

FACTORS INFLUENCING RESIDENT SATISFACTION IN DIAGNOSTIC RADIOLOGY TRAINING AT PHRAMONGKUTKLAO HOSPITAL

Than Prapanpot*, Supakajee Saengruang-Orn**, Chatwadee Limpaiboon*, Tunlada Wiriyankhroh*

*Department of Radiology, Phramongkutklao Hospital, Bangkok, Thailand

**Department of Radiology, Phramongkutklao College of Medicine, Bangkok, Thailand

Abstract

Background: Resident satisfaction is an important indicator of the quality and effectiveness of diagnostic radiology training programs. It reflects multiple aspects of education, including curriculum structure, clinical exposure, supervision, workload, learning environment, and resident well-being. Understanding the factors that influence satisfaction is important for continuous program improvement of the diagnostic radiology residency program at Phramongkutklao Hospital. However, data regarding resident satisfaction and training experiences within this institutional context remain limited.

Objectives: This study aimed to evaluate factors associated with satisfaction among diagnostic radiology residents and program alumni at Phramongkutklao Hospital.

Methods: This cross-sectional study used a self-administered online questionnaire distributed to current diagnostic radiology residents and program alumni at Phramongkutklao Hospital. The questionnaire comprised Likert-scale items and open-ended questions and was validated through expert review. We performed descriptive and comparative statistical analyses and analyzed qualitative responses thematically.

Results: Thirty-seven residents and program alumni completed the questionnaire. Overall satisfaction with residency training was high (mean, 3.73 ± 0.44), with the highest ratings for learning experience and teaching, and the lowest for workload and learning environment. Overall satisfaction was significantly correlated with confidence in recommending the program ($r = 0.595$, $p < 0.001$). Qualitative responses highlighted workload imbalance, limited research support, and gaps in specific clinical skills.

Conclusion: Diagnostic radiology residents and program alumni reported high overall satisfaction with training; however, workload, learning environment, and research support were identified as key areas for improvement. Resident satisfaction was strongly associated with willingness to recommend the program, supporting its role as an indicator of training quality and program effectiveness.

Keywords: radiology residents, diagnostic radiology, residency training, residency satisfaction, medical education

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Correspondence to:

Prapanpot T, Department of Radiology, Phramongkutklao Hospital, Bangkok, Thailand

Email: than.prapanpot@gmail.com

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Introduction

Resident satisfaction is an important indicator of the quality and effectiveness of residency training programs. In diagnostic radiology training, satisfaction reflects multiple aspects of education, including curriculum structure, clinical exposure, supervision, workload, learning environment, and resident well-being.^(1–5) Previous studies have shown that excessive workload, fatigue, and limited autonomy are associated with burnout and reduced learning effectiveness. In contrast, supportive learning environments and effective supervision are associated with improved educational experiences and professional development.^(6–9)

At Phramongkutklao Hospital, diagnostic radiology residency training is conducted under competency-based curricula guided by the Royal College of Radiologists of Thailand and nationally standardized, competency-based curricula, including the revised national curriculum (2022) and institutional training standards (2023).⁽¹⁰⁾ These curricula define six core competencies: patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice. While these national standards provide a consistent framework for residency training, opportunities for structured feedback from residents and program alumni to inform curriculum development remain limited.^(10,11) International evidence suggests that without systematic mechanisms to capture trainee perspectives, standardized curricula may fail to address important context-specific challenges.^(12,13)

Resident satisfaction is closely associated with learning quality, well-being, motivation for continued professional development, and confidence in clinical practice.^(7–9) Understanding the perspectives of current residents and program alumni may therefore help identify strengths and areas for improvement in the diagnostic radiology residency program at Phramongkutklao Hospital, particularly regarding workload, learning environment, teaching quality, research support, and preparedness for independent clinical practice.

This study aimed to evaluate factors associated with satisfaction among current diagnostic radiology residents and program alumni at Phramongkutklao Hospital.

Methods

Study design and study population

This study employed a cross-sectional, quantitative design and used a self-administered questionnaire. To complement the quantitative findings, qualitative data were collected through open-ended questions included in the questionnaire. The Institutional Review Board of the Royal Thai Army Medical Department approved the study protocol before data collection.

