Original article

Prevention of nosocomial infections and standard precautions: knowledge and practice among radiographers in Sri Lanka

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Abstract

Nosocomial infection is an infection if it becomes positive 48 hours or more after admission to the hospital or within 30 days of discharge. Health care workers can be a major source of vectors for pathogens. Nowadays, interventional radiology and other radiological imaging modalities have undergone vast development and the tendency for accidental exposure to blood and other infectious pathogens are on the increase. Therefore, all the health care workers are expected to follow the standard precautions to prevent accidental injuries during the service. This study was carried out to assess the knowledge and the practice of radiographers on nosocomial infection control and standard precautions. A postal survey was conducted to all registered practicing radiographers in Sri Lanka. A pre-designed, pre-tested, anonymous self-administered, structured questionnaire was circulated among radiographers and for each correct answer one point was assigned. In the knowledge section scores < 25%, 25% - 50%, 51% - 75 %, and > 75% were considered as weak, moderate, good, and excellent knowledge, respectively. In the practice section scores < 50%, 50% - 75% and > 75% was considered as bad moderate and good practice, respectively. The good practice was considered as professional practice for the clinical radiology units. Data entry, management and analysis were carried out using MS excel and SPSS statistical software package. The total response rate was 37.9 %. The mean overall age of the respondents was 30 to 39 years and males composed (72.3%) the majority of study population. Most of the respondents (84.98 %) were qualified as diploma radiographers and 78.87 % of the respondents were practicing in government hospitals. More than half (51.6%) of the respondents have worked for < 10 years and 93.4% have never attended any occupational training program regarding infection control. Majority (43.19%) of the respondents have scored 50% from the total knowledge score and more than half (73.2%) believed that the environment is the major source for nosocomial infections. There was no association between the knowledge and the education levels or knowledge between the years of practice (p< 0.05). The highest recorded score for practice was 66.66%. More than half of the respondents (53.5%) washed their hands infrequently, before touching the patients but 51.2% washed their hands frequently after touching the patients and every clinical expo-
Nosocomial infection is an infection if it becomes positive 48 hours or more after admission to the hospital or within 30 days of discharge. Although infection is mostly present in patients, health care workers also can be a major source of vectors for pathogenic agents. Health care associated infections have long been recognized as crucial factors bedeviling the quality and outcomes of health care delivery. Developing countries have reported to have up to 20 times the risk of contracting a nosocomial infection compared with developed countries. Thus, spread of infection serves as a major source of worry for health care practice, particularly in developing countries where the health care system is already overstretched.

Hospitals provide a favorable transmission pathway for the spread of nosocomial infections, owing partly to poor infection control practices among health workers on one hand and overcrowding of patients in most clinical settings on the other. The importance of hospital-acquired infections goes beyond its impact on morbidity and mortality figures in any country, and has profound economic implications. Prevention of health care-associated infections (HAIs) is the duty of all health care workers. Infection control professionals require evidence-based educational content that facilitates reduction in HAIs. Clinical and support staff in health care institutions are inundated with required training facilitated by accrediting bodies and institutional mandates. Standard precautions are designed to reduce the risk of acquiring occupational infection from both known and unexpected sources in the healthcare setting. Strict adherence by healthcare workers to standard infection control precautions may prevent a percentage of these risks. For that healthcare workers should have adequate knowledge and practice about standard infection control precautions.

Over the last decades, radiological services have undergone many changes and with the introduction of interventional radiology and other special imaging modalities, the tendency for accidental blood and infectious pathogens exposure is on the increase. Standard precautions are implemented to reduce the potentiality of acquiring occupational infections from both unexpected and well-known sources during the healthcare system. Stern conformation to standard precautions can reduce a percentage of these risks.

There are several studies which reveal the importance of infection control practice in other professions. Nurses' and physicians' knowledge of standard and isolation precautions have been reported to be insufficient. Few studies have reported on medical students' knowledge of standard isolation precautions or sharp injuries and noted a lack of adequate knowledge of standard precautions.

