A STUDY OF COMMON INFECTIONS ENCOUNTERED IN A GERIATRIC EXTENDED CARE HOSPITAL

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J HK Geriatr Soc 2004; 12:13-17
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Summary

Older patients are generally at high risk of developing infections. Study was done to determine the prevalence, risk factors, types of infection, and pattern of antibiotic usage in elderly patients. Data collection was done by 5 Infection Control Nurses from 219 patients during a one-day study of a Geriatric extended care hospital. The presence of hospital acquired infection (HAI) was determined by the criteria defined by the Center for Disease Control (CDC), Atlanta, Georgia, USA. Results showed that infections were present in 27.4% of patients. The prevalence of HAI was 8.7%. Most patients (91.1%) with infection were on antibiotic treatment. Univariate analysis showed that staying in Geriatric and Infirmary units, use of IV catheter and antibiotics (within 28 days) prior to HAI were significant risk factors for HAI. However, stepwise logistic regression revealed that only the use of IV catheter and use of antibiotics within 28 days were independent predictors for HAI. This study demonstrated an easy and inexpensive way to measure the total infections as well as HAIs in an extended care hospital by using the prevalence survey method. Large scale prospective studies are recommended in future to further evaluate the cost-effectiveness of prevalence surveillance for infection both globally and locally.

Keywords: *Hospital acquired infection, elderly*

Introduction

Ageing is an important risk factor for infectious diseases to develop[1-7]. The reasons for this are complex and multifactorial. The presence of multiple medical problems, nutritional deficiency, regression of the immunity and defense mechanism all contribute to the susceptability of older people to develop infectious diseases[1-5,7-8]. Infection is an important cause of morbidity and mortality in older patients. It also prolongs hospital stay and increases health care costs[1,2,4,5,9-10]. Hitherto, studies performed in Hong Kong which examined the prevalence of infectious diseases among older people were mainly carried out in acute hospital setting. The prevalence and the risk factors of infections among older patients in the extended care setting were not known locally. Studies performed in Western countries show that prevalence surveillance is a rapid and inexpensive way to estimate the magnitude of infection related-problems in hospitals. In addition, regular infection prevalence surveillance in parallel with effective infection control programmes can reduce hospital acquired infection (HAI). The objectives of this study are to determine the prevalence and types of infections, pattern of antibiotic usage in older patients, as well as to identify risk factors for HAI.

Methods

The study was carried out in a geriatric extended care hospital with 296 beds composing of Geriatric (104 beds), Orthopaedic (112 beds) and Infirmary Units (80 beds). The patients in Geriatric and Orthopaedic wards were transferred to the extended care hospital from an acute university hospital for rehabilitation and convalescent care. All patients within the hospital at 0800h on 26 June 1998 were included in this study. A prevalence study design was used. The presence of hospital acquired infection (HAI) was determined by the "Center for Disease Control (CDC) Definition of Nosocomial Infections"[11]. HAI was defined as infections acquired and developed totally in the extended care hospital. Infections incubating at the time of admission and presenting within 48 hours of admission were considered to be infection from other hospitals (IOH).

The surveillance was carried out by five Infection Control Nurses (ICNs) who also performed data collection. Patients' case notes and investigation results were used to assist in deciding if the patient were suffering from infection and if so, whether they had HAIs or IOHs. Clinical finding, results of laboratory and radiological investigations as well as the use of antibiotic therapy were recorded by ICNs to determine whether the patients were suffering from infectious diseases. HAI was determined by the criteria of CDC definitions of nosocomial infections. The following variables were recorded for all patients: demographic data, principle diagnoses and present antibiotic therapy. To study the potential risk factors on HAI, additional information was gathered. This included duration of stay in hospital, Barthel Index (20), urinary and faecal continence status, mental status, use of invasive devices prior to HAI, skin integrity, mobility status and use of antibiotic in the previous 28 days. The abovementioned risk factors have been used to study HAI in previous studies[1,9,12,13].