The target population consisted of diagnostic radiology residents currently in training and program alumni of the Department of Radiology, Phramongkutklao Hospital. Eligible participants included current residents and graduates who had completed the diagnostic radiology residency program at Phramongkutklao Hospital within the past ten years (2015–2024). Inclusion criteria were: (1) current diagnostic radiology residents or program alumni, (2) age ≥ 20 years, and (3) voluntary participation with informed consent. Exclusion criteria included incomplete questionnaire responses, interruption of training for more than 12 months, or refusal to provide consent.

Sample size calculation

The required sample size was calculated based on estimating a proportion in a finite population.^(14,15) According to a previous study by Zhang et al. investigating satisfaction among diagnostic radiology residents in China⁽¹¹⁾, the reported satisfaction rate was 68.6% ($p = 0.686$). The total eligible population of current residents and program alumni in the Department of Radiology at Phramongkutklao Hospital comprised 77 individuals. Using a 95% confidence level ($Z = 1.96$) and an acceptable margin of error of 10%, the minimum required sample size was calculated to be 41 participants. To account for potential non-response, the sample size was increased by 10%. Therefore, the final target sample size for this study was 46 participants.

Questionnaire development and validation

The investigators developed the questionnaire in accordance with the study objectives and relevant literature. It covered multiple domains of residency training, including training structure, clinical exposure, teaching and assessment, workload and learning environment, research support, and preparedness for independent practice.

Three experts with experience in radiology education and curriculum development assessed content validity. Each item was evaluated using the Index of Item–Objective Congruence (IOC) to ensure alignment with the study objectives. Items were revised based on expert feedback prior to data collection. Experts in radiology education and curriculum development reviewed the questionnaire, and items were revised to improve clarity and comprehensibility before distribution.

Data collection

Data were collected using an anonymous online questionnaire distributed via Google Forms. The questionnaire was distributed once via Google Forms between December 2025 and January 2026 during the 2025 academic year. No repeated distribution was performed. All participants received an information sheet detailing the study objectives, procedures, potential risks and benefits, and data protection measures. Electronic informed consent was obtained prior to accessing the questionnaire. No identifiable personal information was collected, and each participant was assigned a unique identification code. Data were stored in password-protected files accessible only to the principal investigator. In accordance with the institution's data protection policy, the research data will be retained for 5 years after study completion before permanent deletion.

All data were treated as confidential and are reported only in aggregate form. To minimize response bias and encourage honest feedback, participants completed the questionnaire anonymously, and no identifiable personal information was collected. Participation was voluntary, and all responses were analyzed in aggregate form to protect participant confidentiality.

Questionnaires with incomplete responses or insufficient data for analysis were excluded from the final analysis. Prior to analysis, data were coded and entered into a secure statistical database to protect participants' privacy and confidentiality. The study was conducted in accordance with relevant ethical guidelines and regulations.

Statistical analysis

Data were anonymized and coded prior to analysis. Descriptive statistics summarized participant characteristics and questionnaire responses, including frequencies and percentages for categorical variables and means with standard deviations or medians with interquartile ranges for continuous variables, as appropriate.

Composite scores for each questionnaire domain were calculated by averaging item responses within the same domain. We assessed normality of continuous variables using the Shapiro–Wilk test. Internal consistency of questionnaire domains was evaluated using Cronbach's alpha. Cronbach's alpha values ≥ 0.70 were considered acceptable.

Comparisons of overall satisfaction scores between groups were performed using independent-samples *t* tests for normally distributed data. Associations between domain scores and overall satisfaction were examined using Pearson correlation coefficients. Open-ended responses were analyzed using an inductive thematic approach, in which responses were coded, grouped into categories, and synthesized into themes through iterative review.

Statistical significance was defined as a two-sided *p*-value < 0.05 . Effect estimates were reported with 95% confidence intervals where applicable. All analyses were performed using Stata/SE version 17.0 (StataCorp LLC, College Station, TX, USA).

