Malaysian J Pathol 1995; 17(1): 17 – 22

Hospital acquired infections in a Singapore Hospital: 1985 - 1992

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Abstract

A prospective survey of hospital-acquired infections (HAI) was conducted from 1985 to 1992. The survey used laboratory results to estimate incidence and alert infection control staff to a need for further action. The results were analysed with regard to the site, speciality and type of organism. The distribution by speciality of patients who had methicillin resistant *Staphylococcus aureus* infections was compared with the distribution of all patients with HAI.

Although the surveillance was only partial, the data collected from year to year over the period of study seemed constant. The distribution of infection by type, location and bacterial cause was similar to results from other parts of the world. Notable differences were the high incidence of *Acinetobacter sp.*, and the pattern of antimicrobial susceptibility to commonly used agents. Over half the *Staphylococcus aureus* isolates were methicillin resistant.

Key words: Hospital acquired infection, *Acinetobacter sp.*, methicillin resistant *Staphylococcus aureus.*

INTRODUCTION

Surveillance of hospital infection is necessary to recognize changes in level of incidence of infection, to introduce special measures to control outbreaks, to assess the efficacy of preventive measures to reduce the level of avoidable infection and to identify high risk patients.[1]

In the literature various methods of data collection have been described. The most comprehensive is hospital-wide total continuous surveillance for all sites of infection.[1] A comprehensive survey is not possible without a number of specialist staff; an Infection Control Nurse (ICN) covers, on average, 1300 beds.[3] Whichever the method used, it should not be time consuming nor labour intensive. The method employed should help to sort out an existing problem. The available resources should be used to achieve the ultimate objective - to reduce the incidence of HAI.

The objective of this study was to investigate the unknown epidemiology of HAI in a new university hospital, in order to identify priorities for infection control.

MATERIALS AND METHODS

The National University Hospital, Singapore is a 700 bed teaching hospital which opened in 1985 and admits patients for a range of medical and surgical specialities.

The data collection programme was a function of the Infection Control Team made up of the Medical Microbiologist, Nursing Administrator and ICN. The Infection Control Team reported to the Infection Control Committee.

The possible cases of hospital acquired infections were picked up by the ICN by examining the laboratory records every morning and by discussing results with the laboratory technologists and the clinical microbiologist. The ward staff were encouraged to inform the ICN when an infection was suspected; a few cases were detected by this method.

The possible cases of HAI were investigated fully by the Infection Control Nurse by visiting the wards to determine whether they are true clinical infections, whether they are hospital acquired and to decide on relevant action. The definitions and criteria used were adopted from the report on the national survey of infection in hospitals 1980.[4]

If an infection was present it was recorded as hospital or community acquired and categorized by site, speciality and causative microbe.

The specimens collected from patients were analysed in the Division of Microbiology. The organisms were isolated and identified by standard culture techniques and the susceptibility tests were performed by the Kirby-Bauer method. The standards were maintained by regular internal and external Quality Assurance Programmes.

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RESULTS

The overall pattern of the partial incidence survey estimated urinary tract infections to be the commonest HAI (37%), followed by surgical wound infections (23%), respiratory tract infections (17%), and bacteraemia (6%). All other types of HAI collectively accounted for the remainder. The general pattern of microbial causes by site of infection is as shown in Fig. 1.

