

Background and Significance

- Surgical site infections (SSIs) contribute to significant morbidity and mortality for neonates undergoing cardiac surgery, increased length of stay, and overall hospital cost^{1,2}
- Neonates are at increased risk of SSIs due to their inherent immunodeficiency, immature skin, and exposure to multiple medical devices^{1,3,6}

Needs Assessment

- Cardiac Neonatal Intensive Care Unit (CNICU) of an academic tertiary care hospital, the 2019 SSI rates were:
 - Cardiac NICU: 4.6/100
 - Pediatric Cardiac Surgery: 2.9/100 cases
- Like centers achieved SSI rate <2.0/100 cases^{4,5}
- Average increase length of stay of 98.5⁶
- Median SSI Cost \$136,950⁵
- 60% of SSIs are preventable¹

Clinical Question

For neonates undergoing cardiac surgery in the CNICU of this tertiary care academic setting, will critique of current preoperative and postoperative practices and comprehensive review of the literature provide evidence to develop an SSI bundle and effective SSI prevention surveillance tool?

Aims and Objectives

- Identify modifiable and non-modifiable SSI risk factors
- Assess compliance with current standard of care
- Develop bundle and corresponding SSI prevention surveillance process in preoperative and postoperative settings
- Create, critique, edit, and pilot a surveillance tool
- Analyze information from tool to determine its effectiveness, identifying critical care gaps
- Share information and establish plan for revision and sustainability

Methodology

Design

- QI pilot project
 - 6-weeks pre-intervention observation
 - 2-weeks data presentation, practice review, evidence-based practice education
 - 6-week post-intervention observation

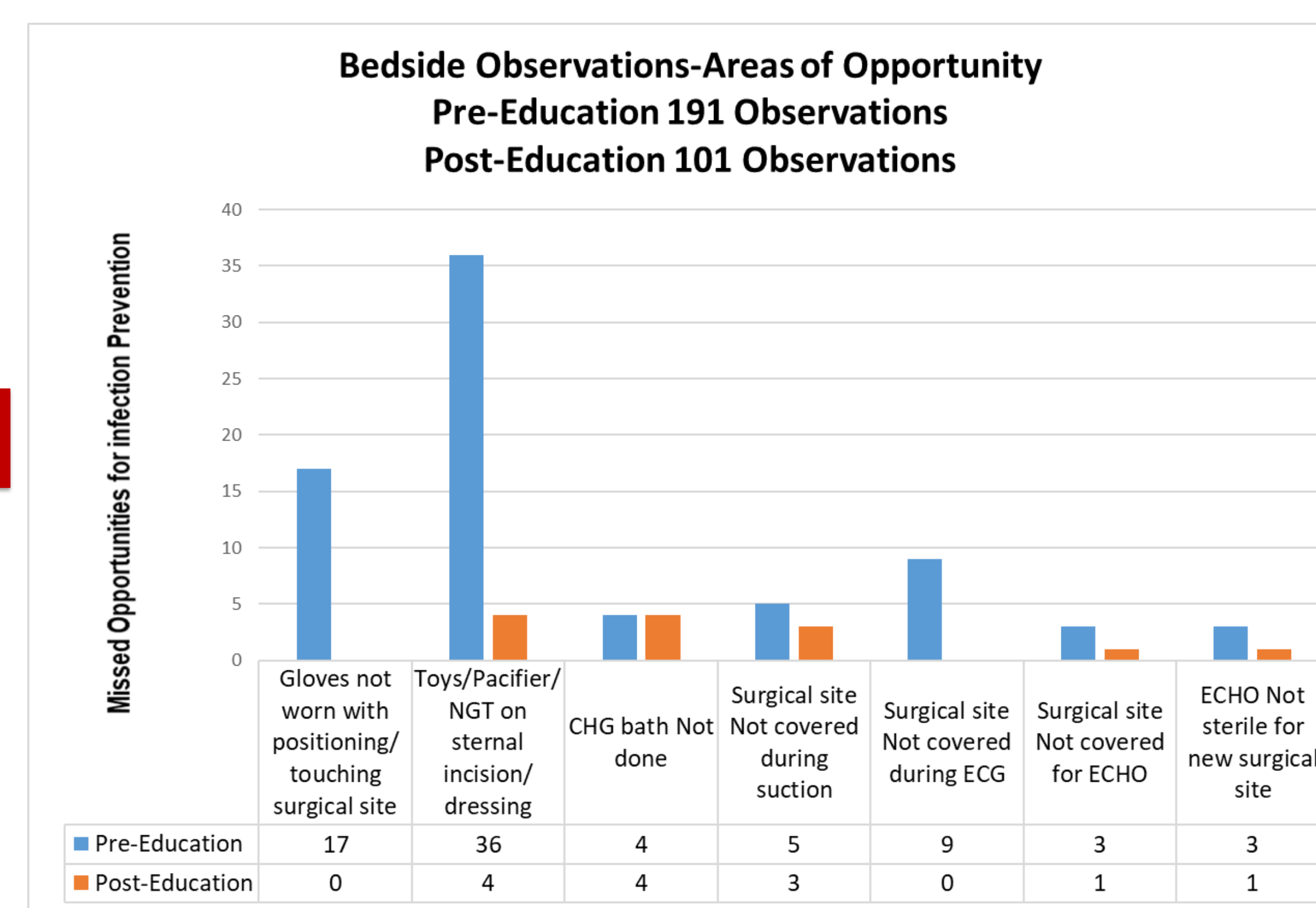
Setting

- 17-bed CNICU with average annual census of 250 and of those, ~ 150 (60%) undergo cardiac surgery