Results

The questionnaire was distributed to 77 eligible participants, including current residents and program alumni. A total of 37 participants completed the questionnaire, corresponding to a response rate of 48.1%.

Participant characteristics

A total of 37 participants completed the questionnaire, including 20 current residents (54.1%) and 17 program alumni (45.9%). Most participants were male (54.1%), followed by females (40.5%), with 5.4% preferring not to disclose gender. The mean age was 31.3 ± 3.2 years (range, 27–42 years). Among program alumni, most were employed in military hospitals, followed

by general or tertiary care hospitals. Most participants were trained under a system-based curriculum (86.5%), with smaller proportions from transitional zone (10.8%) and modality-based programs (2.7%). **Table 1** summarizes participant characteristics.

Overall satisfaction was assessed as both a composite mean across five domains and a single global satisfaction item.

Table 1. Demographic characteristics of survey respondents (n = 37)

Characteristic	n (%)
Training status	
Current residents	20 (54.1)
Program alumni	17 (45.9)
Gender	
Male	20 (54.1)
Female	15 (40.5)
Prefer not to answer	2 (5.4)
Age (years), mean $\pm$ SD (min - max)	31.30 $\pm$ 3.21 (27 - 42)
Current workplace	
Military hospital	11 (29.7)
Tertiary/general hospital	3 (8.1)
University hospital	1 (2.7)
Current residents (not yet employed)	20 (54.1)
Prefer not to answer	2 (5.4)
Training model	
System-based	32 (86.5)
Transitional zone	4 (10.8)
Modality-based	1 (2.7)

Overall satisfaction and domain-specific ratings

The overall mean satisfaction score across all five domains was 3.73 ± 0.44 . Among individual domains, satisfaction with the learning experience was rated highest (mean, 3.87 ± 0.48), followed by teaching and assessment (3.84 ± 0.49), research and academic development (3.74 ± 0.81), readiness for clinical practice (3.68 ± 0.62), and workload and learning environment (3.39 ± 0.57).

Within the learning experience domain, participants reported high satisfaction with case volume in individual rotations, while opportunities for elective rotations received comparatively lower ratings. In the teaching and assessment domain, the fairness of examinations was rated

highly, whereas the perceived usefulness of portfolios and logbooks received lower scores. Workload during regular working hours received the lowest ratings among all individual items, while on-call workload and availability of learning resources received moderate ratings. **Table 2** presents overall satisfaction scores across the five training domains, and **Figure 1** illustrates them.

Overall satisfaction and recommendation of the program

The mean overall satisfaction score for the residency program was 3.76 ± 0.64 . Participants also reported high confidence in recommending

the program to junior trainees, with a mean score of 3.89 ± 0.88 . **Table 3** shows overall satisfaction and confidence in recommending the program.

Factors associated with overall satisfaction

Comparisons of overall satisfaction scores across personal characteristics showed no statistically significant differences by training status (current resident vs. program alumni), gender, age group, workplace, or curriculum type (all $p > 0.05$). Although these differences were not statistically significant, program alumni, male participants, those aged over 30 years, participants working in military hospitals, and those trained under transitional zone or modality-based curricula

had higher mean satisfaction scores. **Table 4** summarizes comparisons of overall satisfaction across personal characteristics.

