International Journal of Modern Physics and Applications
Vol. 1, No. 5, 2015, pp. 205-209
http://www.aiscience.org/journal/ijmpa
ISSN: 2381-6945 (Print); ISSN: 2381-6953 (Online)

Practitioners' Knowledge on Patients' Radioprotection in Emergency and Radiology Services of Hassan II Hospital Agadir Morocco

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Abstract

The objective of this study is to assess emergency department doctors' and radiology service practitioners' knowledge of radiation doses associated with diagnostic imaging and to describe their practices with regard to informing patients of risk.In order to accomplish this study three questionnaires were developed, the first was sent to emergency physicians, the second to the radiology technicians and the third to the radiologist physicians. These questionnaires contained several questions related to practices and practitioners' knowledge on radiation protection of patients. All practitioners of the two departments have completed the questionnaire. 40% of prescribers took into account the ratio benefit/risk related to x-rays during radiological exam prescription. Only 20% of prescribers' explained the risk related to x-rays to the patients during radiological exam prescription. One out off four physicians has correctly estimated the effective dose received by patient during an abdomen pelvic scan compared to the dose of a standard chest x-ray radiograph in an adult. Over three-quarters of doctors (75%) underestimated the lifetime risk of fatal cancer attributable to a single computed tomography scan of the abdomen pelvic. 46% of practitioners reported that they have never received any formal training on risks to patients from radiation exposure. Practitioners in our sample had a varied knowledge of the risks from radiation exposure, but overall knowledge was reduced. The diagnostic imaging request process may need to include information on radiation doses and risks. Therefore a broader diffusion of training in radiation protection of patients could be a solution to improve the knowledge of hospital practitioners on radiation protection of patients.

Keywords

X-ray Imaging, Radiological Exam, Patient's Protection, Dose

Received: November 11, 2015 / Accepted: November 27, 2015 / Published online: December 14, 2015

1. Introduction

An act of diagnostic medical imaging is the result of a multidisciplinary work between a prescriber physician, a radiology technician and a radiologist physician. The first two players in this process are not very sensitive to radiation doses delivered by the instruments for radio- diagnosis. In Europe, The literature shows that prescriber physician have underestimation of delivered doses and risks to low doses of X-rays [1, 2].

However, in Morocco [3], as in most developed countries, there is a remarkable growth in the radiological exams as is the case of the radiology service of Hassan II Hospital. The radiology standard acts and the computed tomography (CT)

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scan acts have witnessed an increase of 17% and 154% respectively between 2010 and 2012, which causes an increase in the collective dose.

This radiation is not risk free for the population. Current epidemiological studies allow to individualizing a small but measurable statistical risk from levels achieved by the repetition of radio - diagnostic. There is a statistically significant excess risk of cancer from a cumulative dose of 100 millisievertmSv [4] in humans. Below these thresholds, the calculation of risk is controversial [5]. Children's are particularly vulnerable because of the high radio sensitivity of their organs: the International Commission of Radiological Protection considers that the risk of radiation-induced cancer compared to adults is three times higher in children from birth up to the age of 10 [6].

In this context, the physician prescriber must be the first actor of patient's radiation protection. His role is paramount: justification of the requirement to reduce the dose to a minimum, information and explanation to the patient the risk-benefit balance related to the achievement of irradiating examination.

The radiology technician and radiologist physician are the second actors of radioprotection of patients. Their roles are essential: Optimization and limitation of the dose delivered during the production of a medical imaging exam to a minimum.

2. Methods and Materials

The questionnaires were designed to evaluate the current practice of practitioners. The questionnaire covered six main areas.

The first requested demographic data of prescriber (Gender, qualification, years of experience).

The second part targeted many issues related to investigate practitioners' knowledge about: (a) the use of a guide of medical imaging for chooses the best exam to the pathology explored. (b) Responsibility justification of radiological examinations. (c) Quantification of ratio benefit/ risk before prescribing radiological examinations. (d) Reception of routine reports for radiological examinations requests. (e) Prior exchange of written information with the physician prescription before make a radiological examination, as well as the use of a guide of medical imaging before radiological act implementation.

