

Systematic Review

Interprofessional education and collaborative practice with practicing radiographers: A mixed methods scoping review



K. Johnson ^{a, b, *}, P. Martin ^{a, c}, D. McDonald ^d, M. McGrail ^a

^a Rural Clinical School, Medical School, The University of Queensland, Australia

^b Department of Medical Imaging, Stanthorpe Hospital, 8 McGregor Terrace, Stanthorpe, 4380, Australia

^c School of Health and Medical Sciences, University of Southern Queensland, Australia

^d Darling Downs Health, Toowoomba Hospital, Australia

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ABSTRACT

Introduction: There is increasing evidence substantiating the advantages of Interprofessional Education and Collaborative Practice (IPECP) in healthcare. Despite this, global adoption is still in its infancy. Whilst there has been some recognition of the importance of collaborative practice in healthcare, implementation of IPECP programs remain limited in many countries.

Methods: This scoping review aimed to synthesise global evidence for the implementation and effectiveness of IPECP on practicing radiographers and to further identify the enablers and barriers to the implementation of IPECP within radiography. The JBI guidelines for the conduct of scoping reviews and the PRISMA guidelines for reporting scoping reviews were followed. Databases searched included Medline, CINAHL, Scopus, Embase, Cochrane library, and JBI. Grey literature was searched through Google, Google Scholar, and the ProQuest Dissertations and Theses Global.

Results: Following full text screening, 21 articles were included in the review, and data was extracted onto a custom-developed template. IPECP competencies identified in the included studies were mapped against the Canadian Interprofessional Health Collaborative (CIHC) framework of competencies.

Conclusion: Results indicate that while certain factors such as peer support and interprofessional communication facilitated IPECP, numerous barriers impeded its implementation on a wider scale.

Implications for practice: Implications for practice, policy and research include the need to prioritise funding for IPECP initiatives and to establish regulatory frameworks that support interprofessional collaboration.

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Introduction

The primary goal of interprofessional education is to bring together health professionals from various fields, enabling them to share their expertise and learn from one another.¹ This collaborative approach fosters teamwork, enhancing the delivery of exceptional, efficient, and effective care to clients.¹ Students are exposed to Interprofessional Education (IPE) at the university level, with the aim of graduating with a strong understanding of the advantages of collaboration and the skills necessary to implement them in their daily professional lives.²

* Corresponding author. Rural Clinical School, Medical School, The University of Queensland, Australia.

E-mail addresses: kate.ryan1@health.qld.gov.au (K. Johnson), priya.martin@unisq.edu.au (P. Martin), Daniel.mcdonald@health.qld.gov.au (D. McDonald), Matthew.mcgrail@uq.edu.au (M. McGrail).

Interprofessional collaborative practice (IPCP) is the process of different professions, such as occupational therapy, physiotherapy, and nursing, combining their knowledge to work together with clients, their families, and the community to provide an exemplary standard of care.³ IPCP has been proven to strengthen the health care system, leading to improved health outcomes for clients and their wider communities.³ For instance, a client may transition home earlier for their recovery instead of enduring a lengthy hospital stay, which necessitates clear collaboration among multiple health professionals.³ IPCP is often seen as a means to repair struggling healthcare systems by promoting improved teamwork and a focus on client-centered care.³ The benefits of both interprofessional education and collaborative practice (IPECP) are acknowledged as an important step in enhancing healthcare outcomes such as client experience, satisfaction, as well as a decrease in the cost of healthcare long term.^{2,4}

Since its humble beginnings in 1895 when X-rays were first discovered,⁵ the practice of radiography as a profession has been an

integral part of the client journey to receiving high quality healthcare.⁶ A preliminary search of the literature demonstrates a lack of evidence for IPECP in radiography. Hogg⁷ noted that radiography, in comparison to other health professions, has made little headway in IPECP. Radiographers tend to work in isolated settings, which is believed to enhance their productivity, quality, and speed of work.⁷ Similarly, the recent global IPE situational analysis report showed that only 21 academic institutions reported radiography students participating in IPE programs, in comparison to 94 nursing programs, 82 medical programs and 74 physiotherapy programs.⁸ Naylor and Foulkes⁹ postulate that radiographers would benefit from an interprofessional approach to their clinical practice, as working in silos can hinder seamless client care and overall experiences. In agreement, Squibb¹⁰ concludes that effective IPCP in radiography is crucial for ensuring safe health care. The limited evidence and engagement of radiographers in IPECP highlights a significant gap, suggesting the need for greater emphasis on interprofessional approaches to enhance quality of care and improved patient outcomes.

