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Radiographers' Perspectives on Justification of Radiographic Procedure in Klang Valley

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Abstract
Justification ensures that radiological examinations are clinically warranted and that benefits outweigh radiation risks and costs. This qualitative exploratory study examined how radiographers in private hospitals in the Klang Valley perceive and enact justification in practice. Semi-structured interviews were conducted with ten purposively selected radiographers and analysed thematically. Participants routinely checked clinical information, correlated indications with requested examinations and consulted referrers when doubt arose, but reported limited authority, inadequate referral details and workflow constraints. Strengthening policies, communication and digital referral systems could support safer, more patient-centred imaging.

Keywords: Justification; Radiographer; Medical Imaging

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1.0 Introduction

Medical imaging has become central to modern healthcare, enabling clinicians to visualise internal anatomy and physiology for diagnosis and follow-up (Hussain et al., 2022). Modalities such as radiography, computed tomography (CT) and magnetic resonance imaging (MRI) allow detection of abnormalities that would otherwise remain hidden (Atabo & Umar, 2019). However, radiography and CT rely on ionising radiation, which carries cumulative risks of malignancy and other radiation-related harm (Pearce et al., 2012). To manage these risks, the International Commission on Radiological Protection (ICRP) identifies justification as a fundamental principle of radiological protection. Any decision that alters radiation exposure circumstances should yield greater benefit than harm for the patient (Vom & Williams, 2017). In practice, justification involves deciding whether an examination is necessary, whether it is the most appropriate test for the clinical question, and whether an alternative non-ionising modality could provide equivalent information.

Despite these principles, evidence shows that a substantial proportion of imaging remains unjustified. Foley et al. (2022) reported that less than half of CT procedures in their sample were appropriately justified, while Rawle and Pighills (2018) found that almost half of radiological examinations were unnecessary once referrals and clinical information were systematically reviewed. Unjustified examinations expose patients to additional radiation without improving diagnosis or treatment, increasing long-term risks such as cancer (Pearce et al., 2012; Sharma et al., 2018). They also generate avoidable costs and raise ethical concerns about non-maleficence, patient autonomy and responsible use of healthcare resources (Chilanga et al., 2022; Goldberg et al., 2011).

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Radiographers are pivotal to the justification process. ICRP guidance emphasises radiographers' responsibility to reduce unnecessary imaging and maintain radiation protection standards. Reitan et al. (2024) found that most radiographers analyse justification daily and actively participate in evaluating referrals across multiple modalities. While radiologists typically pre-vet CT and MRI referrals, general radiography is often not pre-vetted in advance, leaving radiographers as the last checkpoint before exposure (Reitan et al., 2024). In such situations, radiographers review patient histories, assess indications and consult radiologists when referrals are unclear or incomplete.

In Malaysia, diploma-qualified radiographers are appointed at grade U29 and degree-qualified radiographers at grade U41. According to the Suruhanjaya Perkhidmatan Awam Malaysia job description for Juru X-Ray Gred U29 (2024), assessing and examining requests for radiographic procedures is not explicitly included in the U29 scope of work. This situation may lead some radiographers to feel less accountable for reviewing doctors' orders before performing procedures, despite their close involvement in patient imaging. Yet there is limited research on how radiographers working in Malaysian private hospitals actually experience and enact justification in their daily practice. This study, therefore, explores radiographers' experiences in justifying radiographic procedures in private hospitals in Klang Valley, examines their perspectives regarding radiographic procedure justification, and identies the key challenges they face in carrying out justification within private healthcare settings.

