

Nosocomial infection in the Intensive Care Unit at Teaching Hospital Karapitiya, Galle; an audit

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ABSTRACT

Background: Nosocomial infections are associated with increased mortality and morbidity in intensive care units (ICU). Studies have shown that surveillance helps to reduce its occurrence. The aim of this audit was to ascertain the incidence and types of nosocomial infection in a selected ICU.

Method: All patients who were admitted and stayed for more than 48hrs in the ICU during a period of three months were studied. Infections were identified on clinical parameters and laboratory investigations.

Results: Two main nosocomial infections detected were ventilator associated pneumonia (26.4%) and urinary tract infection (UTI) (10.9%).

Conclusion: Nosocomial infections accounts for a noteworthy percentage of pneumonia and UTI in the ICU.

Key words: Nosocomial infection, ventilator associated pneumonia, blood stream infection, urinary tract infection.

Introduction

Nosocomial infections - derived from the Greek words *nosos* (disease) and *komein* (to care for) - affect about 30% of patients in the critical care units and are associated with substantial mortality and morbidity (1). The cost of treatment of these infections contributes to a significant portion of the expenditure incurred in maintaining an intensive care unit (ICU). Teaching Hospital Karapitiya, Galle, is one of the main tertiary care centers in the country. All the general medical and surgical patients requiring intensive care are admitted to the main ICU where the audit was conducted.

The main objective of this study was to ascertain the types of nosocomial infection, the patients who suffer them and the incidence of its occurrence.

Methods

The audit was conducted for three months from 1st June 2010 to 30th August 2010. We studied all the patients admitted to the main ICU who stayed for more than 48hrs during this period. Permission to

conduct this prospective audit was obtained from the Director Teaching Hospital Karapitiya. Reports of blood, urine and sputum cultures were obtained from the Department of Microbiology. An infection was regarded as nosocomial if the clinical signs and laboratory investigations which were negative at the time of admission became positive after 48hrs. However we did not have on admission culture reports on blood, urine and sputum in some of the patients.

A lower respiratory tract infection (LRTI) was diagnosed on the following criteria.

1. New shadow developing in the chest radiograph
2. Temperature > 99°F
3. White count > 11,000
4. crepitations on auscultation

We used the following criteria to differentiate ventilator associated pneumonia (VAP) from LRTI.

1. New shadow developing in the chest radiograph

2. Temperature < 96.8 or > 99°F
3. Ventilated for more than 48hrs
4. White count > 11,000 or < 4,000
5. Cultures positive from endotracheal secretions

Urine cultures were taken from catheterized patients who had fever and a high white count as part of the septic screening. However it was assumed that once positive *Candida* spp and heavy mixed growths were colonizers.

Blood cultures were done as part of the septic screening in patients who had fever and a high white count.

Results

Total number of patients admitted and stayed in the ICU for more than 48hrs was 82 and 48 of them were subsequently discharged to the respective wards and 34 succumbed to their illnesses. Of the 82 patients studied 68 were ventilated and only 26 of them had an underlying pathology related to an infection (**Table**). Total of 20 patients of this ventilated group developed a LRTI within the first 48hrs (**Table**). The majority of them (14) were in categories that had no infection in any part of the body at the time of admission to the ICU or at the time of commencing ventilation (**Table**).

Ventilator associated pneumonia

All 20 patients who developed a LRTI had their tracheal secretions cultured and 2 of them failed to grow any organisms in the endotracheal secretions.

Of the 20 patients who developed a new respiratory tract infection VAP was diagnosed in 18 (26.4%) patients on the above criteria.

The cultured organisms were as follows:

Acinetobacter spp	5
Pseudomonas spp	3
Coliform spp	2
Mixed Gram negative bacilli	6
Staphylococcus aureus	2

Blood stream infection (BSI)

During the 3 month period 78 blood cultures were done from 52 patients. Of the 52 patients cultures were positive only in two. One of them grew an extended spectrum beta lactamase producing (ESBL+) coliform species in blood drawn through the central line (CVC). Though this patient was

Table: Patient categories admitted to the ICU

Reason for admission	No.	Ventilated	LRTI	BSI	UTI / Colonization
Head Injury	14	14	4	1	1
Other Trauma	6	6	1		
Poisoning	5	5	3		7
Post-op Elective Ventilation	9	9	4		2
Medial reasons without infection *	11	8	2		1
Infections from Medical wards	7	4	0		
Infections from other wards	30	22	6	1	11
Total	82	68	20	2	22

*Myocardial infraction, heart failure

admitted with sepsis to the ICU, the organism isolated in blood was not found in urine or respiratory tract secretions. Therefore this was considered to be after a BSI associated with CVC or CVC colonization. The other who was admitted after a head injury with a depressed skull fracture grew pneumococci in blood secondary to meningitis.

