

Research Article

Knowing the Enemy: Health Care Provider Knowledge of Computed Tomography Radiation Dose and Associated Risks

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ABSTRACT

Background: There is ionizing radiation and associated risk from many medical imaging examinations, especially computed tomography (CT). Unfortunately, health care providers often have limited knowledge regarding radiation dose levels and potential risk.

Research objectives: To assess knowledge of dose levels and risk among referring physicians, imaging technologists, and radiologists in Saskatoon, Saskatchewan, and to identify potential differences between and within those groups.

Materials and methods: A survey was designed and administered to health care professionals.

Results: A total of 308 of 328 surveys were completed (91% response rate). Overall 73% of physicians, 97% of radiologists, and 76% of technologists correctly believed that there is a risk for cancer from an abdomen–pelvic CT scan. Although only 18% of physicians, 28% of radiologists, and 22% of technologists selected the most appropriate estimate of abdominal–pelvic CT dose in terms of chest x-ray equivalents, this is similar to other reported studies. Physicians and technologists who use CT were more likely to select the correct dose than those who do not. Most respondents (91% of physicians, 100% of radiologists, and 100% of technologists) felt that pregnant patients should always be informed about radiation dose as a risk. Although frequency of discussing risk decreased with increasing patient age, technologists were more likely to discuss risk at any age. A total of 93% of respondents expressed interest in receiving dose feedback from medical imaging procedures.

Conclusions: Radiologists and technologists generally showed better knowledge than referring physicians. Among physicians and technologists, knowledge was better in those who use CT than those who do not.

RÉSUMÉ

Contexte : Le rayonnement ionisant et les risques connexes sont associés à plusieurs examens d'imagerie médicale, notamment la tomodensitométrie. Malheureusement, les fournisseurs de soins de santé ont souvent une connaissance limitée des niveaux de dose de rayonnement et les risques potentiels.

Objectifs de la recherche : Évaluer le degré de connaissance des niveaux de dose et des risques connexes parmi les médecins traitants, les technologues en imagerie et les radiologistes de Saskatoon, en Saskatchewan, et recenser les écarts potentiels entre et au sein de ces groupes.

Matériel et méthodologie : Un sondage a été préparé et envoyé aux professionnels de la santé.

Résultats : 308 des 328 questionnaires envoyés ont été retournés (taux de réponse de 91%). 73% des médecins, 97% des radiologistes et 76% des technologues ont correctement répondu qu'il existe un risque de cancer dans le cas d'un examen par TDM de l'abdomen et du bassin. Bien que seulement 18% des médecins, 28% des radiologistes et 22% des technologues aient sélectionné la meilleure estimation de dose TDM pour l'abdomen et le bassin en termes d'équivalence avec la radiographie de la poitrine, ce résultat est similaire à celui constaté dans d'autres études. Les médecins et les technologues qui utilisent la TDM sont plus susceptibles de choisir la dose correcte que ceux qui ne l'utilisent pas. La plupart des répondants (91% des médecins, 100% des radiologistes et 100% des technologues) croient que les patientes enceintes devraient toujours être informées du risque présenté par la dose de rayonnement. Bien que la fréquence des discussions sur le risque diminue à mesure que l'âge des patients augmente, les technologues étaient plus susceptibles de discuter du risque, quel que soit l'âge du patient. 93% des

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répondants disent souhaiter recevoir de l'information sur la dose utilisée dans les procédures d'imagerie médicale.

Conclusion : De façon générale, les radiologistes et les technologues affichent une meilleure connaissance que les médecins traitants.

Keywords: Tomography, x-ray computed; radiation dosage; dose-response relationship, radiation; health knowledge, attitudes, practice; physician; medical imaging; technologist, medical

Introduction

Computed tomography (CT) is a widely used and indispensable tool in modern medicine. In Canada, there were 510 scanners performing an estimated 4.4 million scans in 2011–12 [1]. In Saskatchewan, it is estimated that there were more than 285,000 scans in 2013, a 111% increase from 2001 [2].