2.0 Literature Review

2.1 Justification, Levels of Exposure and Overutilisation

Justification is a core pillar of radiological protection and underpins decisions to expose patients to ionising radiation. ICRP states that any action which changes a radiation exposure situation should produce more benefit than harm for the individual patient (Von & Williams, 2017). In medical imaging, this means determining whether a requested examination is clinically warranted, whether it is the best test for the indication, and whether a non-ionising modality could be used instead (International Atomic Energy Agency, 2024). ICRP conceptualises justification at three levels (Valentin, 2008; Del Llano et al., 2023). Level 1 justifies the use of ionising radiation in medicine for society as a whole. Level 2 concerns specific procedures for defined clinical indications, typically operationalised through guidelines and referral criteria. Level 3 addresses justification for individual patients, where the practitioner must consider the patient's condition, prior imaging and available alternatives. For high-dose examinations and complex interventional procedures, Level 3 justification is fundamental. It depends on high-quality referral information, access to previous studies and effective communication between referrers, radiologists and radiographers (Clarke et al., 2023).

When justification is weak or absent, overutilisation of imaging is a predictable result. Foley et al. (2022) found that less than half of CT examinations in their sample met appropriate justification criteria, while Rawle and Pighills (2018) showed that almost half of radiological procedures were unnecessary after a systematic review. Such unjustified imaging exposes patients to additional cumulative radiation and may increase long-term risks of malignancy and other radiation-related harm (Pearce et al., 2012; Sharma et al., 2018). It also generates avoidable costs and challenges ethical principles of non-maleficence and responsible resource use (Chilanga et al., 2022; Goldberg et al., 2011).

2.2 Radiographers' Roles, Barriers and Gaps

Although referrers and radiologists hold formal legal responsibility for requesting and authorising examinations, radiographers are increasingly recognised as central to the practical implementation of justification. At the point of care, they receive referrals, meet patients, verify clinical details and decide how to apply, adapt or, where appropriate, question requested examinations (Clarke et al., 2023). A recent scoping review described this "vetting of medical referrals" as a key contribution of radiographers and highlighted their role as active gatekeepers of radiation exposure (Clarke et al., 2023). Empirical studies show that most radiographers assess justification daily and regard referral assessment as part of their professional identity. Chilanga and Lysdahl (2024) reported that radiographers across Australia, Indonesia, Rwanda and the United Kingdom perceived their involvement in vetting as essential for patient-centred care and for preventing unnecessary exposures. Reitan et al. (2024) similarly found that 86% of respondents evaluated justification every day and 79% believed they had an obligation to do so.

At the same time, several factors can hinder adequate justification. Poor-quality referrals, such as a lack of specific clinical details, clear indications, or anatomical site, are frequently reported and undermine both justification and optimisation (Chilanga & Lysdahl, 2024; Sitareni et al., 2023). Interprofessional hierarchy may make it difficult for radiographers to challenge questionable requests, especially when referrers dismiss their concerns. Organisational pressures such as workload and expectations for high throughput further limit opportunities for careful justification, particularly in busy or commercially driven settings (Clarke et al., 2023). Training and experience also shape radiographers' confidence. Without structured support, less experienced staff may default to performing examinations as requested rather than exercising critical judgment (Mork-Knudsen et al., 2021; Reitan et al., 2024). Most existing studies have been conducted in public or mixed systems in Europe, Africa and Australia, with relatively little evidence from Southeast Asian private healthcare. There is also limited qualitative work that explores radiographers' lived experiences of justification, particularly how they negotiate hierarchy, patient expectations and business pressures in private hospitals (Chilanga et al., 2022; Sitareni et al., 2023). The present study addresses these gaps by examining how radiographers in private hospitals in the Klang Valley experience, interpret and manage justification of radiographic procedures, and by identifying practical challenges and opportunities to strengthen justification in this context.

3.0 Methodology

3.1 Study Design and Setting

This study employed a qualitative exploratory design to gain an in-depth understanding of radiographers' experiences, perspectives and challenges in justifying radiographic procedures in private hospitals. Exploratory qualitative designs are appropriate when a topic is insufficiently described in the literature, and the aim is to generate rich insights rather than test predetermined hypotheses (Alele & Malau-Aduli, 2023; Khan, 2014). Semi-structured interviews were chosen to provide a flexible but focused framework for exploring participants' views. The study was conducted in three private hospitals in the Klang Valley, Malaysia. These hospitals were selected because they provide a range of imaging services and employ radiographers who are routinely involved in the justification of radiographic procedures.

