Original Article

Nurses' awareness on hospital acquired infection risks of the geriatric patients: A descriptive and cross-sectional study

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Abstract

Introduction: The increasing number of persons > 65 years of age form a special population at risk for nosocomial and other health care-associated infections. Nosocomial infections are major problems in terms of morbidity and mortality as well as prolonged hospitalization and increased costs. The aim of the present study was determination of nurses' awareness of hospital-acquired infection risks of the geriatric patients.

Methodology: This descriptive and cross-sectional study was conducted at a university hospital in North Cyprus. A total of 164 voluntary nurses composed the sample of the study. A questionnaire that was developed by the researchers based on the literature was used as data collection tool. After the ethical approval, data were collected using a questionnaire in September and October 2017 with self-completion method. The methods used to analyze the data include an analysis of descriptive statistic variables such as frequency and percentages for the categorical variables and the Pearson's Chi-square test for comparisons.

Results: Results of the study showed inadequate awareness among nurses on hospital-acquired infection risks of the geriatric patients. It was also determined that there were the statistically significant differences in term of education levels and experiences of nurses with different items on hospital-acquired infection risks of the geriatric patients.

Conclusions: Based on the results of the study, implementations of comprehensive, systematic, and continuous educational programs to enhance awareness of the nurses on health care-associated infections was recommended.

Key words: Health care-associated infections; geriatrics; risks; nursing.

Introduction

Worldwide aged population has been increasing [1-3]. There were 901 million people aged 60 years or over in 2015, an increase of 48 per cent over the 607 million older persons globally in 2000. By 2030, the number of people in the world aged 60 years or over is projected to grow by 56 per cent, to 1.4 billion, and by 2050, the global population of older persons is projected to more than double its size in 2015, reaching nearly 2.1 billion. Two thirds of the world's older persons live in the developing regions and their numbers are growing faster there than in the developed regions. Projections indicate that 1.7 billion people 60 years of age or older - nearly 80 per cent of the world's older population - will live in the less developed regions in 2050 [2]. Increasing ratio of elderly population results in increased health problems of this age group and this is a worldwide community problem [3,4]. Aging is associated with numerous chronic illnesses and comorbid conditions, polypharmacy and immunosuppressive medications, and changes in the immune system. The aged body is different physiologically from the younger adult body, and during old age, the decline of various organ systems becomes manifest. These changes with age have important practical implications for the clinical management of elderly patients. As growing number of the global population is aging; accordingly, a higher number of elderly patients are hospitalized for various causes [4]. The increasing number of persons > 65 years of age form a special population at risk for hospital acquired infections (HAI). The frequency and severity of infectious diseases increase in elderly patients because of humoral and cellular immunity changes, organ and tissue dysfunctions and underlying chronic diseases [1,4,5]. The elderly has defective host defenses that compromise their ability to ward off infectious agents; factors influencing immune competence include immune senescence, changes in no adaptive immunity, chronic diseases, medications, malnutrition, and functional impairment [1]. Physiologic accompaniments of aging are changes in no adaptive

immunity that render the elderly more vulnerable to infection. Chronic diseases including cancer, atherosclerosis, diabetes mellitus, and dementia predispose to certain types of infection [1,4]. Medications such as sedatives, narcotics, anticholinergic, and gastric acid immune suppressants may further suppress innate defenses [4]. Malnutrition, which reduces cell-mediated immunity, may be more common in the geriatric community higher than is generally realized. Alone or in combination, these defects in host defense place geriatric populations in the forefront of nosocomial infection statistics [1,5]. According to studies conducted in this population, age is a risk factor for acquiring nosocomial infections [1,4]. Data conducted in the United States of America from National Nosocomial Infections Surveillance system indicated that persons $\geq$ 65 years of age accounted for 54% of all nosocomial infections [6]. The risk of developing a HAI increases linearly with age; a prevalence study reported a 11.5% HAI prevalence rate in patients over the age of 85, which decreases significantly with younger age [7]. In a study, 47.9% of all HAI episodes occurred in the elderly patients and the incidence of HAI per 1,000 patient days was found to be 2.49. The incidence of HAIs was 1.64 in the younger patients' group. In compared with younger population, elderly had also higher mortality and morbidity rates due to infections. Hospital-acquired infections are major problems in health sector in terms of morbidity and mortality as well as prolonged hospitalization and increased costs. Several studies have shown that mortality increase with the age. In a study, the overall mortality rate was as 16.8%. They found that increase in mortality rate was significantly associated with the older age; 12% in the younger and 22% in the older age groups [4]. Prevention and control efforts are important to cope with HAI in the aging population [7,8]. Nurses play a pivotal role in preventing HAIs, not only by ensuring that all aspects of their nursing practice are evidence based, but also through nursing research and patient education. Defining the risk factors, which promote infections, has a key role in management [9]. It is important for nurses to be aware of the infection risks of elderly individuals to prevent hospital-acquired infections in elderly patients. However, a study was not found in the Northern Cyprus about this subject. Determination of awareness of the nurses about the nosocomial infection risks of the elderly individuals may be useful in improving evidence-based infection control measures in health care settings and infection control preparedness.