The increased use of CT and other medical imaging procedures has significantly increased the population's cumulative radiation exposure [3]. Although newer CT scanners have numerous dose management tools and protocols [3–5], a recent review of British Columbia provincial CT examinations compared 2013 with 2004 diagnostic reference levels, finding similar levels for CT head studies, and only 12% and 25% decrease for chest and abdomen–pelvis studies, respectively [6].

Although risk from radiation dose levels in the range of medical imaging procedures is small, it is real as evidenced from atomic bomb survivors and nuclear industry workers showing significantly increased risk of malignancy in persons exposed to doses in the range of diagnostic CT [7, 8]. In addition, a United Kingdom study revealed an increased risk of brain cancer and leukemia among people who received diagnostic CT during childhood [9]. Calculating the risk of malignancy induction for any individual is difficult as it depends on patient age, gender, scan technique, regions being scanned, and local radiosensitivity of tissue. Allowing for this, the risk of fatal malignancy may be as high as 1 in 1,000 for a 10-mSv exposure (approximate dose of an abdomen–pelvis CT) [10]. This risk is significant on a population basis, with up to 2% of cancers in the United States population possibly attributable to CT [8].

Unfortunately, health care providers including physicians, radiologists, and medical imaging technologists are often not aware of radiation doses for common CT scans or the potential increased risk of cancer with CT [3, 11–13]. It is important for health care professionals (including referring physicians, radiologists, and technologists) to be aware of radiation dose levels and risks from imaging tests for several reasons, including the ability to weigh the risks and benefits of tests, counsel patients on relevant risks, optimize protocols to minimize radiation dose, and select appropriate protocols to minimize radiation dose [3–5].

There have been several prior studies assessing knowledge of radiation dose and risk from CT [11]. One of the first was a 2002 survey at Yale which found that only 9% of

Parmi les médecins et les technologues, le niveau de connaissance est plus élevé chez ceux qui utilisent la TDM que chez ceux qui ne l'utilisent pas.

emergency department physicians and 47% of radiologists believed that a CT scan increased a patient's lifetime risk of malignancy [14]. In addition, 73% of emergency physicians and 77% of radiologists underestimated dose from an abdomen–pelvis CT [14].

There have been five reported studies of radiation dose knowledge among Canadian health care professionals [13, 15–18]. A 2003–2004 survey of 220 Toronto area pediatric physicians showed 77% of respondents vastly underestimated risk of malignancy induction from CT and 97% of respondents underestimated effective dose from an abdomen–pelvis CT [15]. Another study of 32 Toronto physicians revealed that 9% believed there was no ionizing potential from CT, and there was low level of concern regarding dose from medical imaging for their population [16]. That same study surveyed 127 patients, with 72% being unaware of the radiation risk from the imaging test they were about to receive [16]. Of those informed about the risks 42%, 33%, and 17% were informed by the technologist, nurse, and referring physician, respectively [16].

A 2010 study of 628 Canadian emergency medicine physicians showed that 95% understood that CT used ionizing radiation and 82% correctly estimated the lifetime attributable risk of malignancy associated with CT [17]. However, only 37% reported regularly communicating these risks with their patients [17]. A 2012 study of 126 Canadian pediatric emergency physicians found that although 98% understood that there was malignancy risk associated with head CT scans, only 37% of study participants correctly identified the best risk estimate, and 69% discussed these risks with patients “most of the time or almost always” [18].

In a recent survey of 92 Ottawa medical imaging staff members (68 radiologists and 24 technologists), 72% of respondents correctly identified the dose for a CT abdomen, with only 18% underestimating this dose [13]. Although the survey included technologists, the reported data are largely presented for the whole group except to say that technologists received a lower mean score than radiologists [13].

There are fewer published surveys of medical imaging technologists. A 2009 survey of Australian and Saudi Arabian technologists showed that 86% of respondents believed there was a risk of malignancy from CT [19]. A 2011 survey of medical imaging technologists in the United States revealed that only 37% believed that radiation dose from medical imaging posed a health risk and only 39% correctly estimated the dose of an abdomen–pelvis CT [20].

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