3.2 Participants and Sampling

Purposive sampling was used to recruit radiographers who met the following inclusion criteria: (i) currently working as diagnostic radiographers in a private hospital in the Klang Valley; (ii) actively involved in clinical imaging rather than purely administrative roles; and (iii) proficient in English to allow participation in online interviews. Radiographers working on a temporary or locum basis, or in non-clinical positions, were excluded. Ten radiographers (coded RG1–RG10) were recruited. The sample included diploma- and degree-qualified radiographers and spanned a range of clinical experience from less than 2 years to more than 10 years. The sample size was consistent with recommendations for small-scale qualitative studies using thematic analysis, where six to ten interviews are often sufficient to identify key themes within a relatively homogeneous professional group (Braun & Clarke, 2021; Guest et al., 2006).

3.3 Data Collection and Analysis

Data were collected through semi-structured online interviews conducted via Microsoft Teams. Interviews were scheduled at times convenient to participants, and each session was audio-recorded with consent. The interview guide, adapted from previous studies on justification and referral assessment (Chilanga et al., 2022; Sitareni et al., 2023), covered demographic information, experiences of justification in daily practice, and challenges or uncertainties in deciding whether to proceed with procedures. Probing questions were used to clarify responses and encourage elaboration. Interviews continued until information from different participants became largely repetitive and no new issues emerged. All interviews were transcribed verbatim and analysed using thematic analysis as outlined by Braun and Clarke (2021). The study followed six phases, from familiarisation to theme generation and refinement. Coding was essentially inductive, with themes grounded in participants' accounts rather than imposed from pre-existing frameworks. ATLAS.ti software was used to organise the data, support systematic coding and maintain an audit trail.

3.4 Trustworthiness and Ethical Considerations

Trustworthiness was addressed using Lincoln and Guba's (1985) criteria of credibility, dependability, confirmability and transferability. Credibility was supported by the consistent use of the interview guide, prolonged engagement with the data, and the inclusion of direct quotations. Dependability and confirmability were enhanced through clear documentation of methods and a transparent coding trail. Ethical approval was obtained from the Faculty of Health Sciences ethical review board at Universiti Teknologi MARA (UiTM) Puncak Alam. All participants received an information sheet explaining the purpose of the study, the voluntary nature of participation and their right to withdraw at any time. Written informed consent was obtained before each interview. Confidentiality was assured by removing personal identifiers from transcripts and by assigning each participant a code (RG1–RG10). Audio recordings and transcripts were stored in password-protected files accessible only to the researcher.

4.0 Findings

Table 1 summarises the main themes derived from the analysis, while detailed descriptions and supporting quotations are presented in Sections 4.1–4.3.

Table 1: Summary of findings

Objective	Core findings
Explore radiographers' experiences in justifying radiographic procedures	Radiographers routinely review referrals and patient history and consult clinicians to justify examinations across multiple imaging modalities.
Examine radiographers' perspectives regarding justification	Justification is understood as an ethical risk–benefit assessment guided by patient safety and the ALARA principle.
Identify challenges in carrying out justification	Interprofessional hierarchy, limited authority, poor referral quality and workload pressures restrict consistent justification.

