

Prognostic factors for surgical-site infection (SSI) event and length of hospitalization for children with intussusception post-operative

Abstract

Background: Usual surgical complications after laparotomy either manual reduction or resection anastomotic, can be expected in intussusception cases. For all studies, reported that there were some complications including wound infection, wound dehiscence and evisceration if bowel surgery was performed, but the reason is still unclear.

Objective: To identify prognostic factors associated with surgical-site infection event and length of hospitalization for children post operative for intussusception.

Methods: This cohort retrospective study identified prognostic factors for surgical-site infection event and length of hospitalization using retrospective data from the medical records in Tarakan District Hospital from January 2014 to December 2015. The different factors then analyzed using chi square (univariate analysis) with level of significance $p < 0.05$ to find each role in the outcome of surgical-site infection event and length of hospitalization

Results: Preoperative haemoglobin, sepsis, type of ward after operation, contributed significantly in surgical-site infection event with RR of 19.250 (95% CI 2.083-177.915), 21.333 (95% CI 3.646-124.831), 11.2 (95% CI 2.204-56.925), respectively, while postoperative haemoglobin, and operation time duration, had a protective effect in surgical-site infection event with RR of 0.464 (95% CI 0.321-0.691), 0.130 (95% CI 0.028-0.602), respectively. Otherwise, preoperative albumin, and operation time duration, contributed significantly in length of hospitalization with RR of 30 (95% CI 1.471-611.797), 10.5 (95% CI 2.15-51.28), respectively

Conclusion: Sepsis and preoperative haemoglobin level were the strong factors associated with the outcome of surgical-site infection event, while operation time duration was the strong factors associated with the outcome of length of operation for children with intussusceptions in Tarakan District Hospital.

Keywords: prognostic factors for intussusception, surgical-site infection, length of hospitalization

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Leecarlo Millano LG

Surgery Department, Tarakan District Hospital, Indonesia

Correspondence: Leecarlo Millano LG, Surgery Department, Division of Pediatric Surgery, Tarakan District Hospital, JL. Kyai Caringin 7 Jakarta, 10150, Indonesia, Tel 6213503150, Email leecarlo_millano@yahoo.com

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Introduction

Intussusception is an invagination of the intestine into the intestine itself, and usually involves the colon and small bowels. It is an emergency situation where a late diagnosis often occurs causing bowel perforation, obstruction, and necrosis.¹ The management of intussusceptions is generally divided into (1) non operative management, a reduction using hydrostatic or pneumatic pressure, and (2) operative management, a manual reduction (milking procedure) or an anastomosis resection. The operative management is done when non operative management fails, and this occur in 10% of cases.^{2,3}

Unfortunately intussusceptions cases that are managed operatively leave complications such as surgical wound infection that would increase the post operative length of stay in the hospital. Some studies conclude that the rate surgical wound infections in patients with intussusceptions is around 26%, and the dehiscence wound is up to 8%.³ This study attempts to explain the factors that play a role in the occurrence of surgical wound infections in patients that undergone surgical laparotomy in Tarakan District Hospital, Jakarta.

Materials and methods

This study is done in the Pediatric Surgery Division of Tarakan District Hospital, Jakarta from January 2014 to December 2015.

This retrospective cohort study evaluates the predicting factors of the occurrence surgical wound infections and the length of hospitalization of patients with intussusceptions. Subjects for this study are taken from the medical record through consecutive non probability sampling by entering the ICD X code for intussusceptions (K.56.1).

After collecting the data, the predicting factors are identified and analyzed using the SPSS 17th Edition. The ordinal and nominal data were analyzed using chi square test. The significant difference is defined as $P \leq 0.05$. Multivariate analysis is used to estimate which variable has the highest effect on surgical wound infection and length of hospitalization.

