

ORIGINAL ARTICLE

Catheter Related Infections in Pediatric Patients

by

HERRY GARNA

*(From the Department of Child Health, School of Medicine,
Padjadjaran University, Hasan Sadikin General Hospital, Bandung)*

Abstract

During a 9-month prospective study, from August, 1988 to April, 1989, a total number of 4328 hospitalized pediatric patients at the Department of Child Health, Padjadjaran University, Hasan Sadikin General Hospital Bandung, were observed to identify skin and soft tissue nosocomial infections (not included postoperative), especially catheter related infections.

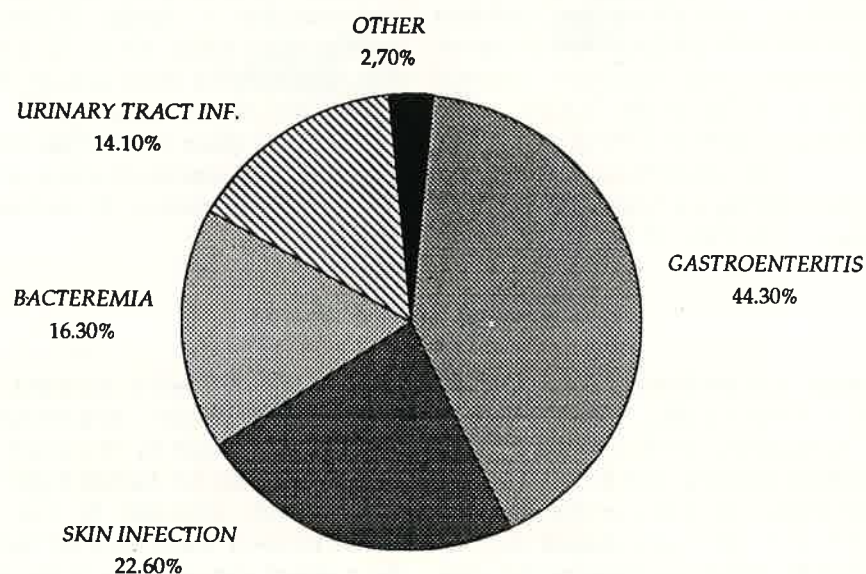
The gastrointestinal tract was the most frequent site of nosocomial infections (44.3%), then subsequently followed by skin infection (22.6%), bacteremia (16.3%) and urinary tract infection (14.1%).

The most frequent cause of nosocomial skin infections like phlebitis was IVFD occurring in 82 out of 93 patients (88.2%). The overall phlebitis attack rate was 4.2%.

When the duration of infusion is divided into 3 groups of 0-36 hours, 37-72 hours and ≥ 73 hours, then it becomes clear that the longer the duration of infusion, the higher the attack rate ($\chi^2=8.07$, $p<0.05$).

Klebsiella pneumonia seemed to be the pathogen most frequently associated with nosocomial skin infections (26.7%), followed by *Enterobacter aerogenes* (20.0%), and then *E. coli*, *Ps. aeruginosa* and *S. aureus* 13.3% each.

It could be concluded that the risk of contracting phlebitis from IVFD with a duration of ≥ 73 hours was 1.9 times higher than that of less than 72 hours.



OTHER consist of :

Post Operative Wound Inf. 1.0%

Lower Respiratory Tract Inf. 1.2%

Stomatitis 0.25 %

Otitis media 0.25%

Figure 1. Relative frequency of nosocomial infection according to body site of infection, during August 1988 - April 1989 in the Department of Child Health, Hasan Sadikin General Hospital, Bandung.

Table I. Frequency distribution of pathogens accounted for nosocomial skin infections during August 1988 to April 1989 among pediatric patients at the Department of Child Health, Padjadjaran University, Hasan Sadikin General Hospital, Bandung

