

SAFETY TECHNIQUES USED BY NURSES TO PREVENT X-RAY EXPOSURE DURING FLUOROSCOPIC GUIDED SURGERIES

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INTRODUCTION

Fluoroscopy is an imaging technique that uses X-rays to obtain real-time moving images (Suhm *et al.*, 2003). It allows surgeons to see the internal structure and function of a patient on a display screen and plays a major role in the guidance of surgical procedures (Robert, 1997). The fluoroscopy is a source of X-ray and as such, is a potential health hazard with continued exposure during surgeries (Mariscalco *et al.*, 2011). Fluoroscopic guided surgeries are increasing with providing many benefits for patients in Sri Lanka..

Following the X-ray radiation safety guide-lines is significantly important for theatre nurses. Otherwise it causes different health hazard such as developing cataracts, losing hair, birth defects and developing malignancies (World Health Organization, 2011).

There are no published studies on importance of following radiation safety in Sri Lanka. Hence, the study was focused on examine the safety techniques used during fluoroscopic guided surgeries. Further, this study was determined the knowledge and attitudes among nurses on X-ray safety.

METHODOLOGY

The quantitative descriptive design was utilized for the study. It was conducted using convenience sampling method with 100 fluoroscopic theatre nurses at the National Hospital of Sri Lanka (NHSL), Colombo South Teaching Hospital (CSTH) and Sri Jayewardenepura General Hospital (SJGH). Ethical approval was obtained from the Ethical Review Committee of above hospitals. Pre-tested validated self-administered questionnaire was used to collect data as a tool. It was focused on participants' demographic data; determine nurses' knowledge and attitudes towards X-ray safety; examine existing practice of safety techniques to prevent X-ray and identify barriers to practice safety techniques. Questionnaire was given after obtaining informed written consent. Data was collected from November to December in 2014. The response rate was 96%. Data was analyzed by descriptive statistics using Statistical Package for Social Sciences (SPSS) 16.0 version.

RESULTS AND DISCUSSION

The demographics of the participants for gender showed that 95% were female while 5% were male nurses. The sample represented with 41 from NHSL, 30 from CSTH and 29 from SJGH. In terms of academic qualifications, there were 60.2% of the respondents were diploma holders, whereas 27.8% undergraduate and 11% were graduated with B.Sc. nursing.

The highest numbers of nurses (80%) aware that X-ray can be damaged to the thyroid gland, brain, genital organs, eye, thoracic, abdominal organs and extremities. Further data showed that 60% of nurses reported that there were no harm to hair and teeth due to X-ray (Figure 1).

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Most of the nurses have satisfactory knowledge about damage of main organs due to X-ray exposure. Not only in Sri Lanka but also United State of America the situation is same (Yurt *et al.*, 2014).