Table 1 Characteristic demography of subjects

Characteristic	N	%
Sex	Male	21 61.8
	Female	13 31.2
Age	3 – 9	18 52.9
	9 – 12	4 11.8
	> 12	12 35.3

Table 2 Factors contributing to surgical wound infection

		N (%)	Surgical wound infection		P	RR	95% CI	
			Yes	No			Lower	Upper
PRE-OP Hb	<= 12 g/dl	22(64.7%)	14(9.7%)	8(23.5%)	0.002*	19.25	2.083	177.915
	> 12 g/dl	12(35.3%)	1(5.3%)	11 (32.4%)				
POST-OP Sepsis	Sepsis	15(44.1%)	12(35.3%)	3(8.8%)	0.000*	21.333	3.646	124.831
	No Sepsis	19(55.9%)	3 (8.8%)	16(47.1%)				
Ward	PICU	17(50.0%)	12(35.3%)	5(14.7%)	0.002*	11.2	2.204	56.925
	Non-PICU	17(50%)	3(8.8%)	14(41.2%)				

Table 3 Factors that affect the length of hospital stay

		N (%)	Length of stay		P	RR	95% CI	
			<= 10hari	> 10 hari			Lower	Upper
PRE-OP Albumin level	< 2.56	6 (17.6%)	1 (2.9%)	5 (14.7%)	0.045*	30	1.471	611.797
	2.56-3.52	21 (61.8%)	11 (32.4%)	10 (19.4%)				
	> 3.52	7 (20.6%)	6 (17.6%)	1 (2.9%)				
Duration of surgery	<= 120 minutes	18 (52.9%)	14 (41.2%)	4 (11.8%)	0.002*	10.5	2.15	51.281
	> 120minutes	16 (17.1%)	4 (11.8%)	12 (35.3%)				

Table 4 Protective factors of hospital length of stay

		N (%)	Length of stay		P	RR	95% CI	
			<= 10 days	> 10 days			Lower	Upper
PRE-OP Hb	<= 12 g/dl	22 (64.7%)	8 (23.5%)	14 (41.2%)	0.009*	0.114	0.02	0.657
	> 12 g/dl	12 (35.3%)	10 (29.4%)	2 (5.9%)				
POST-OP Hb	<= 12 g/dl	28 (82.4%)	12 (35.3%)	16 (47.1%)	0.020*	0.429	0.279	0.657
	> 12 g/dl	6 (17.6%)	6 (17.6%)	0 (0.0%)				
POST-OP Sepsis	Sepsis	15 (44.1%)	2 (5.9%)	13 (38.2%)	0.000*	0.029	0.004	0.199
	No sepsis	19 (55.9%)	16 (47.1%)	3 (8.8%)				
Ward	PICU	17 (50.0%)	4 (11.8%)	13 (38.2%)	0.001*	0.066	0.012	0.353
	Non Picu	17 (10.0%)	14 (41.2%)	3 (8.8%)				
Resection	Resection	21 (61.8%)	8 (23,5%)	13 (38.2%)	0.028*	0.185	0.039	0.88

Results

There were 34 patients with 21 male (61.8%) and 13 females (38.2%). There were 18 patients aged 3-9 months (52.9%), 4 patients aged 9-12 months (11.8%), and 12 patients aged >12 months (35.3%) (Table 1). The variables identified were pre and post-op hemoglobin level (g/dl), pre and post-op albumin level (g/dl), operation time duration, post-operative sepsis occurrence, type of ward for post-operative care, resection, and patient's nutritional status. The outcomes of this study were surgical wound infection occurrence and length of hospitalization.

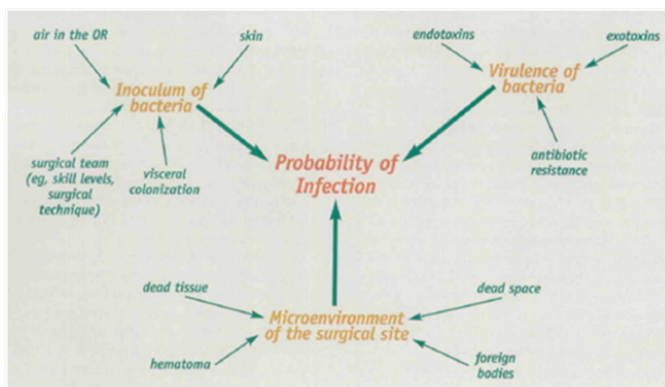


Figure 1 Surgical wound infection occurs from various contributing factors such as bacterial inoculation from variable sources, the different virulence of bacteria that contaminates surgical wounds and micro-environment of the surgical site that may be affected by hemostasis, electro surgery, surgical string, and dead space in the wound.⁵