Recruitment and Population

- Convenience sample of neonates with congenital heart disease undergoing cardiac surgery

Pre-Post Observations



Results

- 25 neonates underwent cardiac surgery
- Pre-intervention = 15** ★ **Post-intervention = 10**
- Demographics, modifiable, and non-modifiable factors were comparable or did not demonstrate differences: gestational age, age at surgery (days), weight (grams), invasive lines, total protein/albumin, TPN, by-pass, lowest temperature highest glucose 24 hours post surgery, blood loss, ECMO, delayed closure, and feedings
- SSI rates were as follows:

MSSA Infections	
Pre-intervention	Post-intervention
2 (13%)	None

Unanticipated Findings

	Case	Gestational Age (weeks)	Age @ Surgery (days)	Weight @ Surgery (gms)	Infection Type	Organism	
PRE	INFECTIONS	1	38	15	3360	Deep	MSSA
		2	38	7	2755	Superficial	MSSA
	DEHISCENCE TYPES	3	33	13	1570	Superficial	NA
		4	38	10	3580	Superficial	NA
		5	39	16	3590	Superficial	NA
		6	37	14	3030	Superficial	NA
POST	7	38	6	3840	Superficial	NA	

- 5 (20%) neonates developed non-infectious superficial wound dehiscence

Pre-intervention = 4 ★ **Post-intervention = 0**

Discussion

- No significant correlation between known risk factors: gestational age, weight at surgery, hyperglycemia, blood loss/transfusion, TPN, or delayed sternal closure
- Data did not support gestational age, weight, age at surgery, hyperglycemia, blood loss, blood transfusion, TPN, or delayed sternal closure as contributing factors
- Both SSIs were secondary to MSSA necessitating consistent preoperative surveillance for methicillin-sensitive *Staphylococcus aureus* (MSSA) methicillin-resistant *Staphylococcus aureus* (MRSA)
- Post-education bedside observation improvement could have been influenced by Hawthorne effect (clinicians altering behavior due to awareness of project)
- Other potential influencing factors include the timing of intraoperative antibiotic administration as well as number and timing of blood transfusions

Conclusions and Implications

- SSIs are multifactorial and preventable
- SSIs are the most common and costly of all hospital-acquired infections where organizations are at risk of monetary penalties and ranking
- It is the responsibility of an interdisciplinary team to take stock in evidence-based practice in the care of surgical wounds and provide for optimal healing environments, nutrition, dressing changes, and prevention of contamination
- This project contributed to a culture of safety which will help meet the IHI triple aim of reducing cost and improving health and the patient experience
- Despite the small sample size and limited data collection, several modifiable risk factors were identified that may lessen the incidence of SSI
- Project initiative has already been assumed by frontline clinicians working collaboratively with the interdisciplinary surgical team for policy change and bundle guidelines

References and Surveillance Tool available upon request

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Characteristics	PRE No SSI or Dehiscence (n=9, %)	Post No SSI or Dehiscence (n=9, %)	Pre SSI (n=2, %)	Post SSI (n=0)	Pre Wound Dehiscence (n=4, %)	Post Wound Dehiscence (n=1)
PREOPERATIVE SETTING						
Invasive Lines						
# of Patients (%)	8 (89)	8 (89)	2 (100)		4 (100)	1
Total Protein (g/dl)						
Mean (SD)	5.4 (0.9)	5.1 (0.6)	5.5 (1)		5 (0.4)	-
Albumin (g/dl)						
Mean (SD)	3.5 (0.5)	3.3 (0.4)	3.4 (0.1)		3.3 (0.5)	-
TPN						
# of Patients (%)	8 (89)	8 (89)	1 (50)		4 (100)	1
OPERATIVE SETTING						
By-pass						
# of Patients (%)	9 (100)	8 (89)	2 (100)		3 (75)	1
Lowest Temp (°C)						
Mean (SD)	26 (6)	24 (7)	23 (7)		30 (8)	18
Antibiotics Mins to Incision						
Mean (SD)	21.4 (23)	17 (6)	9.5 (5)		20.5 (8)	13
POSTOPERATIVE SETTING						
Steroids						
# Patients (%)	3 (33)	4 (44)	2 (100)		0 (0)	1
Glucose First 24° (mg/dl)						
Mean (SD)	187 (64)	264 (95)	201 (81)		173 (32)	123
Blood Loss 24 hours (ml)						
Mean (SD)	140 (126)	103 (46)	99 (0)		47 (12)	124
Blood Transfusion						
# Patients (%)	9 (100)	8 (89)	2 (100)		3 (75)	1
Delayed Chest Closure						
# Patients (%)	2 (22)	2 (22)	0 (0)		0 (0)	0
ECMO Perioperatively						
# Patients (%)	2 (22)	3 (33)	0 (0)		0 (0)	0
Colonized S. aureus						
# Patients (%)	0 (0)	1 (11)	2 (100)		1 (25)	0
Feedings (Post-op day #)						
Mean (SD)	6 (3)	4 (2)	6 (0)		4 (1)	5