The main aim of the study was to determine nurses' awareness on HAI risks of the geriatric patients. Furthermore, the study questions are as the followings:

- Are nurses aware of HAI risks of the geriatric patients?
- Is there any correlation between descriptive characteristics and awareness of the nurses on HAI risks of the geriatric patients?

Methodology

Study Design

The study was planned with descriptive cross-sectional design.

Setting and Sample

The study was conducted at a university hospital in North Cyprus. This hospital is the largest and leading university hospital of Cyprus which is in northern part of Nicosia. The hospital has infection control committee, 209 patient room and two intensive care units. The study was performed on the register nurses who work in the hospital. A total of 168 nurses work in the Near East Hospital. All voluntary nurses who work in adult care clinics were composed the sample of the study (N: 164) with 97.6% access rate.

Study Tools

A questionnaire that was prepared by the researchers based on the literature was used as data collection tool in this study. The questionnaire contained two sections. The first section was regarding to demographics characteristics of nurses and included 11 questions. The second section consisted 33 questions regarding awareness of nurses on HAI risks of geriatric patients with three choices (Agree, not agree, don't know).

Pilot Study

A pilot study was performed on ten nurses for clarity of the tool. These nurses were included in the total sample, since there was no revision.

Data Collection

The data were collected in September and October 2017. The questionnaires were administered by researchers on nurses while they are on the wards or clinics during duty shift with self-completion method. Completion of the questionnaire took almost 20 minutes.

Ethical Aspect

Ethical approval was obtained from the Institutional Reviews Board (IRB) of the University. In addition, organizational permission and informed consent from the nurses were obtained. Explanation was made about voluntarily attendance and the nurses were not required to write their names for confidentiality.

Data Analysis

Statistical Package for the Social Sciences (SPSS) software version 20.0 was used to analyze the collected data. The methods used to analyze the data include descriptive statistic such as frequency and percentages for the categorical variables and the Pearson Chi-square test for differences. The chosen level of significance is $p < 0.05$.

Results

In the present study, a total of 164 questionnaires were included and Cronbach's alpha coefficient was found as $\alpha = .81$, which shows the questionnaire is

Table 1. Descriptive characteristics of the nurses (N = 164).

Descriptive characteristics	N (%)
Age (Mean: 27.7)	
≤ 25	79 (47.9)
26 – 30	63 (38.4)
≥ 31	22 (13.7)
Educational degree	
Health care vocational high school (HCVHS)	32 (19.4)
Bachelor degree	128 (78.2)
Master degree	4 (2.4)
Gender	
Male	52 (32.1)
Female	112 (67.9)
Working experience as registered nurse	
≤ 5	109 (66.1)
6 -10	48 (29.1)
≥ 11	7 (4.8)
Years of hospital experience	
≤ 5	110 (67.1)
6 -10	48 (29.1)
≥ 11	6 (3.8)
Working experience in the unit	
≤ 5	96 (58.8)
6-10	55 (33.6)
≥ 11	13 (7.6)
Currently working unit	
Emergency care	34 (23.2)
Intensive care unit (ICU)	28 (16.7)
Medical unit	27 (15.8)
Obstetrics/gynecology unit	21 (12.8)
Oncology unit	11 (6.3)
Surgical unit	30 (17.7)
Rehabilitation unit	13 (7.5)

Table 2. Educational characteristics of the nurses on hospital acquired infection risks of the geriatric patients (N = 164).