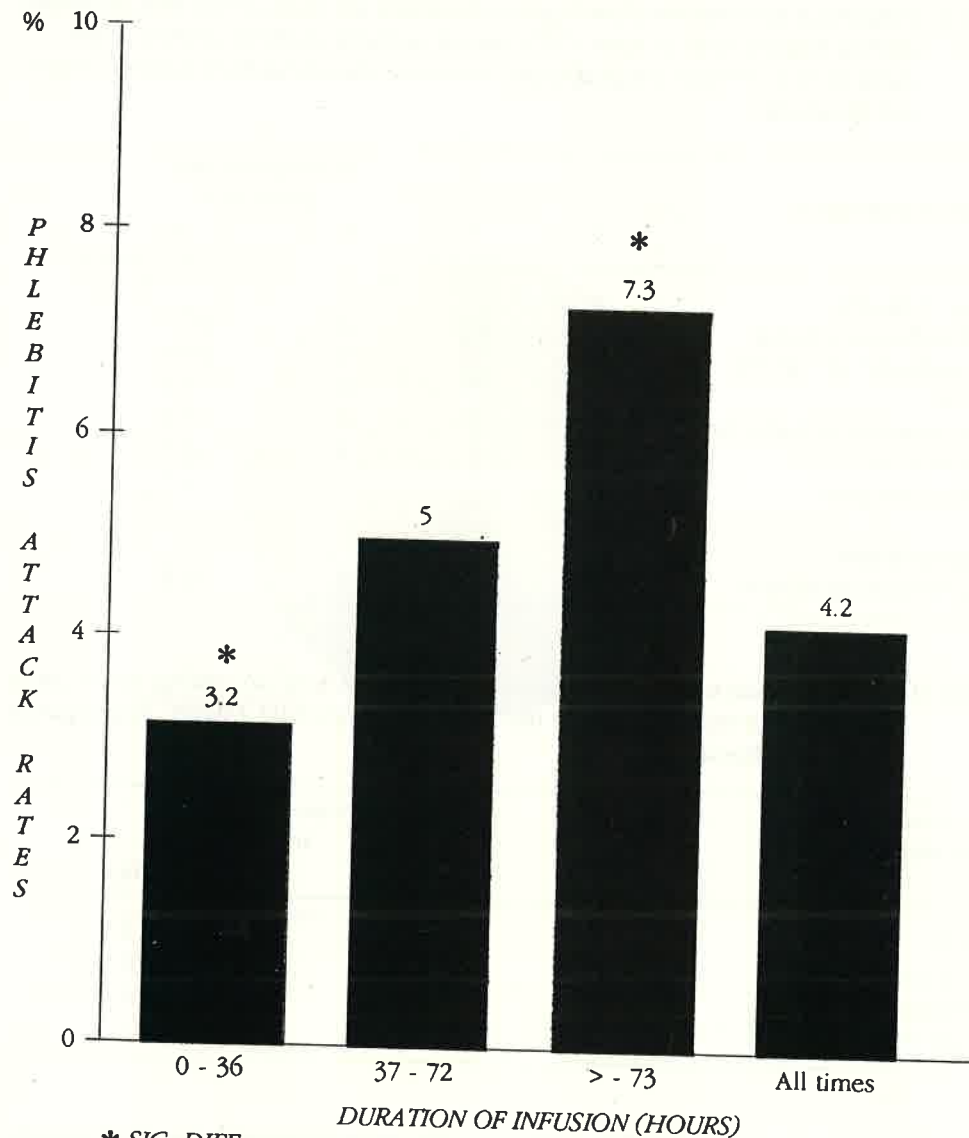
Type of pathogens	Nosocomial skin infections	
	n	%
<i>Gram-negative :</i>		
Klebsiella pneumonia	4	26.7
Enterobacter aerogenes	3	20.0
E. coli	2	13.3
Pseudomonas aeruginosa	2	13.3
Providencia	1	6.7
Proteus vulgaris	1	6.7
<i>Gram-positive :</i>		
Staphylococcus aureus	2	13.3

Table II. Frequency distribution of nosocomial skin infections according to the cause during the 9-month study at the Department of Child Health, Padjadjaran University, Bandung

The cause of nosocomial skin infections	Nosocomial skin infections	
	n	%
IVFD	82	88.2
Pressure	8	8.6
Perspiration	2	2.1
Fecal irritation	1	1.1

For cultures of nosocomial skin infections pus was collected only from 18 out of 93 patients (19.4%), of which 10 (55.6%) contained a single microorganism, 2 specimens (11.1%) had mixed microorganisms and 6 (33.3%) were negative.

The most frequent cause of nosocomial skin infections like phlebitis was IVFD occurring in 82 out of 93 patients or 88.2%. Skin infection due to pressure was found in 8 subjects or 8.6%, and to other causes such as perspiration and fecal irritation in 3 children or 3.2% (Table II).



* SIG. DIFF
(95 % conf. interval)

Figure 2. Phlebitis attack rates after infusion of various durations during August 1988 - April 1989 in the Department of Child Health, Hasan Sadikin General Hospital, Bandung

As far as their body site was concerned, IVFD infections were mostly at the leftside of the head, subsequently followed by the forehead and then the rightside of the head, showing percentages of 8.0%, 5.4%, and 5.1%, respectively.

