ORIGINAL ARTICLE

Hospital Stay in Nosocomial Infections

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Abstract. A 9-month prospective study on nosocomial infections was held from August 1988 till April 1989 at the Department of Child Health, Medical School, Padjadjaran University, Hasan Sadikin Hospital Bandung. The purpose of the study was to compare the duration of hospitalization in patients with and without nosocomial infections. The Department of Child Health has 4 main wards, A2 (for low socioeconomic families), A3 (for middle and high socioeconomic families), R-17 (for neonates) and NICU. There were 4328 hospitalized pediatric patients observed consisting of 293 children (29.9%) in A2, 485 (11.2%) in A3, 2487 (57.5%) in R-17, and 63 children (1.4%) in NICU. There were 128 episodes of nosocomial infections in A2, 22 in A3, 220 in R-17, and 41 episodes in NICU, showing rates of 9.9% in A2, 4.5% in A3, 8.8% in R-17 and 65.1% in NICU. The means hospital stay of patients with nosocomial infections were 26.77 and 22.44 days in A2 and NICU, while in A3 and R-17 17.61 and 6.75 days. The means hospital stay of patients without nosocomial infections were 13.11 and 9.24 days in A2 and NICU, and 10.48 and 3.10 days in A3 and R-17. Length of stay specific nosocomial infection rate rose with the duration of hospitalization, with 3.2% of patients staying up to 6 days, 16.7% of patients staying 7-13 days, 19.7% of patients staying 14 to 20 days, and 48.8% of patients staying 35 days or more. It can be concluded that the longer the length of stay, the higher the number of nosocomial infections. The overall mean hospital stay of patients with nosocomial infection was 2.4 times higher than that without nosocomial infection. **[Paediatr Indones 1993; 33:142-9]**

Introduction

Nosocomial infections are important in terms of patient morbidity, mortality, and additional hospital costs.[1] Case-control studies, in which patients with nosocomial infections are matched with uninfected patients, have clearly demonstrated that nosocomial infections prolonged hospitalization significantly.[2,3] Over half of the incremental costs attributable to nosocomial infections are thought to be accounted for by the per diem charges of the additional stay.[4] In the United States the average prolongation of hospital stay resulting from nosocomial infection is approximately four days. However, the prolongation varies for the four major sites of infection.[5] Girard et al. found and increase in length of hospital stay of 23% for neonates with acquired nosocomial infections at Centre Hospitalier Lyon-Sud, France.[6] The objective of this study was to compare the duration of hospitalization in pediatric patients with and without nosocomial infections.

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Materials and Methods

The study was held at the Department of Child Health, Medical School, Padjadjaran University, Hasan Sadikin Hospital, Bandung. It was a prospective study of 9-month duration, from August 1, 1988 till April 30, 1989, investigating the incidence of nosocomial infections.

The Department of Child Health has four main wards, A2, A3, R-17 and NICU. The A2 ward is particularly for patients coming from low socioeconomic families, whereas the A3 ward for pediatric patients of high and middle socioeconomic families. Ward R-17 is the neonatal ward, while NICU is for critically ill neonates. Patient's records and case finding by trained nurses were used as the basis for detecting nosocomial infections. During the study period a careful monitoring of records of all patients movements was held. The following information were recorded: name, medical record number, data of birth, date of admission, date of discharge, and diagnosis. Infection data were recorded in a special nosocomial infection form by those trained nurses. During that time, none of the selected and already trained nurses were transferred either from one ward to another in the department or to any other department in the hospital.

Every trained nurse reported a new suspected nosocomial infection case in her ward to the investigator, who then immediately examined the patient and checked the patient's record. If a nosocomial infection was suspected the nurse completed all the forms needed. These forms were then rechecked and corrected if errors were present by the investigator together with the nurse. After all the forms were completed, data cleaning and verification of these completed questionnaires were done by the investigator to ensure that no data were missed or had escaped the attention before computerization. Statistical analysis was done by using frequency distribution and chi-square.

Results

During the 9-month study a total number of 4328 hospitalized pediatric patients were observed, consisting of 293 children (29.9%) in ward A2, 485 (11.2%) in ward A3, 2487 (57.5%) in ward R-17, and 63 children (1.4%) in NICU. It revealed that among them a total number of 342 patients had one and or more nosocomial infections, yielding 411 episodes of nosocomial infections.