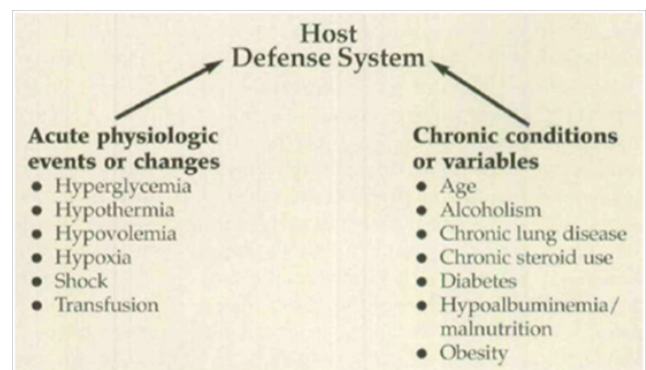


Figure 2 The host's immune system is a complex combination of innate and adaptive response that can prevent the occurrence of surgical wound infection. Physiological changes that occur in peri-operative period (pre-operative, intra-operative, and post-operative) and chronic medical illness can affect the patient's immune system and cause surgical wound infection.⁵

Surgical wound infection

Surgical wound infection occurred in patients with lower pre-operative hemoglobin level (9.7% vs. 5.3%, p=0,002 with 95% CI 2.083-177.915), post-operative sepsis (35.3% vs. 8.8%, p=0.0000 with 95% CI 3.646-124.831), and PICU as the post-operative ward (p=0.002, 95% CI 2.204-56.925). In our study the PICU was a higher risk for surgical wound infection compared to non-PICU ward (35.3% vs. 8.8%) (Table 2).

Length of hospitalization

Factors that affect the length of hospitalization were pre-operative albumin concentration, where patients with albumin level 2.56-3.52 g/dl had higher length of hospitalization compared to patients with albumin level > 3.52 g/dl ($p=0.045$, 95% CI 1.471-611.797). The surgery that took longer than 120 minutes had higher length of stay (35.3% vs. 11.8%; $p=0.002$; 95% CI 2.150-51.281) (Table 3).

Whereas variables such as pre and post-operative hemoglobin level, sepsis, type of ward for post-operative care, and anastomosis resection were protective factors toward the length of hospital stay (Table 4).

Discussion

Surgical wound infections account for a large portion of morbidity with the rate of 500,000 cases per year from 27 million surgeries including for intussusceptions.⁴

Even though the bacteria causing surgical wound infections are considered contaminants, the infection does not occur in some surgical wounds. Some case reports mentioned that the patient's condition and environment were contributors for the occurrence of surgical wound infection (Figure 1).^{5,6} Odom-Forren found that factors contributing to surgical wound infections are the number of bacteria contaminants, the bacteria's virulence, the micro-environment around the surgical wound, and the immune system of the host.⁷ The host innate immunity is a large contributing factor for surgical wound infection. When the defense mechanism of the host is low, the occurrence of surgical wound infection is high. The immune system of the host is affected by the two factors, i.e. genetic and acquired factor. The genetic factor is varied among individuals, in definition that some patients are genetically more susceptible to infections than others. The acquired factors, that are more general and familiar, include physiological conditions such as hypoglycemia, hypothermia, sepsis, and others (Figure 2).⁵

Fry et al.,⁵ and Gould studied risk factors of surgical wound infection, which were surgeries that involved the abdomen, the duration of surgery that was longer than 2 hours, chronic pulmonary disease, and low level of pre-operative albumin concentration.^{5,6} The management to prevent surgical wound infection involves a complex system including pre-operative prophylactic antibiotics that was according to the wound culture or empirical culture in the hospital. Prophylactic antibiotics, when needed, can be given minimally 30 minutes before the surgery is conducted.⁵⁻⁸

Conclusion

In this study we found that sepsis, perioperative level of hemoglobin, and the type of postoperative ward are factors that play a role in the occurrence of surgical wound infection. Preoperative level of albumin, and operation time duration were significant predicting factors of the length of hospitalization in patients with intussusceptions at Tarakan District Hospital. From these prognostic factors we hope that in the future interventions can be taken to prevent the occurrence of surgical wound infections in general patients and especially in patients with intussusceptions.

Acknowledgments

None.

Conflicts of interest

Author declares that there is no conflict of interest.

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