Most available existing literature pertaining to IPECP and radiography, relates to the pre-qualification phase. For example, a scoping review of IPE in medical radiation science students (n = 53 % radiography students), investigated the effectiveness of IPE strategies and their use to enhance the skills of students, such as translation into practice.¹¹ It was concluded that implementing IPE interventions led to significant improvements, including greater perceived knowledge, a better understanding of other professions, and improved abilities to fulfill respective roles within the interdisciplinary team.^{11,12} No existing review has comprehensively explored IPECP specifically with practicing (i.e. post-qualification) radiographers. This scoping review aimed to synthesise global evidence for the implementation and effectiveness of IPECP on practicing radiographers and to further identify the enablers and barriers to the implementation of IPECP within radiography.

The global IPE situational analysis report⁸ also showed that the Interprofessional Education Collaborative (IPEC) core competencies framework and the Canadian Interprofessional Health Collaborative (CIHC)¹³ framework of competencies were the two most utilised frameworks to facilitate IPECP.¹⁴ The CIHC framework¹³ has been successfully implemented in Australian healthcare settings to facilitate IPECP with health professional students.^{15,16} Therefore, the CIHC framework¹³ will be used to guide the data synthesis in

this review. This scoping review will synthesise the existing evidence on IPECP among practicing radiographers to inform future practice, education, and policy.

Methods

The review's conduct and reporting were guided by the JBI scoping review guidelines,¹⁷ and the Preferred Reporting of Items for Systematic Reviews and Meta-analyses (PRISMA) extension for Scoping Reviews¹⁸ respectively. The completed PRISMA-ScR checklist demonstrates quality assurance of this scoping review (see [Supplementary Table 1](#)). A protocol was developed and registered on Open Science Framework.¹⁹

Search strategy and data sources

The databases that were searched in this review included Medline, CINAHL, Scopus, Embase, Cochrane library, and JBI. This decision was made following a preliminary scoping search using CINAHL and Medline to identify sources with the most relevant citations for the review topic. The grey literature searches included Google (first 100 hits), Google Scholar and ProQuest Dissertations and Thesis Global. An information specialist (DM) guided the development of the search strategy. Detailed PICo (Population, Investigated phenomena, Context and Study design) domains for qualitative research were used to create inclusion and exclusion criteria (see [Table 1](#)). [Supplementary Table 2](#) contains search strategies for all included databases. Searches were completed in August 2023.

Search outcomes

All citations retrieved from the search were imported into Covidence™ and de-duplicated. Titles and abstracts were screened against the inclusion criteria using Covidence™ (Veritas Health Innovation, 2021). For the title and abstract screening stage, articles were dual screened by two reviewers (KJ and PM). Subsequently, at the full-text screening stage, two reviewers (KJ and DM) dual-screened all included articles. During screening, conflict resolution was provided by a third reviewer (PM). Only articles which met inclusion criteria were progressed to data extraction.

Table 1
Inclusion and exclusion criteria.

	Inclusion criteria	Exclusion criteria
Population	Radiographers including junior, senior, and in clinical, management, education, or research roles. Internationally, the following terms are used to denote radiographers: Medical imaging technologist Medical radiation technologist Medical radiation professional Medical imaging practitioner	Non-radiographers including: Medical radiation therapist Ultrasound technician Radiologist Pre-qualification radiographer students Advanced practitioner radiographer Reporting radiographer
Investigated phenomena	IPE, IPCP and IPECP.	Multi-disciplinary, transdisciplinary care.
Context	Healthcare settings including public hospitals, private hospitals, and private practices. All metro, regional, and rural areas.	Non-health care settings e.g., schools, prisons.
Study design	Primary research studies: Quantitative designs (including RCTs, cohort studies, pre-post, cross-sectional etc.) Qualitative designs (including interviews, focus groups, case studies). Mixed methods designs. Secondary research: systematic reviews, other reviews. Editorials, opinion pieces, commentaries, position papers, conference abstracts and posters. Research protocols.	Nil
Other	English publications, full texts, Last 10 years (2013 to current).	Non-English publications Publications prior to 2013.