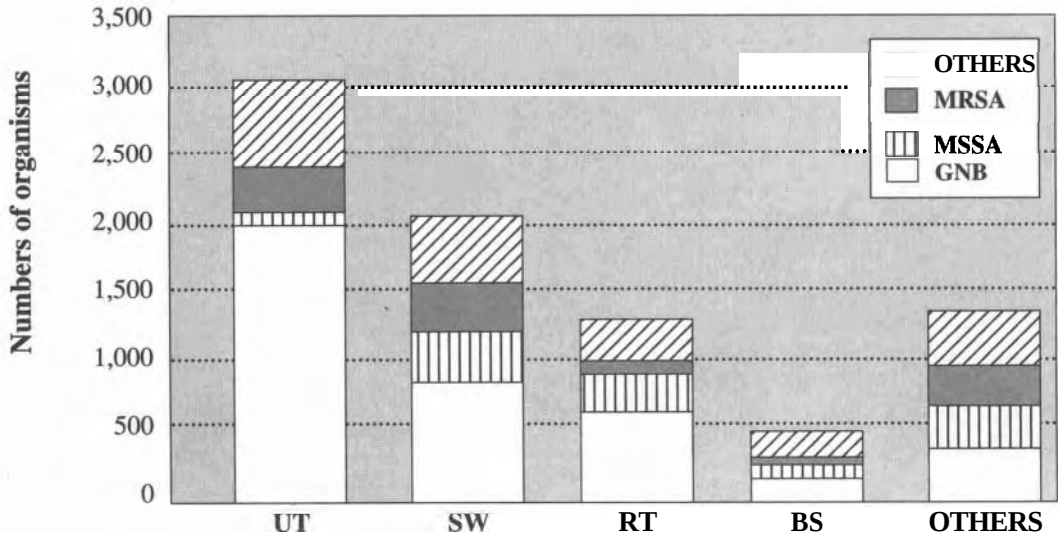
Large numbers of HAI were detected in surgery, medical, orthopaedic, obstetrics and gynaecology wards. The total number of patients that acquired hospital infections (1584) in Intensive Care Units was higher than in any other unit when cases in all six units were considered together (Table 1). Generally, the incidence of MRSA followed the same pattern with the exception of obstetric & gynaecology wards, where the incidence of MRSA was very low.

The occurrence of common nosocomial pathogens in each of the four major sites of infection is shown in Table 2. Staphylococcus aureus was the most commonly isolated pathogen from all HAI, regardless of site. Klebsiella sp. is the second most commonly isolated pathogen overall. Escherichia coli, *Ps* aeruginosa, Enterococcus sp. and *Acinetobacter sp.*, were the other common pathogens.

TABLE 1: Total number of HAI in various Units (1985-1992)

Surgery	1538
Medicine	1522
Orthopaedics	774
Obstetrics	687
Gynaecology	516
Neonatal*	409
ICU (Surgical)*	340
Paediatrics	314
ICU (Medical)'	300
ICU (Paediatrics)*	314
Cardiothoracic*	170
Dental	61
Critical Care*	51
ENT	24
Ophthalmology	11
Total:	7031

*units providing intensive care (a total of 1584 cases)



	UT	SW	RT	BS	OTHERS
OTHERS	919	457	290	166	384
MRSA	53	361	77	63	319
MSSA	69	414	312	54	250
GNB	1,995	803	620	193	387

FIG. 1: Microbial causes by site of infection. UT = urinary tract, SW = surgical wound, RT = respiratory tract, BS = blood stream infections: GNB = Gram negative bacilli, MSSA = methicillin-sensitive S. aureus, MRSA = methicillin-resistant S. aureus.

TABLE 2: Occurence of common nosocomial pathogens by site of infection (%)

	ES	KL	PS	AC	MSSA	MRSA	CNS	ENT	CAND	OTHERS	Total
Urinary Tract	23	23	9	5	2	3	3	17	5	10	100
Wounds	8	10	11	5	18	21	2	5	3	17	100
Respiratory Tract	2	14	20	14	7	27	2	2	9	3	100
Blood Stream	9	22	5	6	15	14	6	6	6	11	100

ES = Escherichia coli, KL = Klebsiella sp., PS = Pseudomonas aeruginosa, AC = Acinetobacter sp., MSSA = methicillin sensitive Staphylococcus aureus, MRSA = methicillin resistant Staphylocooccus aureus, CNS = coagulase negative staphylococcus, ENT = Enterococcus sp., CAND = Candida sp.

In urinary tract infections ***Escherichia coli, Klebsiella sp.,*** and ***Enterococcus sp***. were by far the most commonly isolated pathogens (Table 2).

Staphylococcusaureus was the most frequently isolated organism in wounds, respiratory tract and blood stream infections. The proportion of MRSA compared to methicillin sensitive ***Staphylococcusaureus*** remained higher in wound and respiratory tract infections, with an equal incidence in blood stream infections (Table 2).

Candida sp. accounted for 5% of all HAI, with the respiratory tract being the commonest site affected. ***Enterococcus sp***. contributed to 8% of infections with the major impact in the urinary tract.

