Relationship between knowledge and performance of radiation protection among nurses who work in operating room

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Abstract. This study investigated the correlation between knowledge and performance of radiation protection among operating room nurses. The research design was a descriptive survey. Data were collected by using a Kang’s questionnaire from August 24 to September 7, 2015. The participants were 184 operating room nurses. There were no significant differences in knowledge of radiation protection according to general and occupational characteristics. However, there were significant differences in performance of radiation protection according to gender, age, education, clinical experience, exposure duration (more than 10 years), and special health screening. Knowledge and performance of radiation protection had a significant positive correlation (r=.23, p<.01). This study concluded that educational programs are needed to improve performance of radiation protection among operating room nurses.

Keywords: Radiation protection, nurses, knowledge, performance

1 Introduction

Since the discovery of X-rays, use of radiation has continuously increased along with advances in medicine and radiation technology. In modern medicine, radiation is actively used in diagnosing and treating human diseases, and contributes to medical advances. In the process, exposure to radiation in healthcare workers increases daily, and opportunities for radiation exposure are likely to increase. Therefore, failure to reduce occupational exposure can potentially lead to cumulative radiation damage not only in radiology workers, but in all citizens, which can then lead to unfavorable outcomes in future generations [1]. Safety management is of interest to all who work with radiation. However, unnecessary exposure to radiation may result from carelessness due to lack of knowledge, overconfidence in working with radiation, and/or underestimation of potential dangers; in addition, systematic management that can detect such risks may be lacking [2]. Moreover, despite policies and regulations for radiation safety management, the frequency of radiation use in various fields is rapidly increasing, resulting in increased radiation exposure levels in all citizens [3].

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In the operating room (OR), many procedures rely on use of radiation, and prolonged and continuous exposure can occur; most of the workers are females, and anxiety over occupational radiation exposure becomes much greater if they become pregnant. Therefore, because the risk of exposure to radiation is very high in doctors, nurses, and other OR workers, attention to radiation protection and safety management are needed [4]. Radiologists and other physicians with significant exposure to radiation wear meters to systematically evaluate and manage the level of exposure; however, radiation management in surgeons and nurses exposed during operations using a C-arm is not implemented properly, hence requiring action to address the issue. Studies on radiation protection have involved investigation of protection-related knowledge, awareness, and behavior in radiology workers at medical institutions [1]; radiation protection awareness surveys of diagnostic radiologists [2]; radiation protection-related knowledge, attitudes, and behavior in dental workers [6]; and radiation protection behavior-related awareness and performance in OR nurses [7]. However, there are few such studies, and those that surveyed educational needs are lacking. By identifying the relationship between the level of knowledge of radiation protection and performance of radiation protection behavior in OR nurses, who are directly and indirectly exposed to perioperative radiation, the present study further aimed to provide assistance in developing future programs to improve radiation safety management performance levels in medical workers. The objective was as follows:

1) Identify the level of knowledge of radiation protection and performance of radiation protection behavior in OR nurses.

2) Analyze the differences in level of knowledge of radiation protection and performance of radiation protection behavior in OR nurses, according to their general and occupational characteristics.

3) Analyze the correlation between level of knowledge of radiation protection and performance of radiation protection behavior in OR nurses.

2 Methods

2.1 Participants

Participants in the study comprised 200 OR nurses from 6 affiliated hospitals of H University Hospital, located in the capital area, Gyeonggi Province, and Gangwon Province in South Korea. The sample included only OR nurses who work with radiation or are at risk for radiation exposure, and who understood the nature of the study and consented to participation.

2.2 Data collection

Data collection occurred between August 24 and September 7, 2015. After receiving approval from the K Hospital institutional review board (Approval No. 2015-07-016-002), 200 sets of questionnaires were mailed out, and all 200 sets were retrieved. Those with incomplete responses were excluded and a total of 184 sets were analyzed.
The questionnaire was in a self-reporting format and the name of the participant on the questionnaire and consent form was removed to maintain privacy.

2.3 Measurements & Data analysis

The research tool used was a questionnaire on knowledge of radiation protection and performance of radiation protection behavior, which was developed by Kang (2013) [7]. In regards to the reliability of the tool, questions on knowledge related to radiation protection were processed as correct or incorrect answers, and the corresponding Kuder–Richardson Formula 20 value was .68, while performance for radiation protection behavior had a Cronbach alpha value of 0.88.

Data collected for the study were analyzed using SPSS WIN 21.0, and frequencies, percentages, chi-square tests, t-tests, and one-way analysis of variance (ANOVA) were performed according to analytic goal. Duncan’s post hoc test was performed. The relationship between radiation protection-related knowledge and performance of radiation protection behavior was analyzed using Pearson’s correlation coefficient.

3 Results

3.1 Knowledge of Radiation protection according to general and occupational characteristics

Results of investigation of radiation protection-related knowledge level according to general and occupational characteristics of nurses.

3.2 Performance of radiation protection according to general and occupational characteristics

Results of investigation of performance of radiation protection behavior according to general characteristics of nurses are shown in Table 1. Male nurses showed higher performance of radiation protection behavior than female nurses (t=2.17, p<.05); higher performance of radiation protection behavior was also shown in older nurses (F=2.93, p<.05), nurses with ≥10 years in total clinical experience (F=8.08, p<.001), and nurses with education level higher than graduation from a 4-year university (t=-2.40, p<.05). The differences were statistically significant.

However, marital status, primary role in the OR, and average daily working hours did not show statistically significant differences in performance of radiation protection behavior.

Table 1. Performance of radiation protection according to general characteristics

<table>
<thead>
<tr>
<th>Category</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t(F)</th>
<th>p</th>
<th>Duncan</th>
</tr>
</thead>
</table>

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Results of investigation of performance of radiation protection behavior according to occupational characteristics of nurses are shown in Table 1. Performance of radiation protection behavior according to number of exposures to radiation emitting equipment, average daily direct exposure to radiation, anxiety over risk of radiation exposure, departmental transfer due to concern over radiation exposure, and perceived effects on health due to radiation exposure did not show significant differences. Nurses with >10 years of exposure to radiation emitting equipment ($F=5.02$, $p<.01$) and nurses who received special medical examinations related to radiation exposure ($t=-4.94$, $p<.001$) showed higher performance of radiation protection behavior, with the differences being statistically significant.
3.3 Correlation between knowledge and performance of radiation protection

As shown in Table 2, knowledge of radiation protection showed a statistically significant positive correlation with performance of radiation protection behavior (r=.229, p<.01). Therefore, nurses with higher knowledge of radiation protection showed higher performance of radiation protection behavior.

Table 2. Correlation between Knowledge and Performance of Radiation protection

<table>
<thead>
<tr>
<th>Category</th>
<th>Performance of radiation protection behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge of radiation protection</td>
<td>0.229** (.002)</td>
</tr>
</tbody>
</table>

** p<.01

4 Conclusion

A statistically significant positive correlation was seen between knowledge and performance of radiation protection. Therefore, in order to enhance performance of radiation protection behavior, knowledge of radiation protection needs to be enhanced. Education on radiation protection is needed above all. Implementation of radiation protection-related education is suggested for continuing or general education of nurses.

References