Data extraction

Data extraction was conducted independently by two reviewers (KJ and PM) using a customised template (see [Supplementary Table 3](#)), which contains key elements pertinent to the aim of this review. Any disagreements that arose between the reviewers were resolved through discussion. The CIHC framework of competencies was used to support the data extraction and mapping process, ensuring rigor and comprehensiveness, and aligning this review closely with the IPECP literature.

Data charting

Extracted data items relevant to the review questions were analysed for reporting using frequency counts, charts, tables, and basic descriptive summaries. This process was undertaken by two reviewers (KJ and PM) and validated by the remaining reviewers (DM and MM). The CIHC framework of competencies was used to make sense of the data to aid presentation of findings.

Results

A total of 1219 studies were extracted from the database search. Following removal of 184 duplicates, 1035 articles were progressed

to title and abstract screening. Subsequently, 23 studies were progressed for full-text screening. Of these, two studies were excluded based on wrong intervention/focus (n = 1), and wrong participant population (n = 1), leaving 21 studies in the final review. The grey literature search did not yield any further relevant results. A flow diagram of included studies is provided in [Fig. 1](#). Further information on excluded studies with reasons is available in [Supplementary Table 4](#).

Included studies consisted of two narrative reviews,^{20,21} one editorial,²² three perspective articles,^{23,24,25} and the rest being primary research studies (n = 15). All studies were conducted with practising radiographers in either clinical practice settings,^{10,20,22,23,25–37} training contexts,^{21,38,39} or research.²⁴ Studies had participant counts ranging from 17^{34,35,38} to 279.²⁶ Studies used quantitative methods such as surveys,^{10,26,27,33} and qualitative methods such as interviews^{10,32,34–36,38} and focus groups.^{28,31} Professionals collaborating with radiographers included nurses, other allied health professionals (such as physiotherapists, occupational therapists, and speech pathologists), orthopaedic surgeons, radiologists, trauma surgeons, physicians, theatre staff and medical officers. The number of published studies in this area has somewhat stagnated over the past nine years, last reaching a peak of n = 4 in 2019 (see [Fig. 2](#)), further supporting the need for more research in this area. One possible explanation for