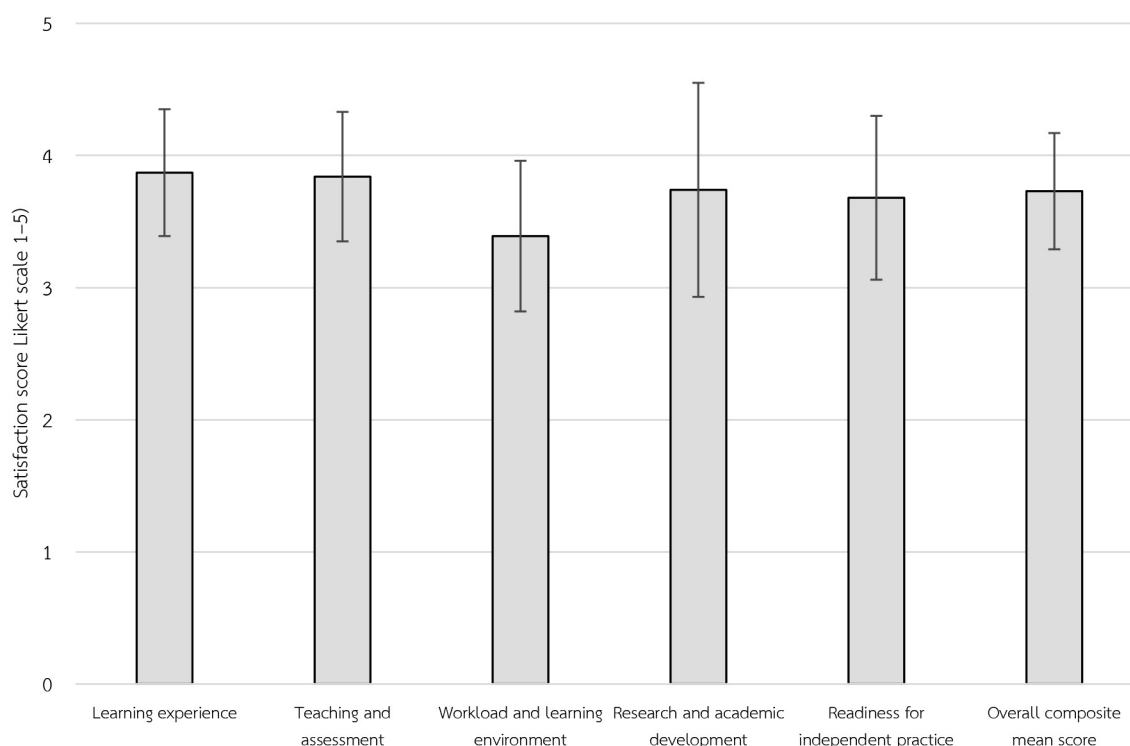
Significant positive correlations were observed among several satisfaction domains. The learning experience demonstrated a strong correlation with workload and the learning environment ($r = 0.672, p < 0.001$). Teaching and assessment showed a strong correlation with research and academic development ($r = 0.567, p < 0.001$), while research and academic development were also significantly correlated with readiness for clinical practice ($r = 0.546, p < 0.001$). Overall satisfaction demonstrated a significant positive correlation with confidence in recommending the

Table 2. Satisfaction with diagnostic radiology residency training across five domains (n = 37)

Item	Mean $\pm$ SD
Learning experience	3.87 $\pm$ 0.48
The number of cases in each rotation was sufficient for learning	4.35 $\pm$ 0.72
The diversity of diseases and organ systems encountered during training was sufficient	3.68 $\pm$ 0.85
Rotation duration across systems was balanced and appropriate	3.78 $\pm$ 0.85
I had sufficient opportunities to choose elective rotations based on my interests	3.68 $\pm$ 1.16
Teaching and assessment	3.84 $\pm$ 0.49
Assessment criteria (e.g., EPA/Milestones) were clear and easy to understand	3.92 $\pm$ 0.80
I received clear, timely, and constructive feedback from faculty	3.70 $\pm$ 0.78
The examination and grading system was fair	4.35 $\pm$ 0.59
The portfolio/logbook was useful for learning development and progress tracking	3.30 $\pm$ 0.74
I had sufficient opportunities to participate in academic activities (e.g., topic discussions, journal clubs, interdepartmental conferences)	3.95 $\pm$ 0.91
Workload and learning environment	3.39 $\pm$ 0.57
Regular working-hour workload was appropriate and supportive of learning	2.97 $\pm$ 0.90
On-call workload was appropriate for learning	3.57 $\pm$ 0.80
The learning environment and resources adequately supported training	3.62 $\pm$ 0.72
Research and academic development	3.74 $\pm$ 0.81
I received sufficient opportunities and support for research throughout training	3.68 $\pm$ 0.88
Research output during training met my expectations	3.81 $\pm$ 0.91
Readiness for independent practice	3.68 $\pm$ 0.62
I felt adequately prepared to interpret and report routine plain radiographs	3.59 $\pm$ 0.83
I felt adequately prepared for emergency on-call duties	3.97 $\pm$ 0.83
I felt adequately prepared to perform or assist with fluoroscopic procedures (e.g., contrast swallowing study, upper gastrointestinal study, VCUG)	3.46 $\pm$ 0.84
Overall mean score across five domains	3.73 $\pm$ 0.44

Scores were based on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), with higher scores indicating greater satisfaction.