Table 1. Nosocomial infections rate according to month and ward

Period	A2			A3			R17			NICU			Overall		
	No. of infs.	No. of ptns	NI rate %	No. of infs.	No. of ptns	NI rate %	No. of infs.	No. of ptns	NI rate %	No. of infs.	No. of ptns	NI rate %	No. of infs.	No. of ptns	NI rate %
1988															
August	18	229	7.9	2	88	2.3	43	318	13.5	6	6	100.0	59	641	10.8
September	3	146	8.9	1	57	1.8	45	285	15.8	7	4	174.0	66	492	13.4
October	15	142	10.6	2	45	4.4	57	300	19.0	3	7	42.9	77	494	15.6
November	414	150	9.3	5	43	11.6	24	260	9.2	9	8	112.5	52	461	11.3
December	18	159	11.3	0	69	0	14	258	5.4	5	6	83.3	37	492	7.5
1989															
January	20	131	15.3	3	49	6.1	7	261	2.7	5	8	62.5	35	449	7.8
February	14	108	13.0	3	38	7.9	12	247	4.9	2	3	66.7	31	369	7.8
March	13	121	10.7	2	52	3.8	5	270	1.9	2	6	33.3	22	449	4.9
April	3	107	2.8	4	44	9.1	13	288	4.5	2	15	13.3	22	454	4.8
Overall	128	1293	9.9	22	485	4.5	220	2487	8.8	41	63	65.1	411	4328	9.5

Infs = infections; ptns = patients; NI = nosocomial infection

There were 128 episodes of nosocomial infections in ward A2, 22 in Ward A3, 220 in ward R-17, and 41 in NICU, showing rates of 9.9% in ward A2, 4.5% in ward A3, 8.8% in R-17, and 65.1% in NICU. The overall nosocomial infection rate was 9.5% (Table 1). Table 2 demonstrates the duration of hospital stay of patients with or without nosocomial infections and the overall hospitalized patients during the study. The mean hospital stay of patients with nosocomial infections was 26.77 and 22.44 days in A2 and NICU, while in A3 and R-17 was 17.61 and 6.75 days, respectively. The mean hospital stay of patients without nosocomial infections was 13.11 and 9.24 days in A2 and NICU, and 10.48 and 3.10 days in A3 and R-17, respectively. The overall mean hospital stay of patients with nosocomial infection was

Table 2. Duration of hospital stay according to ward

Ward	Hospital stay (days)					
	All patients		With NIs		Without NIs	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
A2	13.93	14.7	26.77	24.41	13.11	13.15
A3	10.67	11.8	17.61	8.19	10.48	11.85
R-17	3.23	3.0	6.75	3.75	3.10	2.94
NICU	14.54	15.4	22.44	18.31	9.24	10.05
Overall	7.42	10.66	16.83	18.92	6.94	9.70

I = intermediate; R = resistant; S = sensitive

Table 3. Correlation between duration of hospital stay and site of infections of patients with and without nosocomial infections

Site of infections	Hospital stayu (days)			
	With NIs		Without NIs	
	Mean	S.D.	Mean	S.D.
Gastroenteritis	13.53	17.54	7.84	6.78
Skin infections	19.277	17.87	10.07	5.79
Bacteremia	14.96	19.53	10.17	13.17
Urinary tract infections	20.05	18.56	11.66	11.37
Pneumonia	22.00	6.60	9.03	7.01
Postoperative wounds infections	32.00	37.38	5.33	4.51

I = intermediate; R = resistant; S = sensitive

Table 4. Hospital stay in ward R-17 according to site of nosocomial infections

Site of infections	Hospital stay (days)	
	Mean	S.D.
Gastroenteritis	7.02	3.92
Skin infections	5.13	3.06
Bacteremia	7.72	5.14
Urinary tract infections	6.40	3.40
Overall	6.75	3.75

Table 5. Length of stay-specific nosocomial infection rates

Length of stay (days)	No. of hospitalized patients	Length of stay - specific nosocomial infection rates											
		No. of NIs	Gastroenteritis %	No. of NIs	Skin inf. %	No. of NIs	Bacteremia %	No. of NIs	UTI %	No. of NIs	Other NIs %	Total No. of NIs	Total %
Up to 6	2783	55	2.0	11	0.4	19	0.7	4	0.1	-	-	89	3.2
13-	936	76	8.1	34	3.6	24	2.6	19	2.0	3	0.3	156	16.7
20-	319	26	8.2	17	5.3	8	2.5	9	2.8	3	0.9	63	19.7
27-	103	9	8.7	7	6.8	4	3.9	3	2.9	2	1.9	25	24.3
34-	65	4	6.2	6	9.2	4	6.2	3	4.6	2	3.1	19	29.2
More than 35	122	12	9.8	18	14.8	8	6.6	20	16.4	1	0.8	59	48.4

tively. The overall mean hospital stay of patients with nosocomial infection was 16.83 days (2.4 and 2.3 times higher than that of without nosocomial infection and overall hospitalized patients, respectively).