Educational characteristics of the nurses	N (%)
Previous education on hospital acquired infection Risks of the geriatric patients	
Yes	68 (41.2)
No	96 (58.8)
Educational resource (N = 68) *	
School	24 (35.3)
Courses	13 (19.1)
Web resources	12 (17.7)
Congress/conferences	12 (17.7)
In-service education	7 (10.2)
Perceived quality of geriatric care education (N=68) *	
Excellent	20 (29.4)
Very good	29 (42.7)
Good	19 (27.9)
Fair/poor	0 (0.0)
Need for education on geriatric care	
Yes	164 (100)

*Percentages were calculated based on N=68.

reliable. Most frequent age group was ≤ 25 (47.9%) and mean ages of the participants were 27.7 years. Results showed that the majority of the nurses were female (67.9%) and had bachelor's degree (78.2%). Furthermore, it was determined that, majority of the nurses had 5 years or less experience of nursing (66.1%). Currently working units of the nurses were emergency (23.2%), surgical (17.7%), intensive care (16.7%), medical (15.8%), obstetrics/gynecology (12.8%), rehabilitation (7.5%) and oncology (6.3%) units respectively. Majority of the nurses had working experience at hospital wards for 5 years or less (58.8%) (Table 1). Table 2 shows educational characteristics of the nurses. The majority of the nurses had not received previous education on HAI risks of the geriatric patients (58.8%). Nurses received education on HAI risks of the geriatric patients from five types of resources, mostly from school (35. 3%). Regarding to quality of the HAI risk of the geriatric patient's education, majority of the participants rated as very good (42.7%). Furthermore, all of the nurses stated that they need for education on geriatric care. In the present study, examination of general knowledge of the nurses on hospital acquired infections of the geriatric patients showed that, the majority of nurses had correct answers in majority of the items (6 of 8 items) (Table 3). Most frequent correctly known items were, **"**Compared with younger population, elderly have higher mortality and morbidity rates due to HAI**"** (83.1%), "Hospital acquired infections (HAI) are major causes of morbidity and mortality, prolong hospital stay and increased cost" (72.2%) and "Deterioration in consciousness, apathy,

incontinence, tachycardia or tachypnea may be main indications of infection in elderly" (71.5%). However, "High fever occurs every time as one of the main finding of infection in elderly" (59.2%) and "Classical sign and symptoms of infections occur generally in elderly" (57.1%) were frequent wrong or "I don't know" answers of the nurses. Regarding the nurse's knowledge on HAI risks of the geriatric patients; approximately half of the items (12 of 23 items) were known correctly by majority of the nurses (Table 4). Results showed that, highest correct answers among nurses are about "Aging is associated with changes in immune system function resulting in increased susceptibility to infection" (77.1%) and "Elderly may have atherosclerosis that may predispose HAI" (71.7%) items. Furthermore, most frequent wrong or "I don't know" answers were about "There is no interaction between decreased gastric acidity, bowel peristalsis and HAI among elderly people" (73.8%), "Urinary catheters may prevent urinary infections in elderly" (73.8%), "Elderly may have chronic obstructive pulmonary disease (COPD) that may predispose HAI" (73.3%), "Malnutrition in elderly population can lead to hospital acquired infection" (71.3%) and "There is not important relationship between incontinence and HAI in geriatric patients" (71.3%) items respectively. Although not shown as table, some descriptive and educational characteristics and general knowledge of the nurses were compared in the present study. Comparison of the nurses' ages, gender, educational degree, currently working unit, years of nursing experience and previous education with their general and risk knowledge on hospital acquired infections of

the geriatric patients showed that there were no statistically significant differences in terms of majority of the items ($p > 0.05$). Bachelor's degree nurses' correct knowledge rates were higher (73.5%) than nurses graduated from the health care vocational high school (67.9%) in terms of "Urinary catheters may prevent urinary infections in elderly" item ($p = 0.005$, $p < 0.05$). Furthermore, nurses who had 5 years or less experience had higher knowledge rates (60.1%) than the nurses who had 6-10 years' experience (32.7%) in terms of "Defective respiratory mucosal defense mechanisms in elderly population may lead to have HAI" item ($p = 0.021$, $p = < 0.05$).

Discussion

This descriptive study was conducted to evaluate nurses' general knowledge on HAI risks of the geriatric patients. The study was performed on the registered nurses with different gender, age, experience and the level of education. Furthermore, the majority of nurses were working in the emergency care, intensive care unit and medical and surgical units where hospital acquired infections may occur frequently. Regarding the educational characteristics of the nurses on HAI risks of the geriatric patients; it is a satisfying result that the highest population of nurses had received previous education on hospital acquired infections. Moreover, most nurses received their education throughout school related to hospital infections. In fact, it is important for the nurses to increase their knowledge about HAI through web resources or attending international congress related to hospital awareness on acquired infections or via in-service education [10]. Nurses

Table 3. Nurses' general knowledge on hospital acquired infections of the geriatric patients (N = 164).