Figure 1. Distribution of mean satisfaction scores ($\pm$ SD) across the five domains of diagnostic radiology residency training, including learning experience, teaching and assessment, workload and learning environment, research and academic development, readiness for independent practice, and the overall composite mean score across all domains.



Scores are presented as mean $\pm$ standard deviation on a 5-point Likert scale (1 = very dissatisfied, 5 = very satisfied). Error bars represent standard deviations.

Table 3. Overall satisfaction and confidence in recommending the diagnostic radiology residency program (n = 37)

Item	Mean $\pm$ SD
Overall satisfaction with the residency program	3.76 $\pm$ 0.64
Confidence in recommending the program to junior trainees	3.89 $\pm$ 0.88

Scores were rated on a 5-point Likert scale, with higher scores indicating greater satisfaction or confidence.

Table 4. Associations between personal characteristics and overall satisfaction with the diagnostic radiology residency program

Characteristic	n	Mean $\pm$ SD	p-value
Training status			0.648
Current residents	20	3.70 $\pm$ 0.51	
Program alumni	17	3.76 $\pm$ 0.36	
Gender			0.461
Male	20	3.77 $\pm$ 0.47	
Female	15	3.66 $\pm$ 0.43	
Age (years)			0.951
≤ 30	17	3.72 $\pm$ 0.53	
> 30	20	3.73 $\pm$ 0.36	

Table 4. Associations between personal characteristics and overall satisfaction with the diagnostic radiology residency program (cont.)

Characteristic	n	Mean $\pm$ SD	p-value
Current workplace			0.378
Military hospital	11	3.79 $\pm$ 0.40	
Tertiary, general, or university hospitals	4	3.59 $\pm$ 0.27	
Training model			0.523
System-based	32	3.71 $\pm$ 0.46	
Transitional zone or modality-based	5	3.85 $\pm$ 0.27	

Independent-samples t test was used for group comparisons.

Statistical significance was set at $p < 0.05$.

No statistically significant differences were observed across groups.

Correlations between satisfaction domains and recommendation confidence

program ($r = 0.595$, $p < 0.001$), indicating that higher overall satisfaction was associated with greater willingness to recommend the training program to junior trainees. (**Table 5**)

Qualitative findings from open-ended responses

Analysis of open-ended responses identified several recurring themes across training domains. Participants reported imbalances in clinical

workload across rotations, with certain subspecialties, particularly abdominal imaging and neuroimaging, perceived as having excessive service workload that limited teaching time. In contrast, other areas, including musculoskeletal, pediatric, chest, cardiovascular imaging, and ultrasound, were perceived as having insufficient case volume or limited case diversity.

Table 5. Correlations between overall satisfaction, domain-specific satisfaction, and confidence in recommending the diagnostic radiology residency program ($n = 37$)

Satisfaction domains	(1)	(2)	(3)	(4)	(5)	(6)
Learning experience (1)						
Teaching and assessment (2)	0.545* ($p < 0.001$)					
Workload and learning environment (3)	0.672* ($p < 0.001$)	0.439* ($p = 0.007$)				
Research and academic development (4)	0.399* ($p = 0.015$)	0.567* ($p < 0.001$)	0.341* ($p = 0.039$)			
Readiness for independent practice (5)	0.527* ($p < 0.001$)	0.541* ($p < 0.001$)	0.400* ($p = 0.014$)	0.546* ($p < 0.001$)		
Overall satisfaction (6)	0.478* ($p = 0.003$)	0.577* ($p < 0.001$)	0.367* ($p = 0.026$)	0.436* ($p = 0.007$)	0.517* ($p = 0.001$)	
Confidence in recommending the program (7)	0.539* ($p < 0.001$)	0.216 ($p = 0.198$)	0.347* ($p = 0.036$)	0.350* ($p = 0.034$)	0.326* ($p = 0.049$)	0.595* ($p < 0.001$)

Pearson correlation coefficients are shown.

