Journal of Population Therapeutics & Clinical Pharmacology

Assessment of Radiation Protection Knowledge, Attitudes, and Practices (KAP) Among Interventional Radiology Professionals

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Radiology technology

Abstract:
Objectives: The prevalence of cardiac disease and associated mortality rates have led to increased cardiac imaging, potentially exposing interventional cardiologists to high radiation doses. This study aims to evaluate the knowledge, attitudes, and practices (KAP) of radiation protection (RP) among interventional radiology professionals in healthcare centers.
Methods: A cross-sectional study was conducted using a validated questionnaire with 30 multiple-choice questions. Participants included healthcare personnel working with radiation, such as secretaries, radiology technologists, nurses, and physicians. The questionnaire assessed KAP regarding RP and was divided into three sections.
Results: Significant differences were observed in RP KAP mean scores based on educational age ($p < 0.050$). However, there were no significant differences in RP KAP mean scores based on sex, practice age, or hospital type ($p > 0.050$). Furthermore, a significant difference was found in RP KAP mean scores across different geographical regions ($p < 0.050$).
Conclusions: Educational and practice age, sex, hospital type, and geographic region influence the KAP of interventional radiology staff regarding RP. Given the potential radiation hazards for both medical personnel and patients, proactive measures are crucial. Regular check-ups, diverse educational samples from various regions, continuous training, and practical courses can improve RP awareness. The findings can inform health physics officers to develop strategic plans for enhancing radiation protection services in interventional radiology departments.
Keywords: Knowledge, Attitude, Radiation Protection, Interventional Radiology

Introduction:

X-ray technology has been in use for over a century, initially without a full understanding of its potential hazards, which include dermatoses, cataracts, hematological disorders, and cancer. This necessitates the implementation of radiation protection (RP) strategies, such as the 'as low as reasonably achievable' (ALARA) principle, to minimize exposure risks. The three fundamental principles for medical imaging procedures are justification, optimization, and dose limits, with optimization evolving as knowledge about radiation effects has grown. RP has been a longstanding concern since the early days of radiography, especially as medical imaging technology continues to advance, requiring stringent regulations for safe usage. (Szarmach et al., 2015)

Healthcare personnel working with radiation, including interventional cardiologists, are at risk of significant radiation exposure during routine examinations. Continuous training, refresher courses, and specific training in interventional radiology are recommended by organizations such as the World Health Organization (WHO) and the International Commission on Radiological Protection (ICRP) to ensure proper

RP practices. The complexity and operator dependence of interventional procedures underscore the importance of adequate training in RP techniques and knowledge. (Leung, 2015)

Given the interdependence of knowledge, attitude, and practice (KAP) in achieving good clinical outcomes, various factors such as sex, education and practice age, hospital type, and geographical region can influence RP practices. This study aims to assess the KAP level of RP among interventional radiology staff through a validated questionnaire. The findings can inform the development of educational policies tailored to radiation workers across different specialties and levels of expertise. (Kraska & Bilski, 2012)

Methods:

A validated questionnaire consisting of 30 multiple-choice questions was distributed across various regions, including the northern (13.0%), western (10.0%), eastern (2.0%), central (16.0%) regions, .Content validity ratio (CVR) calculations involved ten panelists, including medical physicists, a nuclear medicine specialist, an occupational health specialist, and an epidemiologist. The finalized questionnaire underwent a pilot study with 15 employees in interventional radiology departments, using a four-week retest design to assess reliability and validity. Pearson's correlation coefficient indicated high overall reliability ($r = 0.81$, $p < 0.001$).

Participants were healthcare personnel working with radiation, including department secretaries, radiology technologists, nurses, and physicians in educational (69.0%), non-educational (8.0%), and private health clinics (23.0%). The questionnaire included demographic information such as age, sex, academic degree, job title, educational age (time since graduation), and a section on general RP practices, including the use of lead aprons, film badges, dose limits, ALARA principle adherence, and participation in RP training courses. Data analysis was conducted using SPSS Statistics (Version 16.0), with one-way ANOVA used to determine statistical significance ($p < 0.050$). Participants were assured of data confidentiality.