The phlebitis attack rates after infusion of various duration can be seen in Table III and Figure 2. The overall phlebitis attack rate was 4.2% and it was observed that this infection started after various duration af-

ter intravenous administration. When the duration of infusion is divided into 3 groups of 0-36 hours, 37-72 hours and > 73 hours, then it becomes clear that the longer the duration of administration, the higher the attack rate ($x^2=8.07$, $p<0.05$). These grouping of duration was based on previous studies and experiences, and the opinion that nosocomial skin infection almost never occurred within 24 hours after infusion.

Table III. Phlebitis attack rates after infusion of various duration during August 1988-April 1989 in pediatric patients at the Department of Child Health, Hasan Sadikin General Hospital, Bandung

	Duration of infusion (hour)			
	0 - 36 (n=1097)	37 - 72 (n=684)	73 plus (n=178)	All times (n=1959)
Phlebitis	pr. Ab	Pr. Ab.	Pr. Ab.	Pr. Ab.
Attack rate (%)	35 1062 3.2	34 650 5.0	13 165 7.3	82 1877 4.2

Pr. = Present

Ab. = Absent

The risk of contracting phlebitis for a duration of 73 hours or longer was almost 2 times higher than that of less than

72 hours. In this study the maximum duration of infusion was 98 hours.

Discussion

The majority of patients with nosocomial skin infections in this study presented only redness of the skin, and the most frequent cause of infections was IVFD (more than 80%).

The presence of intravenous catheter is strongly associated with the prevalence of skin infections. During the study period, 1959 children had IVFD, yielding 82 nosocomial phlebitis, giving phlebitis attack rate of 4.2%. The main risk factor for phlebitis is the duration of use of the same infusion site (duration of catheter

placement) [7].

It was shown in this study that the longer the duration, the higher the phlebitis attack rate, as demonstrated also by several studies.

Efforts toward reducing phlebitis rates probably must be directed to shortening the duration of use of any infusion site. Catheters were withdrawn if medically indicated, i.e., when intravenous therapy was no longer needed.

It has already been accepted as recommended also by Centers for Disease

Control (CDC) that peripheral catheters should remain in place only for 72 hours.

Also in this study gram-negative microorganisms were the most frequent

cause of nosocomial skin infections as compared with gram-positive microorganisms (6.5 : 1), with *Klebsiella pneumoniae* - *Enterobacter aerogenes* as the leading pathogens.

Conclusion

The skin was the second most frequent site of nosocomial infection, after the gastrointestinal tract, followed by bacteremia and urinary tract.

The duration of intravenous catheter of more than 72 hours was the risk factor

for nosocomial skin infections (phlebitis).

The gram-negative microorganisms were the most frequent cause of nosocomial skin infections, with *Klebsiella pneumoniae* - *Enterobacter aerogenes* as the leading pathogens.

Acknowledgement

The research has been carried out through the main sponsorship of the Belgian Ministry of Development Cooperation (ABOS) and Ford Foundation (Project No. 870-1714).

It is appropriate to acknowledge the invaluable contribution of the Nosocomi-

al Infection Working Group members of School of Medicine, Padjadjaran University, Hasan Sadikin General Hospital, Bandung, and Prof. S. Lauwers from the Department of Microbiology Academisch Ziekenhuis - Vrije Universiteit Brussel, Belgium.

REFERENCES

1. Stamm WE. II. Prevention of infections. Infections Related to Medical Devices. *Ann Med*, 1978; 89 : 764 - 9.
2. Centers For Diseases Control (CDC). Guidelines for intravascular infections. Atlanta, Georgia : Guidelines Activity, Hospital Infections Branch, center for infectious Disease, Centers for Disease Control, US. Department of Health and Human Services, 1982.
3. Tully JL, Friedland GH, Baldini LM and Goldmann DA. Complications of intravenous therapy with steel Needles and Teflon Catheter. *Am J Med*, 1981; 70 : 702 - 6.
4. Tager IB, Ginsberg MB, Ellis SE. et al. An epidemiologic study of the risks associated with peripheral intravenous catheter. *Am J Epidemiol*, 1983; 118 : 839 - 51.
5. Daschner FD and Frank U. Contraversies in Hospital Infection Control. *Eur J Clin Microbiol*, 1987; 6 : 335 - 40.
6. Duggan J and Berenger S. Hospital acquired septicemia and the role of intravenous therapy. *Aust Nz J Med*, 1988; 18 : 879 - 80.
7. Leibovici L and The Nursing Staff, Department of Internal Medicine "B". Daily change of an antiseptic dressing does not prevent infusion phlebitis. A controlled trial. *Am J Infect Contr*, 1989; 17 : 23 - 5.