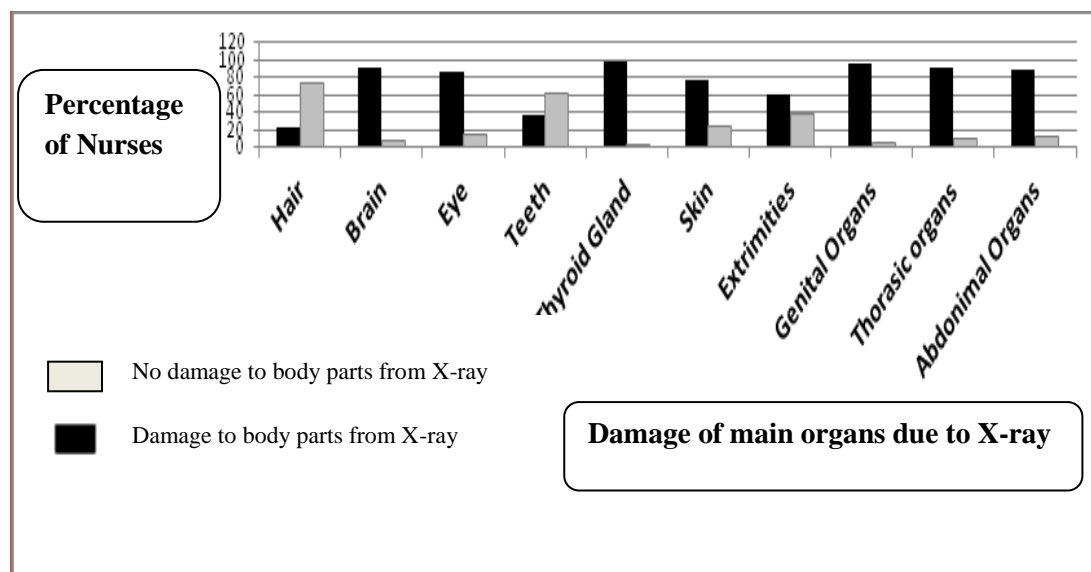


Figure 1. Nurses' knowledge regarding damage to body parts from X-ray

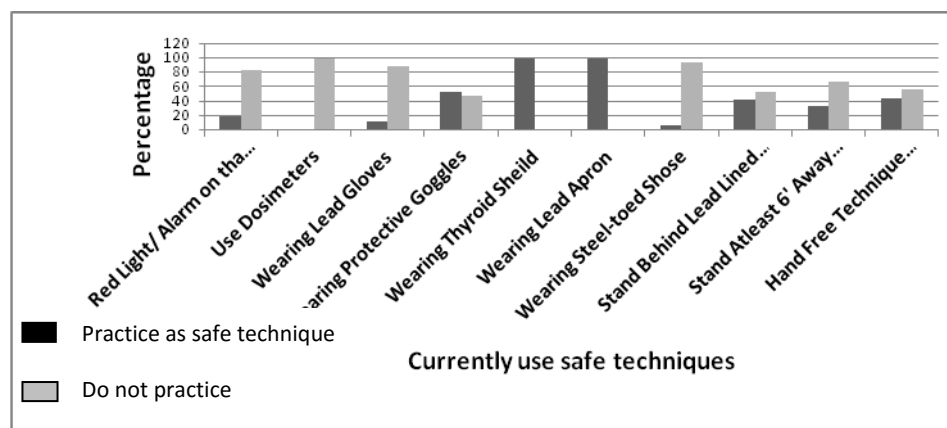
Additionally, it was noted that 99% of nurses were unaware of basic principle of 'As Low As Reasonably Achievable (ALARA)' which as maintain distance from the X-ray source, reduce time of X-ray exposure and shielding. Not only in Sri Lanka but also in Turkey the situation is same (Yurt *et al.*, 2014). Vast majority of nurses (more than 80%) have knowledge of wearing lead apron, thyroid guard and lead lined goggles, red alarm or sign on the door and stand behind lead lined shields as international standard safe techniques to prevent X-ray. Around 60% of nurses are knowledgeable regarding using dosimeters to indicate dosage of personal X-ray exposure, stay away from X-ray beam (at least six feet) and wearing lead lined gloves and use hand free technique from direct X-ray beam as international safety techniques. In contrast, 63% of nurses unaccepted that the wearing steel-toed shoes as standard technique. But nearly half of the sample has lack of knowledge related to some international standard safe techniques for protect themselves, team as well as patients from unnecessary X-ray exposure. Similar finding was pointed out in Kuwait and as well as in Korea (Alotaibi and Saeed, 2006). Sri Lankan nurses do not have basic training program about X-ray safety and it may be one of the reasons for inadequate knowledge regarding some areas.