Urinary tract infection (UTI)

During the 3 month period 76 cultures were done from 49 patients and 22 of these 49 grew organisms. UTI was diagnosed in 9 (10.9%) patients on the above criteria.

The results were as follows:

Confirmed UTI	9
i.e.	
Candida (twice positive)	3
Coliform (once positive)	3
Streptococcus (once positive)	3
Colonizers of catheter	13
i.e.	
Candida (once positive)	10
Heavy mixed growth (once)	3

The 9 patients with confirmed UTI did not have any signs or symptoms of UTI in the first 48 hrs following admission to the ICU. All of them had the positive urine cultures after the first 48 hours.

Discussion

The patient population in intensive care in particular has low host defense immunity. Immunosuppression primarily due to the release of interleukins and other anti-inflammatory agents create a state some times termed immuno-paralysis (2). Endotracheal intubation reduces the local defenses such as coughing, sneezing and mucociliary clearance. Exogenous colonization arises from cross transmission from the hands of health care workers or visitors (3).

In our study VAP rate was 26.9%. We could not perform bronchoscopically directed quantitative cultures due to lack of facilities. However if we had the facilities to perform quantitative cultures, all may

have cultured an organism and our VAP rate may have risen to a higher level as in some other studies. Our UTI rate was 10.9% which is similar to some other studies. Though all patients diagnosed with UTI had a positive culture after the first 48 hrs, we did not have 'on admission screening' urine culture reports in some of these patients. However it should be mentioned that there is no globally accepted policy in doing so. The primary BSI rate was negligible in our study.

Cook and colleagues noted that the administration of paralytic agents was an independent predictor of nosocomial pneumonia in their study of 1,014 mechanically ventilated patients (4). Sedative drugs and stress ulcer prophylaxis have all been implicated as risk factors. One of the largest databases related to nosocomial infection in intensive care is the EPIC study (5). In this 1-day point prevalence study, information was obtained on all patients who occupied a bed in an intensive care unit over 24hrs. A group of 10,038 patients were recruited from 1407 western European intensive care units. Of them 2,064 (21%) had an ICU acquired infection. Patients who remain in the ICU for long periods can have successive infections and are more likely to develop nosocomial infection by resistant pathogens. In the EPIC study 60% of *Staphylococcus aureus* were resistant to methicillin.

In a report from the National Nosocomial Infection Surveillance (NNIS) system involving data from 498,998 patients, 83% of episodes of nosocomial pneumonia was associated with mechanical ventilation, 97% of urinary tract infections arose in patients with a urinary catheter and 87% of primary blood stream infections were in patients with a central line (6).

Respiratory tract is the commonest site of nosocomial infection. The incidence of nosocomial pneumonia in the EPIC study was 47% and 31% in the NNIS study. Langer and colleagues showed an increased incidence from 5% in patients who received 1 day of mechanical ventilation to 69% in those who received 30 days of ventilation (7). Urinary tract is the second most common site of nosocomial infection accounting for 8-35% (5,6,8). Urinary tract infections are generally associated with the presence of a urinary catheter.

Prevention has a key part to play in limiting nosocomial infection. Sherertz and coworkers

documented a fall in catheter related infections from 4.51 to 2.93 infections per 1,000 patients days ($p < 0.01$) in 18 months after a 1 day infection control training course on venous catheters (9). Several studies have reported high rates of contamination with potentially pathogenic organisms by the hands of health care workers (10,11). Hand disinfection with the use of alcohol based antiseptic hand rub solutions have been shown to be effective in reducing hand contamination (12). Infection surveillance can reduce nosocomial infection rates when incorporated with infection prevention programmes (13).

Conclusion

Nosocomial infections accounts for a significant proportion of ICU infections. The reason for some of our infection rates to be lower than similar studies is probably the lack of facilities to perform all the diagnostic tests. However surveillance linked with a multidisciplinary approach is important in its prevention.

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