The third focused on exploringpractitioners' optimisation knowledge about the availability of a procedural act for each imaging near to radiological equipment. Moreover, questioning about a possible pregnancy. It also focused on the prescription of the parameters used to estimate the effective dose during radiological act acquisition and the availability of means and radiation protection materials for radio- paediatrics examinations.

The fourth dealt with doctors' knowledge of radiation doses which can be assessed in too approaches. First, participants were asked to compare the average effective dose received during Abdomen pelvic CT scan (D_{AB}^{CT}~11 mSv) [7] and Radiography Skull (D_{SH}^{RD} = 0,07 mSv) examinations [7]. The second possibility was to evaluate the average effective dose of received during Abdomen pelvic CT scan examination. The third were axed for prescribers' knowledge of the risk of cancer induction after one CT scan Abdomen pelvic examination.

Finally, we asked practitioners' if they have received basic training on radiation protection while exercising their profession.

3. Results

A questionnaire was administrated to all practitioners in both Emergency and Radiology Services (ten Emergency Physicians, ten Radiology Technician and four Radiologist Physicians) and the results can be summarized as follows:

For Emergency Physician

- 80% of the prescribers confirm the knowledge of radiation protection procedures.
- Only 20% of the prescribers use a guide of medical imaging examinations before prescription.
- 20% of the emergency physicians always prescribe the least irradiation examination.
- 60% of the prescribers rarely indicate the reasons and circumstances of radiological examinations.
- 100% the prescribers believe that the presence of information (interest, motive and circumstances) is essential for the realization of the radiological examination.
- 70% of the prescribers claim that they ask women whether pregnant before prescribing radiology exams.
- Among the prescribers, 30% always, 60% sometimes and 10% never report the need to make a preliminary analysis of radiological examinations.
- 40% of prescribers indicated that they always take into account the ratio Benefit/ Risk related to X-rays during radiological exam prescription.
- Concerning the explanation to the patients of the risk related to X rays during radiological exam prescription: 20% answeredby always, 60% by sometimes, 20% by never.

- Emergency physicians were asked to give an estimating of the average dose received by patient during an abdomen pelvic scan (D_{AB}^{CT}) compared to the dose of a standard chest (D_{SH}^{RD}) X-ray radiograph in an adult (D_{SH}^{RD} = 0.07 mSv).A total of 20% answered correctly (7<D_{AB}^{CT}) ≤ 11 mSv), while 80% underestimated the dose.
- Concerning the question that assessed the physicians' knowledge on the lifetime risk for the development of cancer after one abdomen pelvic CT examination. Only 30% answered correctly (approx.1 cancer death per 1,000) [8, 9].
- 70% of the prescribers have not received basic training in radiation protection, while 90% of them have not received any training session.

For the Radiology Technician

- 80% do not have a procedural guide for imaging act nearby of radiological equipment.
- For prior exchange of written information with the prescribing physician, 20% perform the act of imaging without exchange.
- Only 10% report information regarding the estimation of the dose on the act of imaging.
- 80% of the Technicians claim that they ask women whether they are pregnant or not before conductions radiology exams.
- 70% have received training in basic radiation protection of patients, while all technicians have not benefited any training session.

For Radiologist Physician

- All Radiologists do not use a guide to proper use of radiological examinations and not a guide to radiological procedures.
- The drafting of the report is only for routine CT scan examinations.
- 75% of Radiologists do not take specific measures to radio- paediatrics and believe that the presence of a radio physicist is essential for the optimization of radiological examinations.
- 100% said they do not report information on estimates of dose on the radiological report.
- Regarding the explanation to the patients of the risk related to X rays during radiological examinations, 100% of radiology physicians specified the total lack of awareness and information.
- Concerning the question that assessed Radiologists knowledge to give an estimating of the average dose received by patient during an abdomen pelvic scan compared to the dose of a standard chest X-ray radiograph in an adult (D_{SH}^{RD} = 0.07 mSv). Just 25% answered correctly (7<D_{AB}^{CT}) ≤ 11 mSv), while 75% underestimated the dose.
- Only 25% answered correctly the lifetime risk for the development of cancer after one abdomen pelvic CT examination (approx.1 cancer death per 1,000) [8, 9].
- 75% of Radiologists have received basic training in radiation protection of patients, while all radiologist physicians have not received any training session.