Based on the result, most of the nurses (82% - 90%) have positive attitudes related to concern of safety of themselves as well as their team members. It was found that 96% nurses have positive attitude towards wearing protective lead shields is important even their family is completed. Results showed that 75%-87% of nurses believed that it is important to wear protective devices while participatine in fluoroscopic surgeries. In contrast 44% of nurses believed that they have not adequate knowledge regarding X-ray safety. The situation of Turkey is also same as Sri Lanka (Yurt *et al.*, 2014). Whereas 92% nurses felt that they need to update their knowledge and attitudes about X-ray safety (Table 1). It is similar to the findings from the study which done in Kuwait and they pointed out nurses were concerned about X-ray and would like to learn more about health risks associated with X-ray (Alotaibi and Saeed, 2006).

Table 1. Nurses' attitudes towards X-ray safety

Statement	Disagree	Neutral	Agree
1. Must be concern all the persons of the team must wear protective lead shields during fluoroscopic surgeries.	2%	14%	84%
2. When see someone without lead apron and a thyroid shield in the theatre must tell to the radiation technician to stop X-ray screening.	3%	8%	89%
3. Must not allow to persons enter to the theatre without protective wearing when using X-ray.	4%	4%	82%
4. When see unnecessarily X-ray screening by X-ray technician without surgeons' order must tell him to stop screening.	3%	7%	90%
5. Wearing protective lead shields by assisting nurse is important during fluoroscopic surgeries.	3%	10%	87%
6. Wearing protective lead shields by circulating nurse is important during fluoroscopic surgeries.	7%	18%	75%
7. Wearing protective lead shields is necessary when my family is completed.	1%	3%	96%
8. I have adequate knowledge regarding X-ray protection.	44%	27%	29%
9. My knowledge regarding X-ray protection must be updated.	4%	4%	92%

In Sri Lanka there is no evidence of use dosimeters to measure X-ray dosage. In contrast, American nurses monitor X-ray exposure by dosimeters (Bahari *et al.*, 2006). Almost all the nurses (99%) use lead aprons and thyroid shields as basic safety techniques. Furthermore 50% of nurses use protective goggles while 50% do not standard of behind lead lined shield. Although 94% not use steel toed shoes, 89% avoid wearing lead gloves and 82% not use red light or alarm. Average amount (58%) does not follow safety techniques for extremities. As well as nearly 70% of them do not uses distance method as stands at least six feet away from direct X-ray beam (Figure 2). In contrast nurses in Korea used protective garments, safe distance and less exposure time as protective measures to limit X-ray exposure (Jung *et al.*, 2013). The overall sample (100%) was accepted that they did not have opportunity to engage in training on X-ray safety. The situation of Turkey is similar (Yurt *et al.*, 2014).

**Figure 2.** Nurses' existing practice of safety techniques

The majority of nurses (72%) identified that heavy weight of the lead apron as a barrier. As well as, more than half of the nurses (54%) face the shortage of protective devices. Whereas 39% of nurses indicated that they dislike using common aprons. Not only in Sri Lanka but

also the situation of United State is also same (Alotaibi and Saeed, 2006). Unfortunately fluoroscopic theatres of NHSL, SJGH and CSTH in Sri Lanka dosimeters are not available. Insufficient equipment, poor use of modern technology, lack of training and lack of knowledge are the barriers for X-ray safety in Sri Lanka. However developed countries have enough safety devices and technology for X-ray safety (Bahari *et al.*, 2006).

CONCLUSIONS / RECOMMENDATIONS

Even though, Sri Lankan nurses have sound knowledge regarding X-ray effects and international standard safe techniques, they do not aware of ALARA principles. Attitudes of X-ray safety among nurses are satisfactory. Practice of safe techniques is very poor. The study revealed that as a developing country insufficient equipment, poor use of modern technology, lack of training and knowledge are the barriers for X-ray safety. Finally this study recommended that to include X-ray safety in for nursing diploma curriculum. As well as nurses already working with fluoroscopy guided surgeries should update their knowledge and attitudes regarding X-ray safety to positive outcome. Authorities should provide adequate amount of safety devices and personal dosimeters to measure personal X-ray exposure level.

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