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A snapshot of patients' awareness of radiation dose and risks associated with medical imaging examinations at an Australian radiology clinic

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ABSTRACT

Background: Cumulative radiation exposure is linked to increasing the lifetime attributable risk of cancer. To avoid unnecessary radiation exposure and facilitate shared decision making, patients should be aware of these issues. This paper examines patients' awareness of radiation dose and risks associated with medical imaging examinations.
Methods: Consecutive patients attending a private radiology clinic over a nine week period in 2014 in Metropolitan Melbourne were surveyed while waiting to undergo an imaging examination. Patients who were under 18 years of age, did not speak English and/or were referred for interventional imaging procedures were excluded from participation. Survey questions addressed patients' awareness of radiation dose associated with various imaging modalities' and patients' experience and preferences regarding communication of information about radiation. Data was analysed using SPSS (Ver 20.1).
Results: A total of 242 surveys were completed. Most participants were male (143/239, 59.8%) and aged between 33 and 52 years (109/242, 45%). Over half of participants were not concerned about radiation from medical imaging (130/238, 54.6%). Only a third of participants (80/234, 34.2%) correctly reported that CT has a higher radiation dose than X-ray. Very few participants correctly identified mammography, DEXA, PET and PET/CT as radiation emitting examinations. The majority of participants (202/236, 85.6%) indicated that they were not informed about radiation dose and risks by their referring doctor in advance.
Conclusion: This paper provides information relevant to a single private radiology clinic in Australia. Nevertheless, our results have shown that patients presenting for medical imaging have little awareness of radiation dose and risks associated with these examinations and received little information by their referring physicians or staff at the radiology clinic.

Introduction

The use of medical imaging is increasing rapidly, especially in the western world.[1,2] CT in particular has seen the largest increase in use among paediatric and adult populations.[3] Radiology has become an essential component of the diagnostic workup and management of patients not just for life-threatening illnesses but also for the evaluation of other impairments, such as musculoskeletal disorders. Whilst developments in medical imaging technology have undoubtedly assisted physicians in making more accurate diagnoses, concerns have been raised about the overuse of some imaging modalities in terms of radiation exposure and healthcare costs.[4–6] Globally, around one third of all CT and MRI imaging exams are considered inappropriate and over-utilised.[4–6] This is concerning, since cumulative medical radiation exposure has been linked with increasing the lifetime attributable risk of cancer for an individual.[7]

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Despite the continual increase in radiation exposure to patients presenting for medical imaging examinations, there is evidence to suggest that patients receive little or no information about radiation dose (and corresponding risk), and are ill informed about the overall effects of ionising radiation.[8–15] Patients' lack of awareness surrounding radiation dose and cancer risks from medical imaging have important implications for patient outcomes and care. Firstly, patients' demand for unjustified examinations can lead to unnecessary and unintended radiation exposure for patients.[16,17] In turn, inappropriate referrals may lead to prolonged wait times and delayed examinations for patients who require immediate diagnosis and intervention. Further contributing to patients' lack of awareness include emerging evidence that even referring doctors', radiologists', radiographers' and other medical specialists' knowledge of radiation may be suboptimal, and that radiation as a concept is difficult to explain and understand during a short clinical visit or consultation.[8,18–26]

Patient awareness of radiation dose and risks also have implications for informed consent and shared decision making. For instance, patients who are well-informed of the dose, risks and benefits and advantages of a particular imaging modality are more likely to participate in decisions about their own care and experience less anxiety by gaining greater control over their well-being.[14,26,27,29–32] A number of studies assessing patients' awareness of radiation dose and risks have signalled the need for greater awareness. In one study, only 5/76 (7%) of patients who underwent an abdominal CT scan were given information on radiation exposure by their physician.[8] Another study reported that radiation-induced cancer risk comprehension amongst patients was poor and 942/1047 (90%) patients surveyed underestimated the CT radiation dose relative to chest radiography.[11] Some patients are also unaware of the radiation free nature of MRI and ultrasound.[10] The majority of patients believed that having their condition diagnosed with CT was more important than worrying about associated radiation risk.[9,10] Although this attitude may be relevant for patients with severe illnesses such as cancer, for others, the choice and number of medical imaging exams needs to be weighed against the associated benefits and limitations. Regardless, patients should receive sufficient information about their medical care to be able to make informed decisions in conjunction with their healthcare professionals. Unnecessary exposures may be avoided if patients are well informed of these issues, leading to better health outcomes.