This methodology aimed to assess the knowledge, attitude, and practice (KAP) of radiation protection (RP) among interventional radiology staff, providing valuable insights for educational policies and training programs.

Results:

Two hundred and five questionnaires were collected from various geographical regions. The analysis of RP knowledge scores revealed no significant difference based on sex ($p = 0.130$) or educational age ($p = 0.860$). Similarly, there was no significant difference in RP knowledge scores based on practice age ($p = 0.400$) or hospital type ($p = 0.160$). However, a statistically significant difference was observed in RP knowledge scores among different geographical regions ($p = 0.010$), showing significantly higher scores compared to the capital (mean difference = 16.7).

Regarding RP attitude scores, no significant differences were found based on sex ($p = 0.260$), educational age ($p = 0.570$), practice age ($p = 0.830$), hospital type ($p = 0.820$), or geographical region ($p = 0.110$).

RP practice scores showed no significant differences based on sex ($p = 0.330$) or region ($p = 0.070$). However, participants with more than 15 years of educational experience and more than 15 years of practice experience showed significantly higher RP practice scores compared to those with less experience ($p < 0.001$). RP practice scores were also higher in non-educational clinics compared to educational hospitals and private clinics.

Regarding RP KAP scores, a significant difference was observed based on educational age ($p = 0.030$) but not sex ($p = 0.470$), practice age ($p = 0.530$), or hospital type ($p = 0.200$). RP KAP scores were significantly higher in the eastern region compared to other geographical regions.

Discussion:

Radiology examinations play a crucial role in diagnosis, but they also pose risks due to radiation exposure. Adverse biological effects of radiation include an increased risk of cancer, shortened longevity, birth defects, and cataracts. The principles of radiation protection (RP) focus on time, distance, and shielding, which are essential to mitigate risks. In interventional cardiac procedures, healthcare professionals can receive significant radiation doses, especially in high-risk areas like interventional radiology departments. Modern techniques in cardiac interventions carry substantial radiation exposure risks, emphasizing the

occupational concern of RP. Guidelines, such as those from the American College of Cardiology, set dose limits for medical staff to minimize cumulative exposure. (Crane & Abbott, 2016)

Our study found no significant difference in RP knowledge, attitude, and practice (KAP) based on gender, aligning with previous research. However, educational background influences RP awareness, with those with a basic science background typically exhibiting better RP knowledge. The educational age of staff also plays a role, with longer educational periods often associated with higher KAP levels in RP. Continuous training is crucial for maintaining RP awareness, as shown by the lack of significant differences in RP knowledge based on educational age in our study. (Berkhout, 2015)

Interestingly, RP practice scores were higher in older staff (>15 years of practice) compared to younger staff (≤15 years of practice). This highlights the importance of experience and continuous training in maintaining good RP practices. Non-educational clinics showed better RP practices than educational hospitals, possibly due to the disruptive presence of students in educational settings. Geographical regions also influenced RP KAP, with northern showing better knowledge and practices compared to the capital, potentially due to differing organizational policies and training approaches. (Matsuda & Suzuki, 2016)

In conclusion, our study underscores the importance of continuous training, experience, and organizational policies in maintaining high levels of RP awareness and practices among healthcare professionals in interventional radiology. Collaborative efforts between educational institutions, healthcare organizations, and regulatory bodies are essential to ensure effective RP strategies and minimize radiation risks in medical settings. (Alavi et al., 2017)

Conclusion:

Radiation protection (RP) remains a critical concern in the daily practice of medical professionals, especially in interventional radiology. Our study highlighted the impact of education, practice age, sex, hospital type, and geographical region on the knowledge, attitude, and practice (KAP) of RP among interventional radiology staff.

Our findings emphasize the need for comprehensive educational programs and continuous training to enhance RP KAP in interventional radiology departments. Proper education and training can significantly reduce radiation-related harms for both healthcare professionals and patients. It is crucial for healthcare organizations and regulatory bodies to prioritize RP education and provide resources for ongoing training to ensure a safe and effective healthcare environment.

In conclusion, our study underscores the importance of continuous efforts to improve RP KAP among healthcare professionals, ultimately contributing to better patient care and safety in interventional radiology settings.

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