Numbers in parentheses correspond to satisfaction domains listed in the first column.

* Statistically significant at $p < 0.05$

In the teaching and assessment domain, participants consistently identified case-based learning and direct case review with faculty as the most valuable educational activities. Participants expressed a desire for more faculty-led teaching sessions, particularly on core radiology topics, as well as greater opportunities for interdisciplinary case discussions. Suggested improvements included expanding institutional case repositories and increasing structured film-reading sessions.

Regarding workload and the learning environment, participants highlighted limitations in workstation availability, computer performance, and access to dedicated study spaces. Service-related tasks, particularly non-educational consults, were perceived as detracting from learning time. Recommendations focused on improving infrastructure, clarifying workflow processes, and enhancing access to educational resources.

In the research domain, commonly reported challenges included limited research skills, time constraints due to service workload, difficulties accessing data, and inconsistent mentorship. Participants suggested earlier and more structured research training, protected research time, and improved support for data access and academic supervision.

Regarding readiness for clinical practice, participants reported gaps in confidence in plain film interpretation, particularly in musculoskeletal and emergency radiology, as well as in pediatric imaging, fluoroscopy, Doppler ultrasound, and protocol optimization for advanced imaging. Participants recommended more structured training in these areas and reduced non-essential service workload to allow greater focus on core clinical skills. **Table 6** summarizes detailed qualitative comments and corresponding recommendations.

Table 6. Qualitative feedback and recommendations regarding diagnostic radiology residency training

Domain	Key comments	Suggested improvements
Learning experience (Which rotations or subspecialties do you consider to have excessive or insufficient workload or case volume, and what changes would you recommend?)	Participants reported imbalances in workload and case volume across subspecialties. Abdominal imaging and neuroimaging rotations were consistently perceived as having excessive workload and high case volume with limited case diversity, reducing time for case review and faculty teaching due to service-related tasks (e.g., consultations and interdepartmental coordination). In contrast, musculoskeletal (MSK), pediatric, chest/cardiovascular imaging, and ultrasound rotations were perceived as having insufficient case volume and limited diversity, which constrained learning opportunities.	- Adjust daily case volume and redistribute workload across rotations to improve balance between service and learning. - Increase structured training in Doppler ultrasound, which was identified as an essential skill for post-training clinical practice.
Teaching and assessment (Which components of teaching and assessment were most useful, and which require improvement?)	Case-based learning and direct case review with faculty were consistently identified as the most valuable educational activities. Participants favored modality-based training for routine clinical practice but reported gaps in subspecialty-oriented teaching, particularly in MSK and pediatric radiology. Topic presentations and noon conferences were considered beneficial when conducted regularly and in a structured manner. Limited faculty-led lectures, especially on fundamental imaging interpretation, were identified as an area requiring improvement.	- Increase faculty-led lectures focusing on core imaging interpretation and board-relevant topics. - Expand interactive teaching sessions, including interesting case discussions and structured film-reading sessions. - Reduce service-oriented activities (e.g., routine reporting meetings) in favor of higher-quality educational activities. - Enhance interdisciplinary conferences to improve understanding of clinical expectations for radiology reports. - Develop a centralized case repository to support longitudinal learning.

Table 6. Qualitative feedback and recommendations regarding diagnostic radiology residency training (Cont.)