Statistical Package for the Social Science (SPSS) version 10.0 was used to analyze the data. The Chi-squared test and Fisher's Exact test were used to compare categorical variables. Independent t-test was used when appropriate to compare means between two samples. Stepwise Logistic Regression was used to determine the independent risk factors for HAI. Statistical significance was accepted when $p<0.05$

Results

A total of 219 in-patients were studied. The

Table 1. Characteristics of the study patients

Potential risk factors		Total cases+	With HAI+	No HAI+	Unadjusted Odd Ratio(95% CI)	P value
Sex	Male	109 (49.8)	11 (57.9)	98 (49.0)	0.70 (0.27-1.81)	P=0.459[1]
	Female	110 (50.2)	8 (42.1)	102 (51.0)		
Age	≤65 years old	30 (13.7)	1 (5.3)	29 (14.5)	3.05 (0.39-23.76)	P=0.263[1]
	>65 years old	189 (86.3)	18 (94.7)	171 (85.5)		
Clinical unit	Orthopaedics	82 (37.4)	4 (21.1)	78 (39.0)	0.42 (0.13-1.30)	P=0.122[1]
	Geriatrics	80 (36.5)	14 (73.7)	66 (33.0)	5.69 (1.96-16.5)	***P<0.0005***[1]*
	Infirmary	57 (26.0)	1 (5.3)	56 (28.0)	0.14 (0.02-1.10)	***P=0.031***[1]*
Length of stay (Days)	Orthopaedics (Mean ±SD)	23 ± 25.3	16.75 ±10.78	23.36 ± 25.87		P=0.614[2]
	Geriatrics (Mean±SD)	30.6 ± 11.4	19.14 ± 12.27	32.95 ±122.58		P=0.056[2]
	Infirmary (Mean±SD)	994.7 ± 747.9	2406 ± 0	969.48 ± 729.85		P=0.676[2]
Mobility	Immobile	56 (25.6)	8 (42.1)	48 (24.0)	2.30 (0.88-6.06)	P=0.084[1]
	Wheelchair independent / walks with help of	129 (58.9)	9 (47.4)	120 (60.0)	0.60 (0.23-1.54)	P=0.285[1]
	one person Independent	34 (15.5)	2 (10.5)	32 (16.0)	0.62 (0.14-2.81)	P=0.529[1]
Barthel index(20)scores	Mean ± SD	8.04 ± 6.08	7.05 ± 6.47	8.14 ± 6.05		P=0.460[2]
Mental status	Alert	136 (62.1)	8 (42.1)	128 (64.0)	2.44 (0.94-6.36)	P=0.060[1]
	Apathetic / confused / stupor	83 (37.9)	11 (57.9)	72 (36.0)		
Urinary status	Urinary incontinence	130 (59.4)	11 (57.9)	119 (59.5)	1.07 (0.41-2.77)	P=0.892[1]
	Urinary continence	89 (40.6)	8 (42.1)	81 (40.5)		
Bowel status	Bowel incontinence	127 (58.0)	11 (57.9)	116 (58.0)	1.00 (0.39-2.61)	P=0.993[1]
	Bowel continence	92 (42.0)	8 (42.1)	84 (42.0)		
Use of Foley catheter	Yes	8 (3.7)	2 (10.5)	6 (3.0)	3.80 (0.71-20.32)	P=0.095[1]
	No	211 (96.3)	17 (89.5)	194 (97.0)		
Use of IV catheter	Yes	6 (2.7)	3 (15.8)	3 (1.5)	12.31(2.30-66.03)	***P<0.0005***[1]*
	No	213 (97.3)	16 (84.2)	197 (98.5)		
Skin integrity	Skin intact	160 (73.1)	11 (57.9)	149 (74.5)	2.13 (0.81-5.58)	P=0.119[1]
	Ulcer / wound	59 (26.9)	8 (42.1)	51 (25.5)		
Use of antibiotic within 28 days	Yes	89 (40.6)	16 (84.2)	73 (36.5)	9.28(2.62-32.92)	***P<0.0005***[1]*
	No	130 (59.4)	3 (15.8)	127 (63.5)		