4.1 Experiences in Radiographic Procedure Justification

All participants reported involvement across multiple imaging modalities, including general radiography, CT, MRI, mobile radiography and intraoperative imaging such as C-arm and image intensifier. Even junior radiographers handled more than one modality:

"*I do almost all modalities except PET scan, mammography and BMD… Other than that, I do all the procedures like x-ray, CT, MRI, angiography, C-arm and II. But most of the time I do lots of CT scans*." (RG9)

Justification was embedded in their routine workflow. Radiographers described reviewing the requested study and checking patient history before proceeding:

"*First, we look at what studies they requested… then we will go through the patient's history. Usually, the patient's history will be indicated in the request form or in the system*." (RG1)

Communication with referring doctors and radiologists was central to this process. Radiographers frequently contacted referrers to clarify ambiguous or incomplete requests, and sought radiologists' opinions when they were uncertain:

"*To resolve these things, we have to call the referral clinic to double confirm whether the patient really needs the X-ray they stated or if there's any mistake anywhere*." (RG2)

"*If I'm not confident, usually I go to the radiologist to ask if it's acceptable or not. If it's not acceptable, then I need to return the referral letter*." (RG4)

Participants emphasised that justification required active professional judgement, including the selection of appropriate protocols and questioning multi-modality requests. They also described considering patient-specific factors such as age, clinical status and ability to cooperate, and stressed that experience strengthened their justification skills:

"*The longer you are in service, the more you will learn. You will easily identify if the request is actually the correct study for the patient or not*." (RG1)

4.2 Perspectives Regarding Radiographic Procedure Justification

Radiographers consistently framed justification as weighing benefits against risks. Examinations were considered justified only when they were expected to contribute meaningfully to diagnosis or treatment:

"*The procedure that we do must give… a better outcome, like a doctor can diagnose the patient's condition. If we think the procedure is not going to give a diagnosis or a treatment plan… it is unnecessary to the patient*." (RG6)

This risk–benefit reasoning was emphasised for vulnerable groups, such as pregnant women, and closely linked to the ALARA (As Low As Reasonably Achievable) principle. Participants viewed justification as part of their professional duty and ethical responsibility to protect patients from unnecessary radiation:

"*Justification also means that we follow the ALARA principle, as low as reasonably achievable… avoid any unnecessary radiation exposure, like adjust the exposure factor for each patient*." (RG7)

"*For radiographers, you need a good justification when you're going to do some of the procedure. And you must be confident with your justification of what you are doing*." (RG5)

4.3 Challenges in Justifying Radiographic Procedures

Participants reported several challenges that limited their ability to consistently enact justification. A key issue was limited authority to reject or modify unjustified requests. Some radiographers felt compelled to follow doctors' orders even when they believed a procedure was unnecessary or inappropriate:

"*So, honestly speaking, we actually need to follow the doctor's order*." (RG3)

Others felt their opinions were often disregarded:

"*Maybe ten times we give our thoughts, just two times the doctor listens to us… Because I don't have the power, the authority to say this procedure can do or cannot*." (RG9)

Communication and referral-related issues further complicated the justification. Difficulty contacting radiologists during on-call periods and language barriers with patients made it harder to clarify complex cases. Many participants highlighted incomplete, vague or inconsistent referrals as major obstacles:

"*We got one referral from an outpatient that required us to do the X-ray for the spine, but they didn't specify which part of the spine*." (RG2)

"*Sometimes the requests are not in line with the indications… we go back to the patient, go back to the requesting doctor, go back to*

the radiologists." (RG1)

Patient-related constraints, such as pain, immobility and obesity, restricted feasible projections and raised questions about the likely value of some examinations. Non-clinical influences, including patient or family demands and financial considerations, also affected decisions. Less experienced radiographers reported feeling less confident in questioning requests or adjusting complex protocols, particularly in CT and MRI. Despite these challenges, participants suggested strategies to strengthen justification, including structured digital referral systems that require completion of key clinical fields and more open communication between radiographers, radiologists and referrers:

"*We need a system where… if all patient information needed to do the procedure is not complete, then the system cannot proceed to request the radiology examination."* (RG5)

5.0 Discussion

This study examined how radiographers in private hospitals in the Klang Valley experience, understand and manage the justification of radiographic procedures. Overall, justification was described routine rather than an occasional task. Participants reported reviewing referrals, checking clinical histories and aligning requested examinations with indications across multiple modalities. They also described consulting referrers or radiologists when uncertainty arose. This finding supports international evidence that radiographers are deeply embedded in justification processes, particularly in general radiography where radiologist pre-vetting is often limited (Chilanga & Lysdahl, 2024; Reitan et al., 2024; Clarke et al., 2023).