Table 3 shows the correlation between duration of hospital stay and site of infections of patients with and without nosocomial infections during the 9-month study. Nosocomial postoperative wound infections had the longest hospital stay, i.e. 32.00 days, followed by nosocomial pneumonia and urinary tract infections, 22.00 and 20.05 days, respectively. The shortest hospital stay was for nosocomial gastroenteritis showing a mean of 13.53 days. For patients without nosocomial infections, urinary tract, bacteremia and skin infections had the longest hospital stay, i.e. 11.66, 10.17 and 10.07 days, respectively, whereas postoperative wound infections had the shortest stay, i.e. 5.33 days, followed by gastroenteritis and pneumonia, 7.84 and 9.03 days respectively.

In the neonatal ward (R-17) the hospital stay according to site of nosocomial infections is shown in Table 4. Nosocomial skin infections had the shortest mean hospital stay, namely only 5.13 days. The longest was for nosocomial bacteremia i.e. 7.72 days.

Table 5 demonstrates clearly that the longer the length of stay, the higher the number of nosocomial infections ($x^2=482.68$, df=5, p). The table also shows the length of stay specific nosocomial infection rates according to site of infections. Length of stay-specific nosocomial infection rate was 3.2% in patients with length of stay up till 6 days. Length of stay-specific nosocomial infection rates were 16.7%, 19.7%, 24.3%, 29.2% and 48.4% in patients with length of stay up to 13 days, 20 days, 27 days, 34 days and 35 days or more, respectively.

Discussion

Nosocomial infection rates in ward A2, A3, R-17 and NICU were 9.9%, 4.5%, 8.8% and 65.1%, respectively. The differences in nosocomial infection rates in the four wards also reflected the diversity of the patient's diseases, the severity of their illness, and socioeconomic status. It could be expected and predicted that the lower the socioeconomic status, the higher the incidence of nosocomial infection. In this study the mean duration of hospitalization was approximately 7.4 days in all patients, and 17 days in patients with nosocomial infections. The mean hospital stay was only 5.7 days for patients who died and the mean hospital stay of all survived patients was 7.5 days. So the shorter hospital stay because of early death did not influence significantly the general mean hospital stay. Janas et al. in Karantina Hospital Jakarta found mean duration of hospitalization of approximately 9 days and 5 days in patients with and without nosocomial infections respectively.[7]

Patients with nosocomial skin infection in ward R-17 had the shortest mean hospital stay, namely only 5 days. The longest stay of 8 days was in patients with nosocomial bacteremia. Thus, though this ward showed the highest frequency (57.5%) of nosocomial infections, it revealed the shortest hospital stay for nosocomial infections with a relative mean of approximately 7 days. However, this can not be considered as a positive fact, because in this neonatal ward, if the mother knew that her baby had gastroenteritis and she herself was discharged after delivery, she forced to bring her child along with her. This was also the reason why the outcome of nosocomial infection is unknown.

The mean hospital stay of all hospitalized patients in ward R-17 was 3.2 days. The mean stay was only 2.9 days for patients who died and mean hospital stay of all survived patients in ward R-17 was 3.2 days. So the shorter hospital stay because of early death also apparently did not influence the mean hospital stay of all hospitalized patients in ward R-17.

The mean hospital stay of all hospitalized patients with nosocomial infections in ward R-17 was 6.75 days.

The mean stay was 10.00 days for patients who died and 6.55 days for all survived patients with nosocomial infections. So early death apparently did not influence on hospital stay of patients with nosocomial infections. The incidence of nosocomial infection (length of stay-specific nosocomial infection rates) rose with the duration of hospitalization, from 3.2% in patients hospitalized up to 6 days, to 48.4% in patients hospitalized 35 days or more. So the longer the length of stay, the greater the number of nosocomial infections. These data suggest that increasing time in the hospital is directly related to the constant risk of nosocomial infections.

Conclusions

The overall mean hospital stay of patients with nosocomial infection was 2.4 times higher than of without. Not taking into account postoperative nosocomial wound infections and respiratory tract infections as the number was to small, nosocomial urinary tract infections had the longest hospital stay, while the shortest hospital stay was for nosocomial gastroenteritis.

The longer the length of stay, the higher the number of nosocomial infections.

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