ORIGINAL PAPER

Prevalence of Occupational Exposure to Pathogens and Reporting Behaviour among Cypriot Nurses

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Abstract

Background: Occupational exposure to pathogens forms a major concern among nurses, the largest team among healthcare professionals. Unfortunately, international literature marks high rates of occupational exposure to pathogens among nurses. Data from these studies allow to the implementation of prevention programs to avoid such incidences.
Aim: To assess the prevalence of Cypriot nurses' occupational exposure to pathogens as well as their reporting behaviour following such incidences.
Methodology: A cross sectional survey has been conducted among a convenience sample of 577 nurses, during March and May 2010.
Results: Our analysis demonstrated that almost half of Cypriot nurses (48.4%) had at least one incidence of occupational exposure to pathogens, with more than 20% of the exposed nurses having been exposed via more than one mode. The majority of them have made a report of the incident, according to the policy of their hospital. Main reasons for not reporting such a critical incident included being too busy and forgetfulness.
Conclusions: The results indicate that exposure to pathogens among Cypriot nurses is high, a fact that puts them into danger for acquiring an infection. A risk management program should be implemented to reduce such incidents.

Key words: healthcare associated infections, nurse, occupational exposure, prevalence, risk management

Introduction

It is estimated that worldwide, about 35–40 million health care professionals provide their services to patients (WHO 2010). Unfortunately, occupational exposure to pathogens among health care professionals poses a great risk for acquiring a serious or even lethal health care associated infection via several modes (Twitchell 2003a, Twitchell 2003b). Standard Precautions (Siegel et al. 2007) have been described as an effective means for protecting health care professionals and patients from healthcare associated infections (Cullen et al. 2006, Siegel et al. 2007). They are easy to follow and implement; nevertheless,

previous literature has demonstrated that health care professionals, for various reasons, do not comply with them (Sadoh et al. 2006, Gammon et al. 2008, Jeong et al. 2008, Delobelle et al. 2009). As a result, every year, many heath care professionals suffer from one or more incidences of exposure to pathogens during their clinical practice (Smith et al. 2006, Vaz et al. 2010). Nurses form the largest group of health care professionals and are more vulnerable to an occupational exposure (Kosgeroglu et al. 2004).

Background

Occupational exposure

Occupational exposure to pathogens among health care professionals has been defined as any contact of skin, eyes, mucus membranes or any other parenteral contact with blood or other potentially infected fluids or materials that takes place during their daily clinical practice (OSHA 2009). It can occur via different modes (Efstathiou et al. 2011a). The most frequent mode is via a percutaneous (sharp) injury, more frequently via a needle stick injury (WHO 2011). This is attributed to the provision of care to patients that usually requires the use of sharp instruments, e.g. needles or scalpels (Wang et al. 2003).

Unfortunately, misuse of such instruments, ignorance of proper use, improper discard, and needle recapping pose a serious danger for percutaneous injuries. It is estimated that 20 pathogens can be transmitted via a sharp injury, with more serious and more frequently reported the hepatitis B and C viruses (HBV and HCV) and the human immunodeficiency virus (HIV) (Wilburn & Eijkemans 2004, Deuffic-Burban et al. 2011). Pathogens that are airborne (can travel in the air on dust particles or on small respiratory droplets) may be inhaled and can cause respiratory infections. Such pathogens can cause infections with mild (e.g. common flu) to severe symptoms (e.g. tuberculosis). Direct contact with a patient's non-intact skin can lead to the transmission of several pathogens, e.g. methicillin-resistant Staphylococcus aureus (MRSA). The same applies for indirect contact, e.g. the transmission of pathogens via surgical instruments (carriers) which have not been appropriately disinfected. Finally, droplets (which are too large to remain airborne and can travel only a short distance of no more than 1 m) containing pathogens can be generated from a patient during talking, sneezing, coughing, or during procedures like suctioning or bronchoscopy. Such droplets can also cause occupational exposure in a health care professional.

