Project Title

Prevention of central line associated blood stream infection (CLABSI) in neurosurgical patients admitted to Neurosurgical Intensive Care Unit at Tan Tock Seng Hospital

Project Lead and Members

Project lead: Dr Lee Rui Min

Project members:

- Dr Tan Hui Ling
- Dr Fong Wee Kim
- Dr Wong Yu Lin
- Dr Lai Poi Leng
- Dr Mandy Lim
- Dr Felicia Chin
- Dr Nishal Kishinchand Primalani
- Miss Siti Aisyah Bte Abdullah
- Miss Gu Chunguang
- Miss Kui Hui Ling
- Miss Gabrielle Chia
- Miss Kelly Cao

Organisation(s) Involved

Tan Tock Seng Hospital (TTSH)

Project Period

Start date: October 2017

Completed date: June 2019

Aims

To reduce central line* associated blood stream infection (CLABSI)* rate in neurosurgical patients admitted to Neurosurgical Intensive Care Unit at Tan Tock Seng Hospital (Ward 3A) from median of 6.9 per 1000 central line days to 0 per 1000 central line days in 1 year

*Central line and CLABSI as defined using CDC/NHSN definition

Background

Central line associated blood stream infection (CLABSI) is associated with significant mortality, morbidity and costs. According to study done by US Centers for Disease Control (CDC), a 58% reduction in the incidence of CLABSI in the United States has translated to as many as 6000 lives saved, $414 million in potential excess health care costs in 2009, and almost $2 billion in cumulative excess costs since 2001.

Based on MOH National Infection Prevention and Control Indicators annual report, TTSH ICUs have the highest number of CLABSI cases in 2017 amongst the restructured hospitals. TTSH medical, neuroscience and coronary care intensive care units CLABSI rate are higher than the 90th percentile reported by NHSN.

Methods

A macro flowchart looking at central line process was created from the point a neurosurgical patient was admitted to OT/ NICU, to the point this patient was discharged from NICU. Further micro flowcharts were created targeting the following areas:

1) Assessment for need for central venous line
2) Insertion of central venous line in OT/ NICU
3) Central venous line care in NICU
4) Review for need for central venous line

Brainstorming sessions amongst team member were done to analyse the causes contributing to high CLABSI rate among neurosurgical patients in NICU. A cause and effect diagram was then created, and top root causes identified using a Pareto Chart.

Interventions were carried out to target the root causes:

1) Increase awareness of insufficient time for chlorhexidine cleansing solution to dry prior to CVL insertion through videos, department CME, courses, CVL insertion adherence monitoring.
2) Change of OT sterile drape with big opening for CVL insertion to a full body sterile drape with a smaller circular opening
3) Addition of CVL review field into ICU daily ward round form

Multiple PDSA cycles were done and process measures tracked to ensure success of each intervention.

Results

The central line associated blood stream infection (CLABSI) rate in neurosurgical patients admitted to Neurosurgical Intensive Care at TTSH dropped from a median of 6.9 per 1000 central line days to 3.95 per 1000 central line days in 1 year.

ICU bed days savings per prevented CLABSI is calculated at 8.2 days. This translates to a cost savings per prevented infection of $17,056. The treatment related cost savings per patient per prevented infection is estimated to be $1,699.39.

Additional Information

Recipient of the 2019 Asian Hospital Management Award – Patient Safety (Gold Award)

Lessons Learnt

1) Need to get buy-in from relevant parties to make the project a success - from the macro and micro flowcharts, we involved everyone fundamental in our project so that everyone was on the same page.
2) Cause and effect diagram together with micro and macro flowcharts were very useful to help identify the root causes
3) Once interventions shown to be useful, can bring up to higher platforms to achieve more buy in at a hospital level so that there can be maintenance of the interventions and continued interest.

Conclusion

This project's interventions have been rolled out to other intensive care units in TTSH and there is a significant reduction in total number of ICU CLABSI cases from 41 cases in 2017 to 25 cases in 2018.