In one survey, 27% of participating health care students reported insufficient emphasis on teaching about infection control in their training program, whilst 50% expressed a desire for more emphasis on isolation procedures during their training. Several other targeted studies have detected poor adherence to universal precautions among multiple health care providers, including gastroenterologists and their staff, emergency room physicians and hemodialysis practitioners.

Considering the lack of information describing radiographers' knowledge and the practice of the preventive measures necessary to limit the spread of infections at the radiology units, this study was carried out to assess the knowledge and the practice of radiographers on nosocomial infection control and standard precautions in Sri Lanka.

**Materials and methods**

A cross-sectional prospective postal survey was conducted on all the registered radiographers voluntary participants and who were attached to various hospitals and radiology clinics in both government and private sectors in Sri Lanka. The survey instrument was a pre-designed, pre-tested, self-
administered structured questionnaire designed according to the international standards on prevention of nosocomial infections in line with the objectives of the study.

The questionnaire consisted of three major domains such as demographic factors of the participants, knowledge and practice of nosocomial infections and standard precautions. There were six questions about knowledge of nosocomial infections and standard precautions and answered using the options “Agreed”, “Disagreed” and “Don’t Know”. For each correct answer one point was assigned and therefore, the total score for knowledge was ranged between 0% (0) to 100% (6). Scores < 25%, between 25% and 49.9%, between 50% and 75%, and > 75% were considered weak, moderate, good and excellent respectively. A higher score indicated a greater level of knowledge. Six questions addressed the practice of standard precautions and there were three possible answers (always; sometimes; never) for each question. One point was allocated to ‘always’ option and zero points were assigned for each incorrect or don’t know answer. The total scores were ranged from 0% (0) to 100% (6). Scores < 50%, between 50% and 75% and > 75% was considered as bad, moderate and good practice respectively. The good practice was considered as professional practice for the clinical radiology units.

A covering letter describing the purpose of the study with the questionnaire was sent to all the registered radiographers together with a stamped self addressed envelope. Voluntary participation and confidentiality of responses were also emphasized in the mail. To maximize response rate, monthly reminder (total of 4) mails were sent to those who have not responded. Ethical clearance was obtained from the Research and Ethical Review committee of the Faculty Allied Health Sciences, University of Peradeniya, and all the other ethical aspects were considered. Data and other information of the study were only accessible to the researcher and the supervisor and the participation was anonymous. Data editing was carried out along with the process of data collection. Received data was analyzed using SPSS statistical software.

**Results**

A total of 213 questionnaires were returned out of 562, giving a total response rate of 37.9%.

The demographic characteristics of respondents who returned duly completed questionnaires are shown in table 1 and 2.