Among health care professionals, medical doctors, nurses, cleaners, and medical and nursing students are those mostly in risk for an occupational exposure to pathogens (Hsieh et al. 2006, Smith et al. 2006, Vaz et al. 2010), with nurses being at the top of the exposed groups (Perry et al. 2009). Although there is no clear reason for this, it can be attributed to the fact that nurses are, among other health care professionals, the group with the closest and most frequent contact with patients for providing nursing care (Maltezou et al. 2008). Therefore, this fact makes them more vulnerable to infection.

It is estimated that in the United States of America, 600,000–800,000 needle stick injuries occur annually (CDC 2004, WHO. 2011). In the United Kingdom, it is estimated that 17% of all the accidents among health care professionals is attributed (second after injuries during patient moving) to sharp accidents, with 40,000–100,000 incidents per year (Godfrey 2001, NHS. 2005, O'Connor 2009). In France, 8.9 incidences of sharp injuries occur per 100 occupied beds (Venier et al. 2007); in Australia, 19 incidences of sharp injuries occur per 100 occupied beds (WHO. 2011); and in Canada, 14.22 incidences of sharp injuries occur per 100 occupied beds (Nguyen et al. 2001). Furthermore, in Germany, 500,000 incidences of sharp injuries occur annually (Hofmann et al. 2002), and in Switzerland 3.14 sharp injuries occur per 100 full-time health care professionals (Glenngard & Persson 2009).

Worldwide, the number of health care professionals sustaining a sharp injury with an instrument contaminated with HIV is 327,000, with HBV is 2.1 million, and with HCV is 926,000 (Pruss-Ustun et al. 2005). According to the World

Health Organisation, every year, 9% of the health care professionals suffer from a sharp injury (Al-Benna 2010).

Reports from Greece estimate that 74.5% of all health care professionals who have received post exposure prophylaxis antiretroviral therapy have been exposed to blood (Konte et al. 2007).

There are also reports of bacterial infection to health care professionals during respiratory care, intubation or physiotherapy (Low & Wilder-Smith 2005, Wilder-Smith & Low 2005, Chandler et al. 2006, Baba et al. 2009, Lacy & Horn 2009) following an airborne or droplet transmission of a variety of pathogens, including MRSA, SARS and group Streptococcus A.

Finally, reports among health care professionals have also been made concerning contact exposure to pathogens (skin or mucus membranes exposure) (Gessessew & Kahsu 2009, Amuwo et al. 2011).

Exposure reporting system

Although occupational exposure to pathogens should be reported, a large proportion of health care professionals fail to do so (Makary et al. 2007, Azadi et al. 2011, Kostun & Goldsmith 2011). Reasons for not reporting occupational exposure are dissatisfaction with post-exposure support and care, considering patients as "low-risk" (e.g. children), the absence of a formal reporting mechanism, time pressure, ignorance of the need to report the incident, the obligation to report the name of the exposed person, and fear of punishment (Makary et al. 2007, Ghofranipour et al. 2009, Kessler et al. 2011). Unfortunately, such behaviour leaves the health care professional unprotected, since he/she does not receive proper tests, prophylactic therapy and counselling. Furthermore, since no data is reported, no intervention can be made (from hospital administration, ward managers, etc.) to rectify any incorrect behaviour, and avoid similar incidences in the future.

The European Union (EU) has recognized the emerging importance of occupational exposure, especially via sharp injuries. The European Directive 2010/32/EU (Council of the European Union 2010) requires from the EU member states to include in their national legislations, by 11th March 2013, that everybody will be able to make a report of an exposure (although it will not be mandatory to make such a report). Furthermore, the EU makes the suggestion of developing a common reporting system, in order to facilitate the exchange and benchmarking of data. The above directive is referred to all the users of health care services and to medical and nursing students. Already, many European counties (Cyprus, United Kingdom, Austria, Germany, and Greece) (Salzer et al. 2011) have implemented such mechanisms.