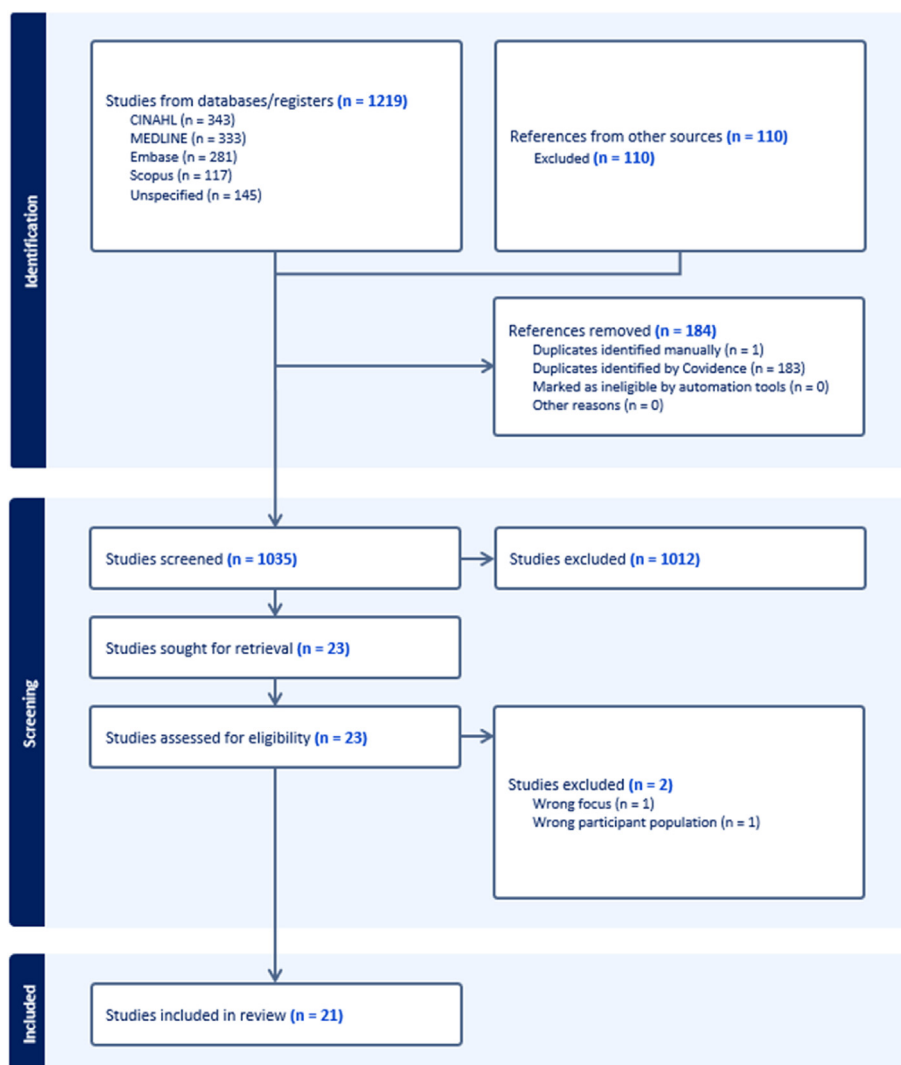


Figure 1. PRISMA flowchart of included studies.

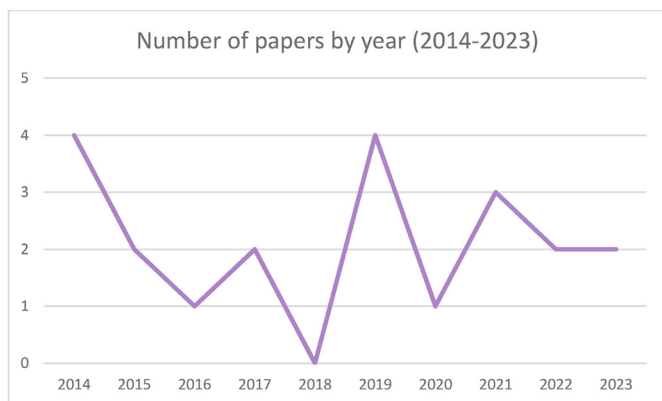


Figure 2. Trend by year of study.

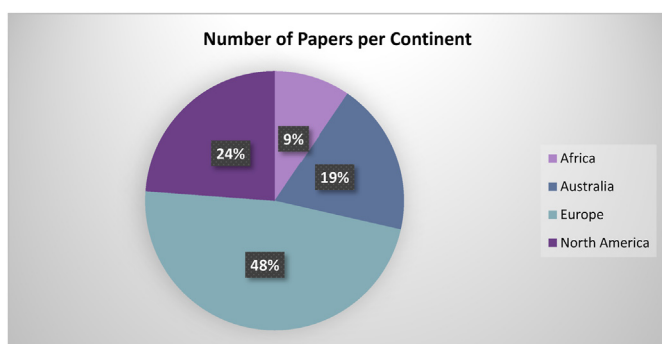


Figure 3. Chart of geographical location of studies.

the reduction in published studies after 2019 could be the COVID-19 outbreak, which impacted all facets of healthcare, including research, and led to an increase in healthcare worker burnout. Most included studies have been conducted in Europe (48 %) and North America (United States and Canada) (24 %) (see Fig. 3). Further information about study characteristics is available in Table 2.

IPECP competencies discussed in included studies, mapped against the six competencies of the CIHC framework, is depicted in Fig. 4. The most frequently discussed competency was interprofessional communication. Studies noted the increased need for interprofessional communication in the workplace and the benefits that staff reported from having strong interprofessional communication in place.^{25,26,31–34,37} Team functioning^{24,27,29,39} and patient/family/community-centred care^{10,22,30,36} were the next frequently reported competencies. The least discussed IPECP competency in included studies was role clarification.²⁰

Only three studies (two from Australia and one from the UK) reported that their workplaces had enablers for IPECP, and they all occurred in hospital settings in the context of clinical practice. Peer support,³¹ strong interprofessional communication¹⁰ and working with very experienced staff members³⁶ were noted as enablers of IPECP. In contrast, many studies reported barriers to IPECP. Fragmented departments,³⁸ culture of perceived subordinate roles within departments,²⁶ language barriers,²¹ interprofessional tension and inferiority complex^{10,28,31,32,36,37} were key barriers noted.