Participants framed justification primarily as risk–benefit assessment and professional responsibility. They emphasised that examinations should proceed only when they are likely to contribute meaningfully to diagnosis or treatment and when benefits outweigh radiation and other burdens, especially for vulnerable groups. This finding aligns with ICRP principles and justification guidance (Vom & Williams, 2017; Valentin, 2008; Del Llano et al., 2023). It is also consistent with evidence linking unjustified imaging to avoidable cumulative exposure and long-term risks, including cancer (Pearce et al., 2012; Foley et al., 2022).

At the same time, the findings highlight barriers that can weaken justification in practice. Limited authority and hierarchical constraints were prominent concerns, with some radiographers feeling obliged to perform examinations they considered unnecessary. Similar dynamics have been reported elsewhere, where interprofessional hierarchy and fear of conflict discourage radiographers from challenging referrals (Chilanga & Lysdahl, 2024; Sitareni et al., 2023). Communication and documentation issues further undermined the justification. Difficulty contacting radiologists during on-call periods, language barriers and poor-quality referrals created uncertainty and additional workload. This finding echoes prior research indicating that incomplete or vague clinical information is a significant obstacle to justification and optimisation (Clarke et al., 2023; Chilanga & Lysdahl, 2024). Junior radiographers also reported lower confidence in responding to questioning requests or in adapting complex CT and MRI protocols, reinforcing the importance of structured mentoring and feedback in developing referral-vetting competence (Mork-Knudsen et al., 2021; Reitan et al., 2024).

Several practical implications follow from these findings. Private hospitals could formalise radiographers' role in vetting and justification through clear local policies, including expectations to clarify or return inadequate referrals and defined escalation pathways to radiologists or clinical leads. Digital request systems that require completion of key clinical fields and prompt consideration of non-ionising alternatives may improve referral quality and reduce unnecessary imaging (Clarke et al., 2023; Chilanga et al., 2022). Targeted education and mentorship, especially for CT and MRI, may also strengthen junior radiographers' confidence and consistency in justification.

A strength of this study is its focus on private hospitals in the Klang Valley, a context that remains underrepresented in the justification literature. However, the small sample size and restriction to three hospitals may limit transferability. The absence of radiologists' and referring doctors' perspectives also limits insight into interprofessional decision-making. Future research could adopt a multi-stakeholder design and compare public and private settings to clarify how organisational and policy factors shape justification practices.

6.0 Conclusion

This study provides insight into how radiographers in Klang Valley private hospitals experience and justify radiographic procedures. Radiographers routinely justify examinations across multiple modalities by reviewing clinical information, applying professional judgement and communicating with referrers and radiologists. They view justification not only as a regulatory requirement but also as an ethical responsibility linked to radiation safety and patient-centred care. However, consistent justification is constrained by interprofessional hierarchy, limited authority to challenge referrals, poor referral quality, communication difficulties, patient-related constraints and variable levels of experience and training.

Strengthening justification in Malaysian private hospitals will require coordinated efforts to formalise and support radiographers' vetting role, improve referral documentation and digital request systems, enhance interprofessional communication and escalation pathways, and provide structured training and mentorship focused on justification and ethical imaging practice. These improvements may reduce unnecessary radiation exposure, optimise resource use and support safer imaging pathways in private healthcare settings.

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Paper Contribution to Related Field of Study

This paper provides qualitative evidence on how radiographers in Malaysian private hospitals understand and justify radiographic procedures. It fills a gap in the literature by focusing on private healthcare in Malaysia. It shows radiographers' role as gatekeepers, the ethical and risk–benefit reasoning they use, and the barriers they encounter. The findings can guide improvements in departmental policies, referral protocols, radiographer education and national discussions on the scope of practice, to support safer and more ethical practice.

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