<table>
<thead>
<tr>
<th>Gender/Age</th>
<th>20-29 years</th>
<th>30-39 years</th>
<th>40-49 years</th>
<th>&gt;50 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>21.13% (45)</td>
<td>23.94% (51)</td>
<td>7.98% (17)</td>
<td>19.25% (41)</td>
<td>72.3% (154)</td>
</tr>
<tr>
<td>Female</td>
<td>10.33% (22)</td>
<td>7.98% (17)</td>
<td>4.69% (10)</td>
<td>4.69% (10)</td>
<td>27.7% (59)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Qualification and work place</th>
<th>Diploma</th>
<th>B. Sc.</th>
<th>M. Sc.</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teaching hospital</td>
<td>44.60% (95)</td>
<td>1.41% (3)</td>
<td>0.47% (1)</td>
<td>0% (0)</td>
<td>46.48% (99)</td>
</tr>
<tr>
<td>Government (other than teaching ) hospitals</td>
<td>31.46% (67)</td>
<td>0.94% (2)</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>32.4% (69)</td>
</tr>
<tr>
<td>University</td>
<td>0% (0)</td>
<td>2.35% (5)</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>2.35% (5)</td>
</tr>
<tr>
<td>Private hospitals/ Clinics</td>
<td>8.92% (19)</td>
<td>9.86% (21)</td>
<td>0% (0)</td>
<td>0% (0)</td>
<td>18.79% (40)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Work experience and participation of training Programs</th>
<th>&lt;1year</th>
<th>1-5 Years</th>
<th>6-10 Years</th>
<th>&gt;10 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participated</td>
<td>0.99%</td>
<td>0.94%</td>
<td>0.94%</td>
<td>3.76%</td>
</tr>
<tr>
<td>Not Participated</td>
<td>5.63%</td>
<td>33.33%</td>
<td>9.39%</td>
<td>44.13%</td>
</tr>
</tbody>
</table>
The mean overall age of the respondents was 30 to 39 years and males composed (72.3%) majority of study population. Most of the respondents (84.98%) were qualified as diploma radiographers and 78.88% of the respondents were practicing at government (with teaching hospitals) hospitals. Duration of work experience was identified to be less than 10 years in most (51.22%) of the respondents and 93.4% have never attended any occupational training program regarding infection control.
The total score of knowledge ranged from 0% to 100% and majority (75.59%) of the respondents had scored 50% or above (good knowledge). More than half (73.24%) believed that the environment is the major source which is responsible for nosocomial infections and only 44.6% respondents had the knowledge that invasive procedures will increase the risk of nosocomial infections. Almost all the radiographers (97.2%) were aware that the standard precautions should include the recommendations to protect both patients and the health workers but 70.9% believed that the gloves should be used for each procedure. A high percentage of respondents (79.8%) were able to identify the necessity of wearing protective clothes when there is a risk of splashes or spray of blood and body fluids. 58.2% respondents were aware that instead of surgical and antiseptic hand washing alcohol-based hand rubs could be used. There was no association found between the knowledge and the education levels or knowledge between the years of practice (p< 0.05) of the respondents.

The total score of practice ranged from 0% to 100%. Majority (20.18%) of the respondents achieved a moderate score of 66.66%. In the study group 47.9% infrequently wear protective clothes during potential blood splatter. However, 66.56% recognized Hepatitis B or C as high risk infections and they change the personal protective habits accordingly. More than half of the percentage (53.5%) washed their hands infrequently before touching the patients, but 51.2% washed their hands always after touching the patients. Higher percentage (67.6%) was aware of the necessity of adequate covering the open cuts and wounds always during their clinical work. Eleven point seven percent (11.7%) of the respondents never wears mask or respirator although when there is a potential to be exposed to infectious respiratory aerosols. There was no statistical significance found between their infection control practice and the education levels or the infection control practice between their years of practice (p<0.05).

Discussion

Standard precautions for infection control are very vital that have been adopted to prevent health workers from being occupationally infected. Assessment of knowledge of nosocomial infections and standard precautions among radiographers is very critical as without the background knowledge, the awareness remains useless and void. In the study, mean overall score for knowledge of nosocomial infections and standard precautions among radiographers are considered to be moderate. However some gaps can be identified on radiographers’ knowledge in specific areas such as infection origins and standard precautions. The results of the study show that the radiographers are sufficiently aware that the standard precautions lead to protect both patient and staff; however, recommendation of using gloves was not sufficiently concerned. The similar results can be found in the three recent studies done by Bryce, Bello, and Easton.

The study indicates that more than half (73.24%) of the participants identified that the environment is the major source responsible for nosocomial infections. The knowledge deficit about the major source of nosocomial infection is of concern because this relates to an important role for radiographers; though this component can be addressed through education.

Health care workers could be at risk of infections with blood-borne pathogens resulting from occupational blood exposure through injuries with sharp instruments and needle sticks if the standard precaution is not strictly adhered to. However this study finding revealed 93.4% have never participated in any occupational training programs on blood and body fluid universal precautions and it is not in agreement with the findings made by various other countries. The study done by Okaro et al (2010) in Nigeria revealed that radiographers claimed to have awareness or recognition for universal blood and body fluid precautions, with various proportions claiming different sources of awareness, the largest proportion being through clinical seminars or symposia.