Discussion

This is the first scoping review of IPECP with practicing radiographers. Results show that research in this area has remained scarce over the last decade, consistent with other reports showing a

scarcity of IPE programs involving radiography students.⁸ This review did not identify any papers from the Indian subcontinent, South East Asia or China, despite their academic institutes reporting the third highest established IPE programs preceded by North America (United States and Canada) and Europe.⁸ This may indicate that there is a gap where IPE occurs at the university level, but lags in the post-qualification context for radiographers. It is unsurprising that 48 % of the publications in this review were from Europe, known to be at the forefront of promoting IPE. Coyle et al.⁴⁰ suggests that Australia has potential for further IPECP initiatives, particularly within the domain of radiography.^{8,40}

Interprofessional communication was the most reported IPECP competency, as mapped against the CIHC framework.¹³ This is unsurprising as Bok⁴¹ and colleagues confirmed from their scoping review of 74 articles involving interprofessional communication with medical students, that IPC among healthcare professionals will increase patient care, foster improved teamwork, and improve the work environment. Effective communication occurs when both the sender and receiver achieve a shared understanding and interpret the message in the same way.⁴² A 2022 USA study found that effective interprofessional communication was a foundational skill set in the service delivery model and is therefore a key skill to master and use in practice.⁴² Hultgren⁴³ concluded, reflecting on over 20 years of interprofessional training, that interprofessional communication is the root from which IPECP grows, supporting the need to invest in and improve interprofessional communication in the healthcare setting. A Canadian study found the collaborative competencies considered most relevant by health professionals were effective communication and defined roles and responsibilities.⁴⁴ Effective interprofessional communication is not only essential for promoting collaboration, but also for ensuring optimal patient care outcomes.

Conversely, the least identified competency from the CIHC framework was role clarification. A USA survey of 1699 employees across 45 geographical locations found that greater role clarification in health professionals has a direct link to a decrease in staff resignations and an increase in occupational satisfaction.⁴⁵ A Canadian study of 16 health professionals highlighted that whilst many interprofessional competencies, such as communication and conflict resolution, can be transferred from previous work roles, role clarification requires exposure with other professions, thus making acquiring proficiency in this area particularly challenging.⁴⁶ One study involving 63 radiography students highlighted that role clarification is one of the key elements to promote inclusivity and equality in the profession.⁴⁷ It is clear from the available evidence that prioritising role clarification is not just timely but imperative for radiographers to enhance patient care and professional development.

The key enablers identified, namely peer support, strong interprofessional communication and working with experienced staff members, are consistent with those found by a 2020 Finish scoping review of well-functioning healthcare departments worldwide.⁴⁸ The benefits from the components of IPECP include reducing the sense of threat among health professionals regarding overlapping roles which enabled them to concentrate on enhancing client-centred care rather than professional competition.⁴⁶ A 2008 USA study found that strong peer support has been proven to offer a safe and secure environment where employees are encouraged to share experiences and provides a platform for open communication and compassion in the work environment.⁴⁹ Moreover, strong interprofessional communication is vital to ensuring the safety of patients in a health care setting.⁵⁰ Incorporating peer support, fostering strong interprofessional communication, and collaborating with experienced staff members can culminate in a comprehensive and effective approach to professional growth and development.

Table 2
Study characteristics.