The highest incidence of septicaemias were seen in acute adult medical specialities at the National University Hospital including dermatology, endocrinology, gastroenterology, haematology, oncology, nephrology, respiratory medicine and neurology in addition to general internal medicine (Fig.2). The urinary tract infections were the most common HAI in Obstetrics and Gynaecology wards but were uncommon in neonatal, cardiothoracic and critical care units (Fig.3).

The partial incidence survey recorded the overall infection rate (Newly infected patients/ discharges X 100) to be 2.3 percent.

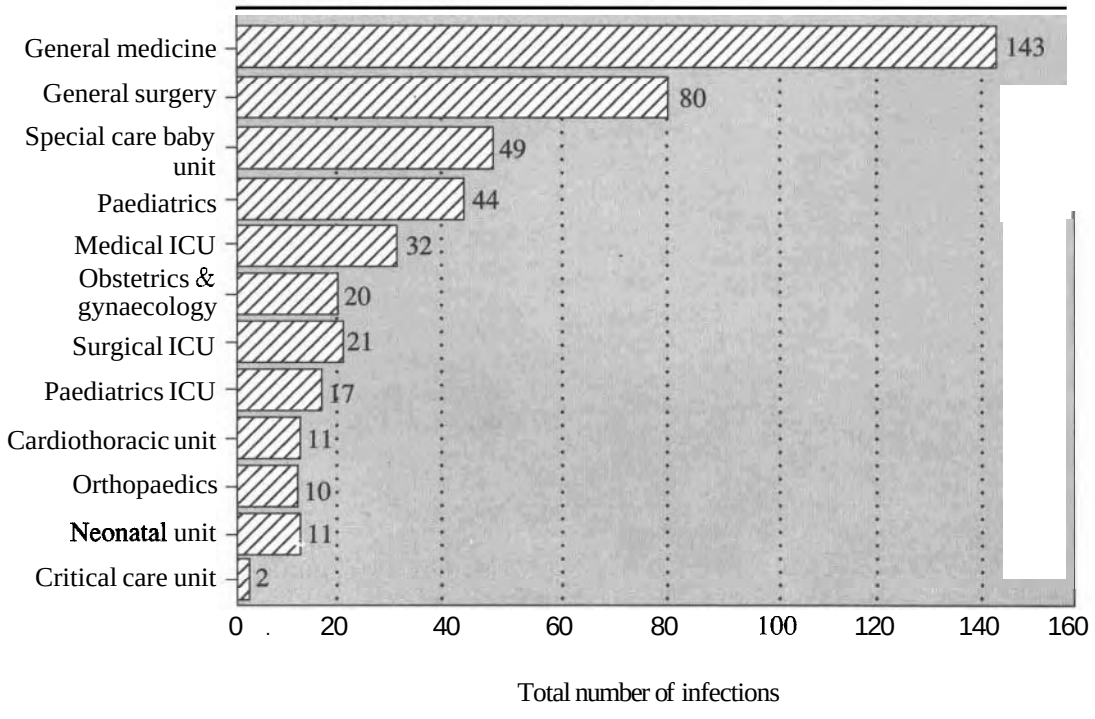


FIG. 2: Total number of bloodstream infections (1985-1992)