In the Cypriot hospitals, an informal mechanism exists for reporting incidences, including occupational exposure. This mechanism is not mandatory, but healthcare professionals are encouraged to make such reports. A reporting form is required to be filled by the exposed person, asking for details on the incidence (when, how, etc.), but it is not known if all cases of exposure are reported via this mechanism. No published data are available either on exposure to pathogens or incidence reporting among any health care group in Cyprus.

Research aim

This study aimed to assess the point prevalence of occupational exposure of Cypriot nurses to pathogens as well as to explore their reporting behaviour following such incidents.

Methodology

A cross-sectional survey has been conducted among nurses in Cyprus to explore their compliance with standard precautions. The results of this study have been previously reported (Efstathiou et al 2011b). Secondary analysis of background data (demographics as well as open-ended and closed questions related to previous exposure, mode of exposure, report of such exposure, and reasons for not reporting) was performed for the purposes of this study. Face and content validity of the questionnaire used has been established by a panel of experts on infection control and research methodology.

Data collection

The study was undertaken during March-May 2010, using a convenience sample of 668 nurses. The distribution of the self completed and anonymous questionnaires took place during the provision of a training program for upgrading from diploma to bachelor level in nursing, offered by the Nursing Department of the Cyprus University of Technology. The vast majority (n=2,898 nurses, 95% of the total nursing personnel) of the 3,050 nurses in Cyprus participated in this 3-year program during 2008–2011.

Questionnaires were distributed in classes during breaks and collected during the same period in order to enhance response rate. Prior to each distribution, the researchers approached the members of the teaching staff giving the lecture, explained the purpose of the study, and asked for permission to administer the questionnaire during the lecture's break.

To be included in the study's sample participants had to meet some inclusion criteria: to be registered nurses according to local legislation, to be willing to participate in the study and to work in a position requiring direct contact with patients in order to provide nursing care.

A total of 597 questionnaires were finally returned (response rate 89.37%). After excluding those with missing data, 577 were eligible for analysis

Ethical considerations

As this study is a part of a PhD thesis, its protocol has been evaluated and approved by the Ethics committee of the Nursing Department, Cyprus University of Technology. Its progress was continuously monitored by a supervisory committee.

The study protocol has been also reviewed and approved by the Cyprus National Bioethics Committee.

Nurses were verbally invited to participate in the study. Those who accepted were given a questionnaire, accompanied by details for the purpose of the study. It was explained that they could refuse participation or withdraw from the study at any time, without affecting them by any means.

Completion and return of a questionnaire was considered as an informed consent. Anonymity and confidentiality were maintained during the whole process, and data were kept safely both in paper and electronic form.

Data analysis

The data were analysed using the SPSS 17.0 for Windows (SPSS, Chicago, IL, USA). Descriptive statistics such as percentages, means and standard deviations were computed for the demographic data (age and gender) and percentages for the rest of the questions.

Results

Demographics

Most of the participants were female nurses (80.6%) whereas the mean age was 36.32 years old (SD = 9.89, min = 20 years, max = 61 years).

Exposure to pathogens

Almost half of the participants (n=279, 48.9%) reported a previous exposure to pathogens. Based on participants' description concerning the mode of exposure to pathogens, data were recoded into sub-categories of modes of exposure. The most frequent mode of exposure reported was via a percutaneous injury, mainly via a needle stick injury. Other modes were less frequent reported, whereas airborne transmission was not reported at all. About 22.6% (n=63) of the exposed participants reported exposure via a combination of mechanisms, more frequently via a percutaneous exposure and droplet transmission (table 1).

Report of exposure to pathogens

Among those participants who reported having previously an occupational exposure to pathogens, 74% stressed that they had reported it to the hospital administration (table 1). When participants were asked to explain the reason for not reporting an exposure, they have replied that they were too busy at the time it took place and then forgot about it.

Other reasons given by the nurses were as follows: patient did not suffer from any infectious disease as indicated in his/her file, did not realize the need to report the incident, ignored the existence of such a reporting mechanism, did not take the exposure seriously, and did not consider it as important incident to be reported. Surprisingly, a participant admitted that he had had many previous exposures and that he eventually decided to stop reporting them.