+Results are expressed as Number of persons (%) except where indicated

* Statistically Significant

[1] Chi-squared test

[2] T-test

sample consisted of 49.8% (n=109) male and 50.2 % (n=110) female patients (table 1). The average age (mean ± SD) was 75.1±13.9. Eighty-two patients (37.4%) were from Orthopaedic Unit, 80 (36.5%) from Geriatric Unit and 57 (26%) from Infirmary Unit. The mean length of stay in different clinical units were: Orthopaedic Unit 23±25.3 days, Geriatric Unit 30.6 ±11.4 days, and Infirmary Unit 994.7±747.9 days (Table 1).

A total of 55 infected patients with 60 infections were found at the time of the survey. The prevalence of infection among 219 patients was 27.4% (60/219). There were 19 HAI and 41 IOH identified. Amongst these 55 infected patients, 34.5% (n=19) had HAI and 70.9% (n=39) had IOH. It was found that 5.45% (n=3) infected patients had both IOH and HAI, and 3.64% (n=2) had 2 IOHs. The remaining patients (n=50, 91%) had either HAI or IOH. Most patients had chest infection / pneumonia (n=16), followed by urinary tract infection (n=11), skin infection (n=9), clinical sepsis of unknown origin (n=8) (Table 2).

On the day of survey, 51 infected patients (91.1%) were receiving antibiotic treatment. Thirty-eight cases (74.5%) were on monotherapy, 11 patients (21.6%) were treated with two drugs, and 2 (3.9%) with three drugs. The most widely used drugs were penicillins (42%), cephalosporins (23%), quinolones (14%) and metronidazole (3.4%).

Among the cohort, 19 HAIs were identified giving a prevalence of 8.7%. These included pneumonia (n=6), symptomatic urinary tract infection (n=3), asymptomatic bacteriuria (n=3), clinical sepsis of unknown origin (n=5), skin infection (n=1) and conjunctivitis (n=1) (Table 2). Univariate analysis showed that staying in Geriatric and Infirmary Units were risk factors for HAIs. In addition, the use of IV catheter prior to HAI and use of antibiotics within 28 days were significant risk factors for HAI (Table 1). However, Stepwise Logistic Regression revealed that only the use of IV catheter and use of antibiotics within 28 days were independent predictors for HAI (Table 3).

Table 2. Types of infection identified

Type of infection	All Infections[+]	HAI[+]
Pneumonia/Chest infection	16 (26.7)	6 (31.6)
Urinary tract infection	11 (18.3)	3 (15.8)
Skin	9 (15)	1 (5.3)
Clinical sepsis	8 (13.3)	5 (26.3)
Fungal	6 (10)	0 (0)
Asymptomatic bacteriuria	3 (5)	3 (15.8)
Wound	3 (5)	0 (0)
Conjunctivitis	2 (3.3)	1 (5.3)
Septic arthritis	2 (3.3)	0 (0)
Total	60 (100)	19 (100)

[+]Results are expressed as Number (%)

Table 3. Stepwise logistic regression analysis for potential risk factors of HAI

Potential risk factors	Adjusted Odd Ratio (95% CI)	P value
Use of IV catheter	0.14 (0.02-0.82)	***P=0.029****
Use of antibiotic within 28 days	0.12 (0.03-0.44)	***P=0.001****

* Statistically Significant

Discussion

Prevalence surveys of infections have been widely used both in international and local settings[1,6,9,10-11,13-20]. The surveillance data are helpful in estimating the magnitude of nosocomial infection problems in a hospital. Although prevalence surveys are less informative than incidence surveys, they have proved to be good indicators for detecting and localizing any problems while being inexpensive and easy to perform. This approach has shown to be feasible in our hospital. Although a number of prevalence surveys have been published[1,9-19], it is difficult to compare the results because of varied patient demography, differences in medical practice, surveillance design, and definitions of HAI. For hospitals without the resources to establish an ongoing incidence surveillance system, repeated prevalence studies are suggested to obtain an overview of the nosocomial infection problems and evaluate the application of infection control measures[10,12].