Hospitals provide a good transmission pathway for the spread of nosocomial infections, due to poor infection control practices among health workers. The study demonstrates that radiographers’ practice of infection control was moderate and better than the practice demonstrated in few other observational studies. Hands should be washed after attending to one patient but before attending to the next. It must not be missed when contacted is made with body fluids. The finding of this study is far from what can be acknowledged as standard practice but this is similar to finding of Suchitra et al study. Okaro et al (2010) in Nigeria shows that many radiographers do not clean couch, cassette and wash hands after every patient making spread of nosocomial pathogens likely.

There is no relationship between the infection control practice with the education level and the experience of the radiographers in this study. Radiographers have lot of things to do in the area of...
practicing standard precautions. Many of them are far away from guidelines which are meant to be followed in the area of hand washing. Findings of this study clearly demonstrate a moderate knowledge and poor practice on infection control among respondent radiographers in Sri Lanka and findings are similar to some studies in other developing countries. Lack of proper infection control practices can put the patients as well as radiographers life at a risk. This highlights the need of continuing educational programmes to upgrade their knowledge on current practices.

Conclusion

This study reveals the radiographers’ knowledge and practice regarding nosocomial infections and standard precautions were moderate.

Acknowledgments: None

Conflict of interest: None

References

Appendix

A study on “Prevention of nosocomial infection and standard precautions: knowledge and practice among radiographers in Sri Lanka”.

**INSTRUCTION:** Please, tick the relevant box for any option chosen or write in the space provided for additional answers.

[A] Personal Information:

1. Which age group do you belong to?
   - (a) 20-29 yrs
   - (b) 30-39 yrs
   - (c) 40 – 49 yrs
   - (d) 50 yrs and above

2. Gender
   - (a) Male
   - (b) Female

3. Place of work?
   - (a) Teaching Hospital
   - (b) Government hospital (other than teaching)
   - (c) University
   - (d) Private Hospital / Clinic
   - (e) Others, specify………………………………..

4. What is your highest educational qualification regarding to your profession?
   - (a) M Sc
   - (b) B Sc
   - (c) Diploma
   - (d) Others, specify.........................

5. Number of years of radiography practice?
   - (a) Less than 1 year
   - (b) 1 – 5 years
   - (c) 6- 10 years
   - (d) More than 10 yrs

6. Have you ever received occupational training on blood and body fluid universal precautions
   - (a) Yes
   - (b) No

[B] Knowledge regarding infection control

7. The environment (air, water, inert surfaces) is the major source of bacteria responsible for nosocomial infection.
   - (a) Agreed
   - (b) Disagreed
   - (c) Don’t Know
8. Invasive procedures do not increase the risk of nosocomial infection.
   (a) Agreed    (b) Disagreed    (c) Don’t Know

9. **Standard Precautions** include the recommendations to protect both patients and the health workers.
   (a) Agreed    (b) Disagreed    (c) Don’t Know

10. **The standard precautions** recommend use of gloves for each procedure
    (a) Agreed    (b) Disagreed    (c) Don’t Know

11. When there is a risk of splashes or spray of blood and body fluids, the healthcare workers must wear nothing
    (a) Agreed    (b) Disagreed    (c) Don’t Know

12. Instead of surgical and antiseptic hand washing alcohol-based hand rub will be use
    (a) Agreed    (b) Disagreed    (c) Don’t Know

[C] Practice regarding infection control

13. Do you wear protective gloves & coats during procedures where there is the potential for blood splatter?
    (a) Always    (b) Sometimes    (c) Never

14. Do you change your personal protective habits if you know the patient has Hepatitis B or C?
    (a) Always    (b) Sometimes    (c) Never

15. Do you wash your hands before touching the patient?
    (a) Always    (b) Sometimes    (c) Never

16. Do you wash your hands after touching the patient and every clinical exposure?
    (a) Always    (b) Sometimes    (c) Never

17. Do you wear a mask or respirator when there is a potential to be exposed to respiratory aerosols?
    (a) Always    (b) Sometimes    (c) Never

18. Do you cover the open cuts and wounds during clinical work?
    (a) Always    (b) Sometimes    (c) Never

Thank you for your kind co-operation!!