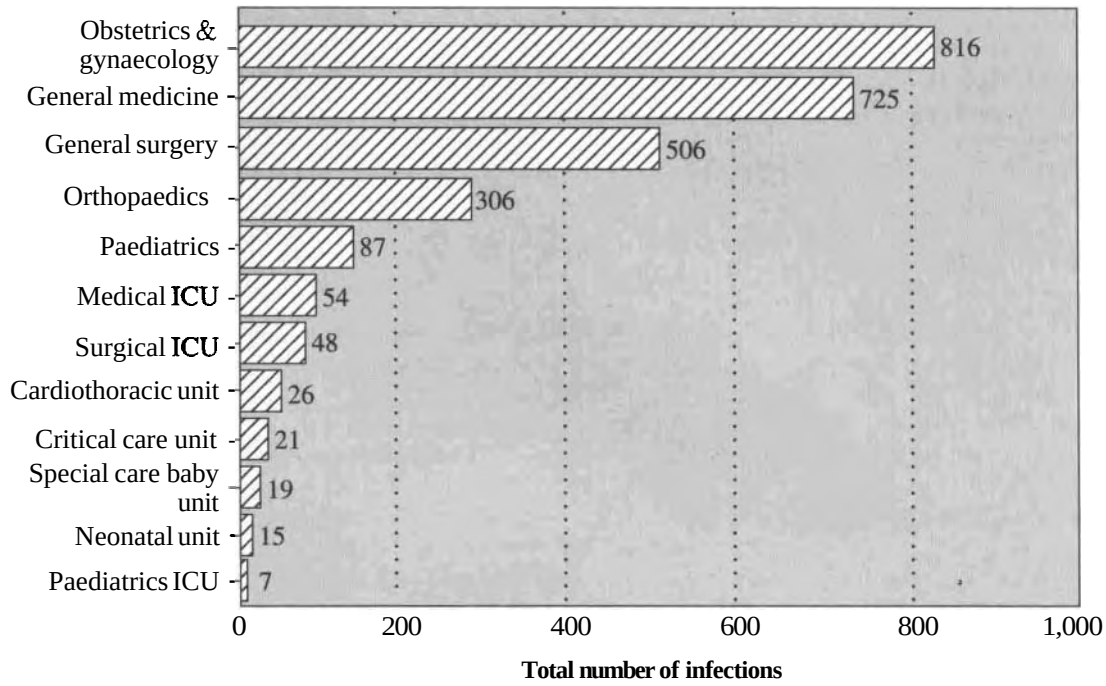


FIG. 3: Total number of urinary tract infections (1985-1992)

DISCUSSION

The most comprehensive type of hospital infection data collection, surveillance of all sites of infection as described by the Centre for Disease Control, Atlanta is labour intensive.[5] Some hospitals have adopted alternative methods to reduce the time required for data collection.[6] The partial incidence survey carried out in our hospital would be expected to detect about 76% of the total HAI.[6] Although only partial, the relative frequency of infections from year to year seemed constant. The method was useful for monitoring unknown epidemiological data; the distribution, patterns and the types of pathogens causing HAI in the new hospital. This approach is considered an effective and efficient method of survillance of hospital infection.[6] In this study, the urinary tract and surgical wound were highlighted as the commonest sites of HAI, as seen in other centres.' The high incidence of *Acinetobacter* sp. might be due to the warm humid environment prevailing in Southeast Asia. This organism is known to survive for up to 13 days even on a dry, smooth surface[7] whereas other Gram negative bacilli tend to die rapidly on drying. The problems caused by Acinetobacter *sp.*[8] and MRSA[9,10] have been reported previously.

Surveillance of the incidence of HAI requires considerable effort and resources, and confirms overall patterns of infection observed in previous studies. As pointed out by Howard et *al* it was felt that the overall surveillance of all hospital infections is not a cost effective use of the Infection Control Nurses's time and does little to reduce or prevent infection.[3] However, the data collected during the period of surveillance in this centre did help to identify priorities for infection control.

A major concern of most hospitals is how their nosocomial infection rates compare with those of other hospitals. There are considerable variations in referral patterns and methods of data collection from one hospital to the other. So interhospital comparison based on traditional nosocomial infection rates may be invalid or misleading." The seven year partial incidence survey provided sufficient baseline data to understand the patterns of HAI occuring in the hospital. It has now been replaced by a target-orientated survey of MRSA in the hospital, together with an alert procedure for the prompt detection of epiderniologically important organisms. The object of our targetted survey procedure can be altered whenever epidemiological priorities change and the method can be carried out with limited resources.

In conclusion, the seven year survey shows no difference in the relative patterns of hospital-acquired infections compared to other centres. Limited resources have led to a more targetted surveillance approach than previously. While this method provides useful data on trends in our institution, it does not permit detailed comparison with other hospitals locally.

ACKNOWLEDGEMENTS

The authors wish to thank Dr. T.J.J. Inglis for helpful comments on the manuscript and Ms. Liew Hong Yin for assistance in preparing the figures and the tables.

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