprofessional relations in health care. *Social Science and Medicine,* 71(5), 898-909.

Oppenheimer, M., 1973. The proletarianisation of the professional. *Sociological Review Monograph*, 20, 213-37.

Salhani, D., Coulter, I., 2009. The politics of interprofessional working and the struggle for professional autonomy in nursing. *Social Science & Medicine* 68 (7), 1221-1228.

Pre-proof

Sakr, M., Angus. J., Perrin, J., Nixon, C., Nicholl, J., Wardrobe, J., 1999. Care of minor injuries by emergency nurse practitioners or junior doctors: a randomised control trial. *The Lancet*. 354(9187), 1321-6.

Society of Radiographers, 2013. *The Scope of Practice.* London: The Society of Radiographers.

Society and College of Radiographers, 2012. *The Society and College of Radiographers Scope of Radiographic Practice Survey.* London: The Society and College of Radiographers.

Venning P., Durie, A., Roland, M., Roberts, C., Leese, B., 2000. Randomised controlled trial comparing cost effectiveness of general practitioners and nurse practitioners in primary care. *British Medical Journal*, 320, 1048–1053.

Pre-proof