Domain	Key comments	Suggested improvements
Workload and learning environment (Which components of the learning environment or institutional resources require further development?)	Participants reported insufficient and suboptimal computer workstations, including limited availability, slow performance, and system instability, which disrupted workflow and learning. Concerns were also raised regarding physical workspaces, including reading rooms, on-call rooms, and rest areas. Service-related tasks, particularly non-educational consultations and urgent scheduling requests, were perceived as detracting from protected learning time.	- Upgrade computer hardware, system performance, and ergonomic office equipment. - Establish dedicated common or study rooms for residents. - Improve workflow systems for protocol assignment, consultations, and interdepartmental case review with clearer scheduling processes. - Enhance access to educational resources, including online journals, textbooks, remote PACS access, and anatomy learning tools (e.g., e-Anatomy).
Research and academic development (What are the primary challenges in conducting research during residency, and what solutions would you recommend?)	Major barriers to research engagement included limited research and statistical knowledge, lack of protected research time, inadequate data management systems, and inconsistent academic mentorship. Participants reported difficulties with data access, incomplete medical records, loss of PACS data, and prolonged ethics approval processes. Changes in research advisors during ongoing projects further affected research continuity and publication potential.	- Introduce structured research methodology and statistics training beginning in the first year of residency. - Establish staged research milestones across training years (R1–R3) with protected research time. - Improve data management systems and provide clearer guidance on research ethics procedures. - Strengthen journal reading and critical appraisal training to support long-term academic development.
Readiness for independent practice (Upon entering independent practice, which competencies were insufficiently addressed, and what enhancements would you recommend?)	Participants reported limited confidence in essential clinical skills at the start of independent practice. The most frequently cited gap was systematic interpretation and reporting of plain radiographs, particularly in MSK and emergency radiology. Additional gaps included pediatric imaging, fluoroscopy, Doppler ultrasound, MSK ultrasound, cardiovascular imaging, and advanced MRI protocol optimization and image quality control.	- Provide structured, system-based teaching for plain film interpretation, particularly in MSK and emergency radiology. - Increase supervised practice and repetition of core skills with faculty feedback. - Expand training in pediatric imaging, fluoroscopy, ultrasound, and cardiovascular imaging. - Reduce non-essential service workload to allow greater focus on developing core clinical competencies.

Discussion

This study provides an institution-specific evaluation of diagnostic radiology residency training at Phramongkutklao Hospital by examining satisfaction across multiple educational domains among current residents and program alumni. Overall satisfaction was high, with particularly strong ratings for learning experience and teaching and assessment, whereas workload and the learning environment received comparatively lower scores. These findings highlight the multidimensional nature of residency training and underscore the importance of balancing service demands with educational quality.

Consistent with prior studies^(6,10,11), satisfaction with learning experience and teaching quality emerged as central components of overall training satisfaction. Previous research in radiology and other medical specialties has demonstrated that adequate case exposure, structured supervision, and timely feedback are strongly associated with perceived training quality and educational outcomes.^(7,9,10) In the present study, high ratings for case volume within individual rotations and perceived fairness of examinations support the value of structured curricula and standardized assessment. However, lower ratings for elective opportunities and portfolio-based assessments suggest areas where educational strategies could be refined to better align with learners' needs and expectations.

Workload and the learning environment were the lowest-rated domains, echoing findings from the international literature showing that excessive service workload and limited protected learning time negatively affect resident satisfaction and learning effectiveness.^(6,7) Qualitative responses further illustrate how uneven workload distribution across subspecialties and non-educational service tasks may reduce opportunities for teaching and reflective learning. Together, these findings reinforce the importance of optimizing workflow, redistributing service responsibilities, and ensuring adequate educational infrastructure to support learning in high-volume clinical environments.

Research and academic development received moderate satisfaction scores, with qualitative

data identifying common barriers, including time constraints, limited research skills, and inconsistent mentorship. Similar challenges have been reported across residency programs, where competing clinical demands often limit research engagement.^(10,11) Structured research curricula, early exposure to research methodology, and protected research time have been shown to improve scholarly productivity and residents' confidence in academic skills. Addressing these barriers may therefore enhance both the educational experience and long-term academic development of trainees.

Readiness for independent clinical practice was rated positively overall, particularly among program alumni; however, gaps were identified in specific competencies, including plain film interpretation, pediatric imaging, fluoroscopy, and ultrasound. These findings are consistent with previous studies^(10,11) indicating that perceived preparedness may vary across imaging modalities and clinical contexts. Targeted educational interventions, such as focused teaching sessions, simulation-based training, and increased exposure to underrepresented modalities, may help address these gaps and facilitate a smoother transition to independent practice.