To date only a handful of studies have been conducted to assess patients' awareness, perceptions and information sources about radiation dose exposure during medical imaging examinations[8–12,27,33–38] and to our knowledge no such study has been conducted in Australia. The aims of our study were therefore to provide a snapshot of patients' awareness regarding radiation dose and associated risks from medical imaging examinations at an Australian radiology clinic. The results of this survey could be used to guide the development and implementation of future interventions to improve patient awareness and ultimately reduce unnecessary radiation exposure.

Methods

Survey

To provide a snapshot of patients' awareness of radiation dose and risks associated with medical imaging we developed and administered a prospective survey for this study. The survey included questions regarding i) patient demographic characteristics (age, gender, type and number of previous medical imaging examinations); ii) awareness of radiation dose of common medical imaging examinations and risks associated with radiation; iii) sources of information about radiation dose and iv) patients' expectations regarding information about radiation dose associated with common medical imaging examinations. The survey was pilot tested among eight community members in order to determine the validity of the survey questions and improve on clarity of questions where needed. The participants of the pilot testing were aged between 20 and 60 years, had no affiliation with the researchers or university department and no professional knowledge of medical imaging examinations. The final survey comprised 14 questions (Appendix 1).

Participants and recruitment

A convenience sample of consecutive patients attending a private radiology clinic in Metropolitan Melbourne were recruited from 1st September to 30th October 2014. The data collection period was nine weeks long. Patients were included in the study if they were over 18 years of age, spoke English and/or were referred for non-interventional imaging procedures. Patients who were referred for interventional imaging procedures were excluded as these procedures are therapeutic in nature and often require repeat interventions. This group is therefore more likely to receive detailed information about exam protocols and procedures than patients' receiving non-invasive routine exams. We therefore limited our patient cohort to those receiving diagnostic exams only. During the study period, every consecutive patient was informed of the survey by reception staff at the clinic who distributed a participant information sheet to the patients. Participants who expressed interest in completing the survey were then handed out the hard copy survey and requested to complete and return the survey while waiting for their scheduled examination. Participants placed the completed surveys in a locked ballot box at the reception desk. The study received ethics approval from the Monash University Human Research Ethics Committee, Melbourne.

Data analysis

Data from the surveys were entered into SPSS Statistical Software (v20.1, Chicago, USA). A frequency analysis was then performed for all questions in SPSS. Categorical response options to each item were coded (e.g. not concerned 1; mildly concerned 2; very concerned 3) and reported as frequencies and percentages A Chi-square test was performed to compare the proportion of male and female participants who were able to provide correct answers to questions about the radiation emission nature of X-ray, mammography, CT, ultrasound, MRI, DEXA, PET and PET/CT. A p-value of <0.05 was afforded significance. Thematic analysis and a quantitative transformation method was applied to qualitative data (open-ended question). This involved grouping the most recurring terms and sentences under key themes and then recording the frequency of these themes.[39] Thematic analysis allows the researcher to closely examine participants' perspectives of the risks and logic of reasoning in a way that would not be possible through closed ended questions.

Results

Participant characteristics

During the survey period, a total of 1240 patients attended the clinic for non-interventional (diagnostic) imaging. Of those, 76 patients were aged less than 18 years old and were thus excluded from the study. Two hundred and forty-two participants completed the survey (242/1164, 21%). The age and gender distribution of

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