Discussion

This is the first -to the knowledge of the authors- study in Cyprus on reporting occupational exposure to pathogens among nurses. Occupational exposure to pathogens among Cypriot nurses appears to be high. Almost half of the participants in this study reported a previous occupational exposure via a certain mechanism. Findings from other studies have demonstrated similar incidences of occupational exposure among nurses, ranging from 35% to 79% (Lee et al. 2005a, Askarian et al. 2008, Joardar et al. 2008, Peng et al. 2008, Foster et al. 2010, Azadi et al. 2011).

This study's findings may lead to the assumption that Cypriot nurses fail to implement Standard Precautions, leaving themselves unprotected and in risk of exposure to pathogens. More than one out of every fifth participant in this study admitted to have had more than one incidents of occupational exposure. In this way, the risk of getting infected multiplies. This can also be considered as a sign that Cypriot nurses fail to implement Standard Precautions, even when they have been already exposed once. Factors that influence Cypriot nurses' compliance with Standard Precautions has already been explored in another study (Efstathiou et al. 2011a), therefore the appropriate measures should be taken urgently in order to reduce the observed rates of occupational exposure among them.

Sharp injuries were described in this study as the most common mode of exposure, and these results are also relevant with previous literature (Lee et al. 2005b, Askarian et al. 2008, Yacoub et al. 2010). This can be attributed to the frequent use of sharp objects, especially needles, as many nursing procedures (e.g. drawing blood, accessing a vein to start intravascular fluids' administration, and assisting surgeons during procedures) require their use (Wang et al. 2003). Droplet and contact transmissions appeared less frequently; they should, however, be taken into serious consideration as these modes can also contribute to the transmission of serious pathogens (e.g. severe acute respiratory syndrome and MRSA, respectively). A reason explaining why airborne exposure was not reported at this study, might be the absence of any immediate signs at the time of exposure (in contrast to percutaneous injuries where pain or bleeding is present). Therefore, nurses with an airborne exposure may not realise this at the time that is happening.

Reporting exposure to pathogens is described in Standard Precautions, as a means for safeguarding nurses from being exposed to pathogens (Siegel et al. 2007). Such a reporting appears to be high among Cypriot nurses: more that 70% mentioned that they have used the existing reporting mechanism. This proportion of reporting is much higher than what is described in the literature, either among health care professionals in general or nurses in specific (Shiao et al. 1999, Ayranci & Kosgeroglu 2004, Blegen et al. 2004, Makary et al. 2007, Nagao et al. 2009, Azadi et al. 2011, Kostun & Goldsmith 2011).

Despite the fact that the majority of nurses tend to report incidents of occupational exposure, hospital and ward managers as well as infection control nurses should be concerned about the reasons that almost 30% of them do not follow advices on reporting. This, in fact, should be an avoidable behaviour as non-reporting nurses are left unprotected against a potential risk of infection that could have been prevented if post-exposure tests and treatment were implemented (Edlich et al. 2010, Tolle & Schwarzwald 2010) and it also does not provide the opportunity of taking appropriate measures to correct any wrong procedures followed, in order to reduce the risk of exposure (Smith 2010).

Table 1: Responds of participants

Question	Response
Have you been previously occupationally exposed, by any mode, to a pathogen during your clinical practice? (n=571*)	Yes 279 (48.9%) No 292 (51.1%)
If YES, describe the mechanism that caused it (n=273*)+	Percutaneous injury 74.2% Droplets 35.2% Contact exposure 13.6%
If YES, did you make a report this exposure; (n=269*)	Yes 199 (74%) No 70 (26%)
Exposure via more than one mode (n=63*)	Percutaneous exposure + droplets 57.8% Percutaneous exposure + contact 26.6% Droplets + contact 10.9% All three modes 4.7%

* sample size varies according to variable
+ responds were recoded into sub-categories according to mode of exposure described