Authors	Year	Country	Context	Study design	Participants	Collaborators with IPC
Arruzza, E	2023	Australia	Clinical education	Narrative literature review	Radiography students (n = NA), graduates (n = NA)	Other allied health professionals (not specifically listed)
Bazzi et al.	2021	Sweden	Training	Qualitative: Semi structured interviews	Radiographers (n = 6) Theatre assistant nurse (n = 2) theatre nurse (n = 3) Nurse anaesthetist (n = 3) Assistant nurse anaesthetist (n = 3)	Specialist Drs; interventional radiologists, vascular surgeons
Chilanga et al.	2022	Norway	Clinical practice	Online questionnaire	Radiographers associated with ISRRRT (International society of radiographers and radiological technologists) Respondents from: Asia (n = 77), UK (n = 64), Scandinavia (n = 33), Australia (n = 31)	Referring clinician, radiologist, radiographer
Davis et al.	2015	America	Clinical practice and training	Retrospective narrative	Members of UNC RAD-AID (n = 45) including radiologist (n = 7) radiographers (n = 17), nurses (n = 3). medical imaging staff of Kamuzu Central Hospital (KCH), Malawi	Referring clinician, radiologist, radiographer, nurses
De Muinck Keizer et al.	2017	Belgium	Clinical practice	Online questionnaire with MCQ	Trauma/orthopaedic surgeons (n = 17), radiographers (n = 16)	Radiographers, trauma surgeon, orthopaedic surgeon
Essop and Kekana	2019	South Africa	Clinical practice	Qualitative: focus group interviews, semi-structured questions	Radiographer (n = 6), referring clinician (n = 12), radiologist (n = 1)	Referring clinicians, radiographers, radiologists
Falker and oberholtzer	2021	America	Clinical practice	Observational study	Radiology nurses, radiographers	Nursing, radiographers, physicians
Gunderman and Cuskaden	2014	America	Clinical practice	Educational perspective	Radiographers, radiologists	NA
Hogg and Cresswell	2021	UK	Research	Research experience - retrospective/opinion	Radiographers, radiography assistants and radiologist	Physicists, radiographers, medical practitioners, nurses
Leggett et al.	2015	America	Clinical practice	Information article	Radiographers, nurses, doctors	Radiographers, nurses, doctors
Lunden et al.	2017	Sweden	Training	Observations and field notes from (1) the Forum theatre phase and (2) the group reflection phase	Radiographers (n = 9), operating theatre nurses (n = 11), anaesthetist nurses (n = 2).	Radiographers, nurses
Makanjee et al.	2014	South Africa	Clinical practice (referral system)	Observational study	Radiographers, referring clinicians	Radiographers, referring clinicians
Moore	2019	America	Clinical practice	Editorial	Imaging professionals	NA
Naylor et al.	2022	UK	Clinical practice	Qualitative; focus group interviews using semi-structured questions	Diagnostic radiographers	Diagnostic radiographers
Squibb et al.	2016	Australia	Clinical practice	Quantitative postal questionnaire (n = 185) Qualitative semi structured interviews (n = 9)	Rural diagnostic radiographers	Referring clinicians
Strudwick and day	2014	UK	Clinical practice	Qualitative: 1: Observation of radiographers 2: semi structured interviews (n = 10)	Diagnostic radiographers	Doctors, theatre department, AE department
Ulrich et al.	2019	Germany	Clinical practice	Cross-sectional online survey	Nurses (n = 77), speech therapist (n = 7), physiotherapist (n = 14), radiographers (n = 18), biomed science (n = 13)	Other health care professionals (not specifically listed)
Wallin et al.	2019	Sweden	Clinical practice	Qualitative; semi-structured interviews	Radiographers (n = 17)	Referring clinicians
Wallin et al.	2023	Sweden	Clinical practice	Qualitative; semi-structured interviews	Radiographers (n = 17)	Radiologists, referring clinician
Williams et al.	2020	Australia	Clinical practice	Non-participant observational study (qualitative, descriptive research methodology) AND qualitative; semi-structured interviews	Radiographers (n = 2) Patients observed (n = 24)	Interprofessional staff (not specifically stated), referring clinician
Yeo et al.	2014	Australia	Clinical practice	Observational study	Radiographers (n = 15), medical officer (n = 15)	Radiographer, medical officer

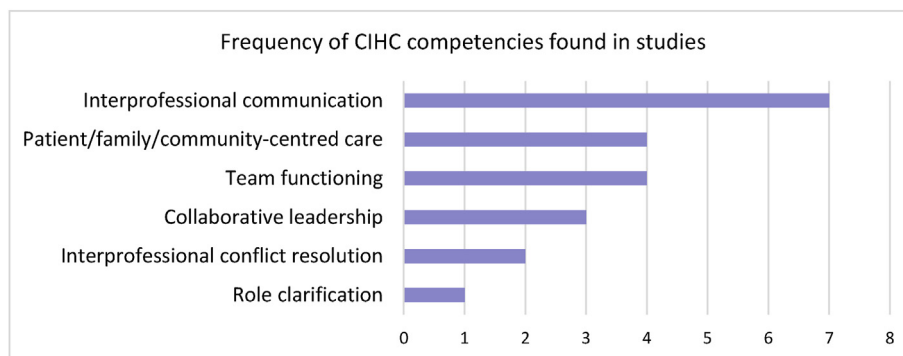


Figure 4. Graph depicting frequency of CIHC competencies.