Statements on Hospital Acquired Infections of the Geriatric Patients	True / False	Correct answer		Wrong / I don't know answer	
		N	%	N	%
Hospital acquired infections (HAI) in the elderly people are seen more often than younger people.	(T)*	110	67.1	54	32.9
There is increased resistance to infections in the elderly.	(F)**	89	53.9	75	46.1
Hospital acquired infections (HAI) are major causes of morbidity and mortality, prolong hospital stay and increased cost.	(T)*	120	72.2	44	27.8
Compared with younger population, elderly have higher mortality and morbidity rates due to HAI.	(T)*	135	83.1	29	16.9
Intensive care unit the highest suspected area in hospital for elderly patient to have HAI.	(T)*	112	67.2	52	32.8
Classical sign and symptoms of infections occur generally in elderly.	(F)**	70	42.9	94	57.1
Deterioration in consciousness, apathy, incontinence, tachycardia or tachypnea may be main indications of infection in elderly.	(T)*	118	71.5	46	28.5
High fever occurs every time as one of the main finding of infection in elderly.	(F)**	66	40.8	98	59.2

(T)*=True statement; (F)**=False statement.

evaluated the quality of geriatric care education on hospital acquired infections rate as was good. However, all of the nurses stated that they need education about geriatric care and this result is important in terms of showing awareness of the educational requirements and willingness of the nurses about education. Similarly, in a study, more than 80% of the nurses rated themselves as either "very good" or "good" in the self-assessment section categories about geriatric care [11]. Regarding to nurses' general knowledge on hospital acquired infections of the geriatric patients; it is satisfying result

that the majority of nurses had correct answers, showing nurses' general awareness about HAI among geriatric patients. Majority of the nurses had correct answers about mortality, morbidity, prolonged hospital staying and increased cost among elderly with HAI. However, in the present study, a majority of the nurses choose wrong or I don't know answers about sign and symptoms of infections in elderly. However early detection is difficult in the elderly because the typical signs and symptoms, such as fever and leukocytosis, are frequently absent. A change in mental status or decline

Table 4. Nurses' knowledge on hospital acquired infection risks of the geriatric patients (n=164).

Statements on Hospital Acquired Infection Risks of the Geriatric Patients	True / False	Correct answer		Wrong / I don't know answer	
		N	%	N	%
Elderly have functional deficiencies (immobilization, dysphagia) that may predispose HAI.	(T)*	96	58.2	68	41.8
Defective respiratory mucosal defense mechanisms in elderly population may lead to have HAI.	(T)*	81	49.1	83	50.9
There is not important relationship between incontinence and HAI in geriatric patients.	(F)**	48	29.9	116	70.1
Elderly may have enlarged prostate that may predispose HAI.	(T)*	106	64.9	58	35.1
There is no interaction between decreased gastric acidity, bowel peristalsis and HAI among elderly people.	(F)**	44	26.7	120	73.8
Elderly may have decrease in kidney functions that may predispose HAI.	(T)*	60	36.8	104	63.2
There is no interaction between decreased liver function and HAI in elderly people.	(F)**	51	31.3	113	68.7
Elderly may have bladder diverticula that may predispose HAI.	(T)*	110	66.1	54	33.9
Elderly may have reduced wound healing that may predispose HAI.	(T)*	103	62.7	61	37.3
Aging is associated with changes in immune system function resulting in increased susceptibility to infection.	(T)*	127	77.1	37	22.9
Elderly may have atherosclerosis that may predispose HAI.	(T)*	118	71.7	46	28.3
Skin integrity impairment, thinned skin, loss of lipid and water content in skin are risk factors for HAI among the elderly patients.	(T)*	94	57.1	70	42.9
Aging increases the incidence of chronic diseases and facilitates development of infections.	(T)*	55	33.3	109	66.7
Elderly may have chronic obstructive pulmonary disease that may predispose HAI.	(T)*	45	26.7	119	73.3
Elderly may have diabetes mellitus (DM) that may predispose HAI.	(T)*	106	64.9	58	35.1
Neurological disorders such as dementia and stroke don't predispose to infections.	(F)**	55	33.9	109	66.1
Elderly people may use medications, such as immuno-suppressants, anticholinergic and sedatives that may predispose to HAI.	(T)*	94	57.1	70	42.9
Utilization of medical devices doesn't responsible for increased frequency of infections in the elderly.	(F)**	104	62.8	60	37.2
Malnutrition in elderly population can lead to hospital acquired infection.	(T)*	48	28.7	116	71.3
Bloodstream infections are the serious threating in elderly.	(T)*	72	43.1	92	56.9
Urinary catheters may prevent urinary infections in elderly.	(F)**	44	26.7	120	73.8
Respiratory and vascular catheter infections are associated with the highest mortality rates in the elderly patients.	(T)*	90	54.6	74	45.4
Most common sites of infections in the elderly are the urinary, respiratory and surgical site infections.	(T)*	110	66.1	54	33.9