Table 2: General Steps of Risk Management

- identification of workplace (which is the workplace, what and how it is offered/produced, employees, procedures followed, building, frequency of adverse events)
- risk assessment (identification of potential risks) and set of criteria/goals to achieve
- evaluation of risk level (analysis of risks and development of a hierarchy of risks starting from the most important)
- Development and implementation of a plan for preventing/eliminating/reducing the identified risks or consequences
- Evaluation of the risk management program (changes if needed) based on the pre-set criteria

The reasons for not reporting are also relevant with previous studies (Panlilio et al. 2004, Makary et al. 2007, Ghofranipour et al. 2009, Azadi et al. 2011, Kessler et al. 2011). Nurses tend to blame the heavy workload as a reason for not making an exposure report, but unfortunately, fail to do so even later because they forget. This is a surprising and a difficult-to-accept finding, given the fact that suffering from an occupational exposure might have serious consequences on health. The least that would have been expected is to forget reporting it, and as a consequence, fail to receive, if necessary, appropriate treatment.

Another reason for not reporting is the fact that this was not considered to be necessary. Most of the nurses in the study failed to explain it, although few stressed that it was needless to report given that no contagious disease was documented in patients' file; therefore, they supposed they were not in risk. It should, however, be stated that antibody testing is not followed for all pathogens. Therefore, the data in a patient's file may not represent his/her actual condition. Standard Precautions require that protection against occupational exposure must be followed every time, considering all the patients as potentially contagious (Siegel et al. 2007).

The findings demonstrate that hospital nursing managers need to take all the appropriate measures to reduce occupational exposure to pathogens among nurses. Heavy workload need to be addressed with better staffing level, so as to help nurses implement Standard Precautions in order to avoid exposure, but also to offer the extra time needed to report an exposure in the unlikely case of happening. In addition, nurses should be informed on the benefits of reporting occupational incidences. They should be encouraged to do so, and be assured that reporting procedures will not lead to punishment. On the other hand, nursing students should be taught about the need for reporting any occupational exposure. They may be reluctant to do so during their training at wards, fearing that by doing so they may face punishment for not following protective guidelines. Students must realize that occupational exposure to pathogens may cause even death, therefore by reporting such incidents will have the opportunity for any post-exposure treatment may be necessary, but also may contribute to the improvement of their training program.

Risk management

Based on the general principles (Table 2) of risk management (Hubbard 2009), a program should be implemented in the Cypriot hospitals, in order to reduce occupational exposure to pathogens among nurses. Such a programme must include the initial assessment of nurses' workplace (e.g. wards, emergency departments, and operating theatres), a risk assessment (assessment of procedures that can cause exposure of nurses to pathogens, e.g. drawing blood or starting intravenous lines), a priority risk evaluation (which procedures are more important), implementation of a risk management programme based on the above evaluations (e.g. use of sharp devices with safety mechanisms or provision of personal protective equipment) and evaluation of the implemented programme for outcomes (redesign if necessary).

Limitations

There are some limitations to this study that should be taken into consideration. Firstly, convenience sampling method has been used. Although this method lacks external validity (data generalizability), it was used for easier sample recruitment and higher response rate (Bowling 2009). Furthermore, since this was a self-report study, a self-report bias may have influenced the data (Polit et al. 2001).

Conclusion

This study demonstrated that occupational exposure of Cypriot nurses to pathogens is quite high. This fact puts nurses into a great risk for acquiring a health care associated infection, which sometimes could be lethal. These alarming results call for attention on behalf of nursing and hospital managers in Cyprus not only for examining the reasons that such high incidences of exposure occur, but for adopting corrective measures if appropriate. On the other hand, the reporting behaviour of an occupational exposure appears to

be better compared to other studies, leading to the assumption that nurses in Cyprus have recognised the importance of using the relevant reporting mechanism, and value its benefits. In this study, most frequent mode of exposure is via percutaneous injury and is relevant to previous findings. This requires further study on whether nurses in Cyprus are not familiar on how to handle sharp instruments and take appropriate corrective measures Risk-management programs should be implemented among nursing personnel, aiming to reduce the reported exposure.

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