Quality Improvement Project: Awareness of Radiation Risks by Referrers and Practitioners Justifying Radiological Examinations

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Abstract

Background: Justification of radiological examinations under the Ionising Radiation (Medical Exposure) Regulations (IR(ME)R) requires both practitioners and referrers to understand the relative radiation doses and associated malignancy risks of commonly requested imaging investigations. However, previous studies have demonstrated poor awareness of radiation exposure among clinicians, which may contribute to inappropriate imaging requests and avoidable patient harm. In a study by Shiralkar et al., 97% of clinicians underestimated actual radiation doses, highlighting a pervasive lack of foundational knowledge even among qualified doctors and underscoring the need for earlier and more structured education on imaging-related radiation risks.

This project therefore aimed to assess baseline knowledge of radiation doses and cancer risks associated with common radiological examinations among medical students, the future referrers responsible for imaging requests, with the objective of fostering an early understanding of radiation risk to promote appropriate imaging practice and patient safety from the outset of their careers.

Aim: To assess baseline radiation awareness among medical students and evaluate whether a targeted educational intervention improves knowledge relevant to imaging justification.

To achieve a measurable improvement of knowledge in 100% of participants following a targeted educational intervention, in keeping with Royal College of Radiologists audit standards that aim for universal competence in radiation awareness among referrers and practitioners

Methods: A prospective quality improvement project was conducted using a structured radiation awareness questionnaire adapted from the Royal College of Radiologists audit resources. The questionnaire assessed participants' knowledge of effective radiation doses by estimating the number of P-A chest radiograph equivalents for common imaging investigations, including plain radiography, CT, nuclear medicine, MRI, and USS. Participants were also asked to estimate the approximate risk of inducing a fatal malignancy for select radiological examinations.

Undergraduate medical students, specifically those in their clinical years, were recruited as participants, as this stage of training is particularly relevant for such an intervention as students observe and begin to participate in clinical decision making such as imaging requests but may have had limited formal teaching on radiation protection. Baseline questionnaires were completed prior to any educational intervention. A focused teaching session was then delivered covering IR (ME) R principles, radiation protection, relative radiation doses, malignancy risk, and the ALARA (As Low As Reasonably Achievable) principle. Following the teaching session, participants completed the same questionnaire. Pre- and Post-intervention responses were compared, with the primary outcome being the change in the proportion of correct answers.

Each cycle of the intervention was delivered through small-group tutorials of approximately 6-10 students to promote participation and discussion, and to allow the content to be tailored to learners' needs. This approach aligns with adult learning theories and is intended to enhance knowledge retention and educational impact. Pre- and post-intervention questionnaires were used both as evaluative measures and as pedagogical tools, priming learners by identifying knowledge gaps and increasing engagement during the session, consistent with principles of self-directed learning and formative assessment.

Results: The questionnaire was scored out of a maximum of 12 points. The mean pre-teaching score was 4.75/12, demonstrating limited baseline awareness of relative radiation doses and associated malignancy risk. Following the intervention, the mean post-teaching score increased to 9/12, representing a substantial improvement in knowledge. Additionally, all participants demonstrated an increase in their individual questionnaire scores, achieving the project aim of 100% participant improvement. Improvements were seen across questions relating to both radiation dose equivalence and estimated malignancy risk.

Conclusion: This quality improvement project highlights the importance of early radiation education for medical students as future referrers. Improving awareness of radiation dose and risk supports appropriate justification of imaging requests in accordance with IR(ME)R guidance, enhancing patient safety, and may reduce unnecessary radiation exposure. The findings support the integration of structured radiation awareness teaching into medical school curricula.