(T)*=True statement; (F)**=False statement.

in function may be the only presenting problem in an older patient with an infection [1]. Older people often have complicating comorbidities or vague systemic symptoms which make definitive diagnosis problematic [7]. Results showed inadequate awareness among nurses on HAI risks of the geriatric patients. It can be said that, inefficient organizational and ineffective in-service education culture to improve nurses' awareness on HAI risks of the geriatric patients are possible causes of this result. A relevant study also found low knowledge scores among emergency nurses about geriatric care. [11]. Whereas, hospital acquired infections are considered one of the most serious and complex health problems worldwide [12]. Health professionals should be knowledgeable about hospital acquired infections and risks of the geriatric patients in order to prevent and manage effectively this important and frequent problem. Continuous educations including update theoretical knowledge about hospital acquired infections among geriatric nurses will help to improve the health care for patients [13]. The most frequent wrong or "I don't know" answers of the nurses regarding risk factors of HAI among elderly people were decreased gastric acidity, bowel peristalsis problems, urinary catheters, malnutrition, chronic obstructive pulmonary disease and incontinence. However, importance of these risk factors has been highlighted in the relevant literature [1,14-16]. In the healthcare, while catheters provide lifesaving therapy, they also have an iatrogenic effect, by being a route of transmission of microorganisms to the patient's body, thereby causing infection [14,15]. Urinary catheters are responsible for 80% of nosocomial urinary tract infections. In a study conducted in Turkey, the percentage of urinary tract infections associated with catheter was reported as 62.4% [1]. It was indicated that, up to 95% of urinary tract infections are associated with an indwelling urinary catheter and older age is among the major risk factors [16]. Urinary tract infections in elderly hospitalized patients are frequently associated with high mortality [17]. Moreover, it is indicated in the relevant literature that, the gastric acid has relationship with the hospital acquired infections [1]. Helicobacter pylori infection prevalence increases with increasing age, reaching levels of 70% in elderly patients with gastroduodenal diseases. Helicobacter pylori is also recognized as linked to chronic gastritis and peptic ulcers [18]. In addition, malnutrition among older patients can easily exposure them to the hospital acquired infections [1]. In the present study, the most frequent correct answers of the nurses regarding HAI risks of the geriatric patients were immune system changes and atherosclerosis items. Relevant literature indicated that the immune system changing in the elderly patients is that is the reason of susceptibility to infection [1,4,5,19]. Comparison of the nurses' some descriptive characteristics with their knowledge on HAI risks of the geriatric patients showed that; there was statistically significant difference only in two items in terms of educational level and experience. In one item, bachelor's degree nurses had higher correct knowledge rates than the nurses graduated from the health care vocational high school. It is well known that, higher education in nursing helps them to learn how to make better health care decisions. The goal of furthering nursing education is for let the nurses able to understand evidence-based practices and apply. This can help them also to achieve better patient outcomes and reduce costs [20]. Experience was also found as a significant factor that affect knowledge of the nurses on HAI risks of the geriatric patients. Nurses who had 5 years or less experience had higher knowledge rates than the more experienced nurses in one item. All nurses that have different experience level should be educated with in service education programs in order to improve their knowledge and skills [9,21]. There is a limitation in this study that could be addressed. The results of this descriptive and cross-sectional study limited with a university hospital in North Cyprus and cannot be generalized to other nursing populations. Further comparative studies that cover the large-scale sample from different hospitals are suggested.

Conclusions

The current study showed high level of knowledge of nurses only on the general knowledge about hospital acquired infections of the geriatric patients. Furthermore, nurses had low awareness on HAI risks of the geriatric patients. In the present study, comparison of the nurses' some descriptive characteristics with their knowledge on HAI risks of the geriatric patients showed that, there weren't statistically significant differences in terms of majority of the items. All of the nurses stated that they need education about geriatric care. Implementation of comprehensive, systematic, and continuous educational programs can be recommended in order to enhance the knowledge and practices of the nurses on hospital acquired infections among geriatric patients. In addition, development of institutional protocols, establishment of guidance booklets are required in order to improve nursing practice on hospital acquired infections risks of the geriatric patients.

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