4. Discussions

54% of surveyed practitioners have received basic training in radiation protection of patients. They are distributed as follows 12% of Radiologist Physicians, 12% of Emergency Physicians and 29% of Radiology Technicians. This result is much lower than 71% put forward by Rahhaoui *et al*. (2011) [10] for practitioners in the northern provinces of Morocco.

Only 4% of practitioners have been trained in radiation protection of patients (specifically emergency physicians). This is significantly below 10%, which was reported by Smani (2013) [11] in the region of Marrakech.

Training in radiation protection of patients thus seems to play an important role. This importance has been emphasized by studies of Jacob, Rice and the directives of the European Atomic Energy Comity Euratom 97/43. [12, 13, 14]

Only 20% of prescribers use a guide of appropriate use of medical imaging examinations. Yet the directives Euratom 97/43 requires justification of the radiological procedure is one of the steps necessary to obtain the radiation protection of patients as part of a quality assurance process [13].

The results also showed that 80% of Radiology Technicians do not have a procedural medical imaging act near radiological equipment. The radiologists explained this lack by the not incurring of national protocols.

80% of radiological examinations performed by Radiology Technicians are based on a prior prescription with the prescribing physician. 60% of these do not indicate the reasons and circumstances of radiological examinations. In radiology, the Initial Responsibility Research pregnancy is the joint responsibility of the prescribing physician screening and Physician radiologist [14].

Only 10% of Radiology Technicians report the information needed to estimate the dose received by patient. In the same context, the Radiologists say they do not write routine reports for conventional radiology, and do not mention the dose delivered to the patient (PDL) on the CT scan reports. Radiology Physicians explain this dysfunction by the

important flow of conventional radiology examination, insufficient numbers of Radiologists and lack of medical secretary in the service.

All practitioners of Radiology confirm the absence of the means of radiation protection and restraint for radiological paediatrics explorations. To overcome this problem of unnecessary exposure, radiologists choose non irradiating examinations [15, 16].

Regarding the radiological equipment, the results confirmed the absence of any quality assurance program, even if the directives Euratom 97/43 states that all radiological equipment in use must be kept under strict surveillance [13, 16, 17].

5. Conclusion

The objective of this study was to provide information about the practitioners' knowledge on patients' radioprotection during different stagesof making radio-diagnostic procedures. The patient's radioprotection of practitioners is characterized by:

- 40% of prescribers take into account the ratio benefit/risk related to x-rays during radiological exam prescription.
- Only 20% of prescribers' explains the risk related to x-rays to the patients during radiological exam prescription.
- 20 % of Emergency physicians have correctly estimated the effective dose received by patient during an abdomen pelvic CT scan compared to the dose of a standard chest X-ray radiograph in an adult.
- Just 30% of prescribers have confirmed the lifetime risk for the development of cancer after one abdomen pelvic CT examination.
- 100% of radiology physicians specified the total lack of awareness and information's of patients on the risk related to x- rays during radiological examinations.
- Only 25% of radiology physicians have estimated correctly the effective dose received by patient during an abdomen pelvic scan compared to the dose of a standard chest x-ray radiograph in an adult.
- 25% of Radiologists have confirmed the lifetime risk for the development of cancer after one abdomen pelvic CT examination.

Therefore, the increased use of medical x - rays necessitates the need organisation of periodic training session of different hospital practitioners on patients' radioprotection, for quality assurance programmes of various equipments and implementation of diagnostic references levels.

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