In this study, the high prevalence of infection, in particular the IOH alerted us that measures on admission to prevent cross-infection were important to reduce infection rates in hospital. The prevalence rate of HAI was 8.7% which was within the range reported by others (3.5%-10.47%) [1,6,9,12-14,17-18]. Pneumonia, urinary tract infection and asymptomatic bacteriuria accounted for nearly 65% of all the HAIs. The percentages of other infections were low. This finding actually agreed with the pattern of HAI reported previously in the published surveys [1,2,4,9,13].

The study showed that the use of IV catheter prior to HAI was significant independent risk factors for HAI. One possible explanation was that HAIs were more frequently caused by antibiotic-resistant bacteria and were more difficult to treat. Hence, more IV infusion and/or IV antibiotics needed in HAI merely reflected the severity and complexity of the diseases in older patients. The second plausible

explanation for the association of IV catheters and HAI was that the use of IV catheter was itself the cause of HAIs such as those with skin infection or labeled as clinical sepsis in the study. This served to remind clinicians and health care workers the importance of strict aseptic technique in inserting IV catheters as well as regular IV site inspection and rotation for prevention of HAI. Unfortunately, it was not possible to delineate whether the use of IV catheters was just an association or itself a cause for the HAI basing on the finding of the present study. The use of antibiotics within 28 days prior to HAI was another independent risk factor for HAI. This suggested that there were more infections requiring antibiotics treatment prior to HAI. It was likely that these patients were frail and were prone to multiple infections. This alerted clinicians that older patients with repeated sepsis would be prone to have HAI and judicious measures should be applied to prevent the HAI development.

Previous studies showed that clinical units were related to the development of HAI[19]. Although Geriatric and Infirmary units were associated with HAI in the present study, stepwise logistic regression analysis did not showed that clinical units were independent predictors for HAI. Other potential risk factors such as age, mobility state, Barthel Index, mental status and use of Foley catheter were also not significantly associated with HAI. This could be due to the relative small sample size in the present prevalence survey. The number of cases with HAI (n=19) was only one-tenth of those with no HAI (n=200). Large scale incidence survey with larger sample size is recommended to identify the risk factors for HAI more accurately. Another limitation of this study was that infection in the elderly could be difficult to diagnose. Even common infections might present atypically[1-3,5,7]. This might lead to under-diagnosis of the prevalence of total infections in the sample. Another practical limitation was that not all cases with infection had microbiology reports available. Without these reports, HAI could not be confirmed according to the CDC criteria. Indeed it had been suggested by Hussain et al and Beaujean et al that revision of the CDC criteria might be needed so that it could be applied to the older population[1,3].

In conclusion, this study demonstrated an easy and inexpensive way to measure the total infections as well as HAIs in a long-term care hospital by using the prevalence survey method. The data from the survey provided valuable information about the pattern of infection, antibiotic usage and the independent risk factors of HAI. Incidence survey with large sample size is required to accurately identify the risk factors for HAI. In addition, large scale prospective studies are recommended in future to further evaluate the cost-effectiveness of prevalence surveillance for infection both globally and locally.

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Acknowledgement:

We want to thank Yuen A, Tsang E, Leung F, Choi A, Lam MC and Ho NY for their support and we also appreciate the efforts of the following ICNs who assisted in conducting this study: Ling SM, Ho YY, Chan WF, and Kwok MW.

LEARNING POINTS

(1) The point prevalence of infection in the studied hospital was 7.4%

(2) Among the infections, 34.5% were hospital acquired infection.

(3) Use of intravenous line and prior antibiotics used within 28 days were independent risk factors for hospital acquired infection.