The strong correlation between overall satisfaction and confidence in recommending the training program suggests that resident satisfaction is not only an educational outcome but also a marker of the program's reputation and sustainability. This finding aligns with existing evidence linking resident satisfaction to recruitment, retention, and long-term workforce stability.^(6,8,10) Importantly, the absence of significant differences in satisfaction across demographic and training characteristics indicates that perceived training quality is driven primarily by program-level factors rather than individual attributes.

The present findings should be considered in the context of diagnostic radiology residency training at Phramongkutklao Hospital. Input from residents and program alumni may provide valuable guidance for refining the curriculum and improving the institution, particularly regarding workload, the learning environment, and research support.

This study encountered several limitations that should be considered when interpreting the findings. First, the study was conducted at a single institution, which may limit the generalizability of the results to other diagnostic radiology residency programs with different institutional contexts, resources, and training structures. Second, the sample size was relatively small, reflecting the size of the residency program, which may have reduced statistical power to detect small differences between subgroups. However, the perspectives included in this study were limited to current residents and program alumni. Other stakeholders involved in residency training, such as faculty members, program directors, curriculum administrators, and allied healthcare personnel, were not included. Future studies incorporating multiple stakeholder perspectives may provide a more comprehensive understanding of residency training and support broader curriculum and organizational development. Third, data were collected using a self-reported questionnaire, and individual perceptions, expectations, or social desirability bias may have influenced responses. Although efforts were made to minimize recall bias by focusing on recent program alumni, retrospective assessment of training experiences may still be subject to recall limitations. Fourth, the cross-sectional study design does not allow for the assessment of changes in satisfaction over time or for causal relationships between training factors and outcomes. Finally, while open-ended responses provided valuable contextual insights, the qualitative component was limited in scope and was not designed as a comprehensive qualitative analysis. Future studies using multi-institutional designs, longitudinal follow-up, and in-depth qualitative methods may provide a more comprehensive understanding of factors influencing resident satisfaction and training quality.

The findings of this study have several implications for diagnostic radiology residency education. First, maintaining strong clinical exposure and high-quality teaching should remain a priority, as these domains are closely linked to overall resident satisfaction. Second, efforts to optimize workload distribution, reduce non-educational service tasks, and improve learning

infrastructure may enhance the educational environment and support resident well-being. Third, structured research training, protected research time, and improved mentorship may strengthen academic development during residency. Finally, targeted interventions addressing gaps in specific clinical competencies may improve preparedness for independent clinical practice.

Incorporating regular feedback from both current residents and program alumni into curriculum review and program development may support continuous quality improvement and better alignment with evolving educational needs. Such approaches may contribute to sustainable, high-quality radiology training programs that meet the expectations of learners, institutions, and healthcare systems.

The findings of this study may help support curriculum development within the diagnostic radiology residency program at Phramongkutklao Hospital. In particular, qualitative feedback on workload imbalance, learning environment, research support, and preparedness for specific clinical skills may help program directors and faculty members identify areas requiring targeted institutional improvement.

These findings may contribute to ongoing organizational and educational development processes, including review of rotation structure, academic support systems, faculty feedback processes, and procedural training opportunities. However, the findings should be interpreted within the institutional context of Phramongkutklao Hospital and may not be generalizable to other residency training programs.

Conclusion

Diagnostic radiology residents and program alumni at Phramongkutklao Hospital reported high overall satisfaction with residency training, particularly regarding learning experiences and teaching quality. Areas related to workload, the learning environment, and research support were identified as key opportunities for improvement. Overall satisfaction was strongly associated with confidence in recommending the training program, underscoring its value as an indicator of educational quality and program effectiveness.

Availability of data and materials

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare no competing interests.

Authors' Contributions

TP conceived and designed the study, developed the questionnaire, collected the data, performed the statistical analysis, and drafted the manuscript. CL and SS contributed to the study design, critically reviewed the questionnaire, provided academic supervision, and assisted with data interpretation. TW, as the corresponding author, provided overall academic supervision, contributed to the study design, and guided the data interpretation. All authors read and approved the final manuscript.

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