The identified barriers to IPECP include fragmented departments, culture of perceived subordinate roles within departments, language barriers, interprofessional tension and inferiority complex. Some of these barriers could be explained by profession-centrism or profession-centric thinking, whereby a particular profession group holds a preferred view of the world and is unwilling to accept other views, usually reinforced through their training experiences.⁵¹ Pecukonis⁵¹ and colleagues proposes that one way of reducing profession-centrism is to promote interprofessional cultural competence which can be achieved using the IDEA model (Interaction, Data, Expertise, Attention). Interaction involves working and learning directly with other health professionals, data relates to securing accurate information regarding professions from other health disciplines, expertise involves effective and clear communication with other health disciplines and attention is the process of exploring one's own background and recognising assumptions made about other health professions.⁵¹ The numerous barriers to IPECP highlighted in the included papers underscores the need for concerted efforts to be made to address the lack of collaboration across professions and promote a culture of inclusivity.

It is noteworthy to consider the socio-political context in which radiographers practice, as this is likely to differ across regions of the world. For instance, in Australia, some radiology services are provided within private for-profit establishments which may influence the implementation of IPECP in practice. Another factor for consideration is the persistence of medical dominance in the radiography field and how this could be constraining on the operation and realization of IPECP in radiography. The impact of a medical model (i.e. hierarchical) does vary across countries and even within regions including differences between rural, regional, and remote health services. This may be influenced by government policies and/or by the culture and organisational context of a health service. However, it is important to recognise that the true essence of collaborative practice lies in the equitable distribution of leadership and support from all levels of regulatory bodies and healthcare organisations.

The findings of this review have implications for practice, policy, and research. Firstly, existing barriers in the workplace that hinder collaborative practice need to be addressed. Enabling IPECP among radiographers can be facilitated through ongoing professional development, fostering a culture of mutual respect, providing opportunities for interprofessional training, and implementing standardised communication protocols. Secondly, implications for policy include the need to prioritise funding for IPECP initiatives, establishing regulatory frameworks that support interprofessional collaboration, and incentivising healthcare institutions to integrate interprofessional practice into their organisational structures. Thirdly, future research on IPECP in radiography can focus on

evaluating the impact of interprofessional training programs on patient outcomes, exploring barriers and facilitators to interprofessional collaboration in radiology departments, and developing best practices for integrating radiographers into interprofessional healthcare teams. Additionally, it could explore the effectiveness of specific interventions aimed at enhancing IPECP among radiographers, such as simulation training or team-based learning approaches. Investigating the long-term effects of IPECP on job satisfaction, retention rates, and patient satisfaction among radiographers could provide valuable insights for improving healthcare delivery. Exploring the role of technology in facilitating interprofessional communication and collaboration in radiography practice is also warranted.

Strengths and limitations

The strength of this review is that it comprehensively investigated the international evidence for IPECP in practicing radiographers in the past decade, by examining the published and grey literature across several sources. Another strength is the use of the JBI guidelines and a registered protocol to guide the conduct of the review. This review is limited by only including papers with currently practising radiographers (as opposed to students). The review may have a possible bias as it only focused on English language publications and only examined papers published within the last 10 years, however this was necessary to ensure currency. Further reviews could include detailed examination of government and regulatory documents along with investigation into the collaborative practice of advanced practice radiographers and reporting radiographers.

Conclusion

This review has revealed both the strong points and areas for improvement in the present status of IPECP worldwide for practicing radiographers. Aligning these findings with the competencies defined by the CIHC framework, has emphasised the specific areas requiring deeper exploration and proactive measures. The multitude of benefits linked to IPECP among healthcare professionals far outweigh any justification for postponing its implementation in the workforce today. Delaying the implementation of IPECP in the post-graduate radiography workforce only prolongs the potential advantages and advancements that could be achieved through enhanced collaborative practices.

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Author contributions

Conceptualization: KJ, PM, MM; Methodology: KJ, PM, DM, MM; Formal analysis: KJ, PM; Investigation: KJ, PM, DM, MM; Resources: KJ, PM, MM; Data curation: KJ, PM; Writing – original draft: KJ; Writing – review and editing - KJ, PM, DM, MM; Supervision – PM, MM, Project administration: KJ.

Conflict of interest statement

Nil.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.radi.2025.01.001>.

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