Project Category

Clinical Improvement, Quality Improvement, Safe Care

Keywords

Clinical Improvement, Quality Improvement, Safe Care, Cause and Effect Diagram, Pareto Chart, Plan Do Study Act, Cost Savings, Infection Control, Anaesthesiology, Nursing, Operations, Intensive Care, Tan Tock Seng Hospital, Central Line Associated Blood Stream Infection, Neurosurgery Intensive Care Unit

Name and Email of Project Contact Person(s)

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Central Line Associated Blood Stream Infection (CLABSI) Prevention at Tan Tock Seng Hospital Neurosurgical Intensive Care Unit

Dr Wong Yu Lin, Adj A/Prof See Jee Jian, Adj A/Prof Tan Hui Ling & Dr Lee Rui Min
Department of Anaesthesiology, Intensive Care & Pain Medicine (AICPM)

Mission Statement

To reduce central line* associated blood stream infection (CLABSI)* rate in neurosurgical patients admitted to Neurosurgical Intensive Care Unit at Tan Tock Seng Hospital (Ward 3A) from median of 6.9 per 1000 central line days to 0 per 1000 central line days in 1 year

*Central line and CLABSI as defined using CDC/NHSN definition

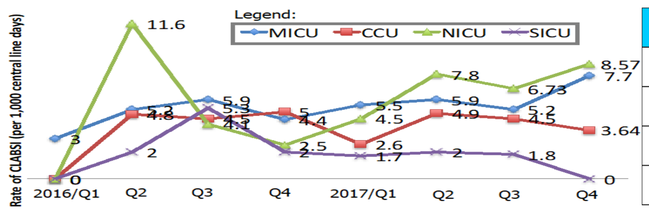
Team Members

	Name	Designation	Department
Team Leaders	Dr Jasmine Yang	Consultant	AICPM
	Dr Lee Rui Min	Consultant	AICPM
Team Members	Dr Fong Wee Kim	Senior Consultant	AICPM
	Dr Lai Poi Leng	Senior Consultant	AICPM
	Dr Mandy Lim	Senior Consultant	AICPM
	Dr Felicia Chin	Resident	AICPM
	Dr Nishal Kishinchand Primalani	Resident	NNI
	Miss Siti Aisyah Bte Abdullah	Senior Staff Nurse	OT Service (AU)
	Miss Gu Chun Guang	Advanced Practice Nurse	Nursing Service
	Miss Kui Hui Ling	Senior Staff Nurse	3A NICU
	Miss Gabrielle Chia	Senior Staff Nurse	Infection Control Unit
	Miss Kelly Cao	Assistant Manager	ICU Operations
Sponsor	A/Prof See Jee Jian	Head of Department	AICPM
Mentor	Adj A/Prof Tan Hui Ling	ACMB (Clinical Quality & Audit)	AICPM

Evidence for a Problem Worth Solving

- CLABSI is associated with significant mortality, morbidity, and costs. Based on MOH National Infection Prevention and Control Indicators Annual Report, TTSH ICUs had the most number of CLABSI cases in 2017.
- TTSH MICU, NICU and CCU CLABSI rates were higher than the 90th percentile reported by NHSN.

Current Performance of a Process



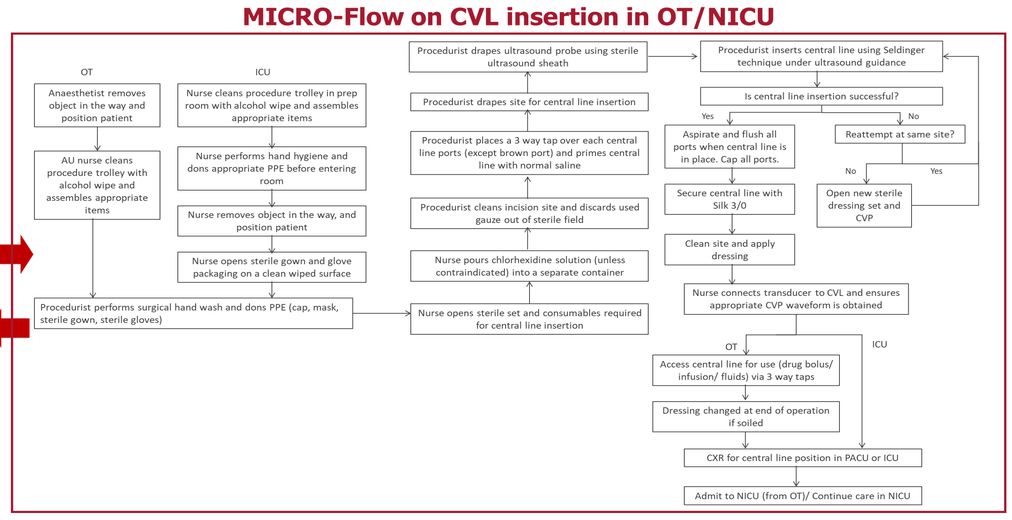
Dept	No. of CLABSI cases in NICU in 2017
NES	7
NL	4
Others	2
Total	**13**

Flow Chart of Process

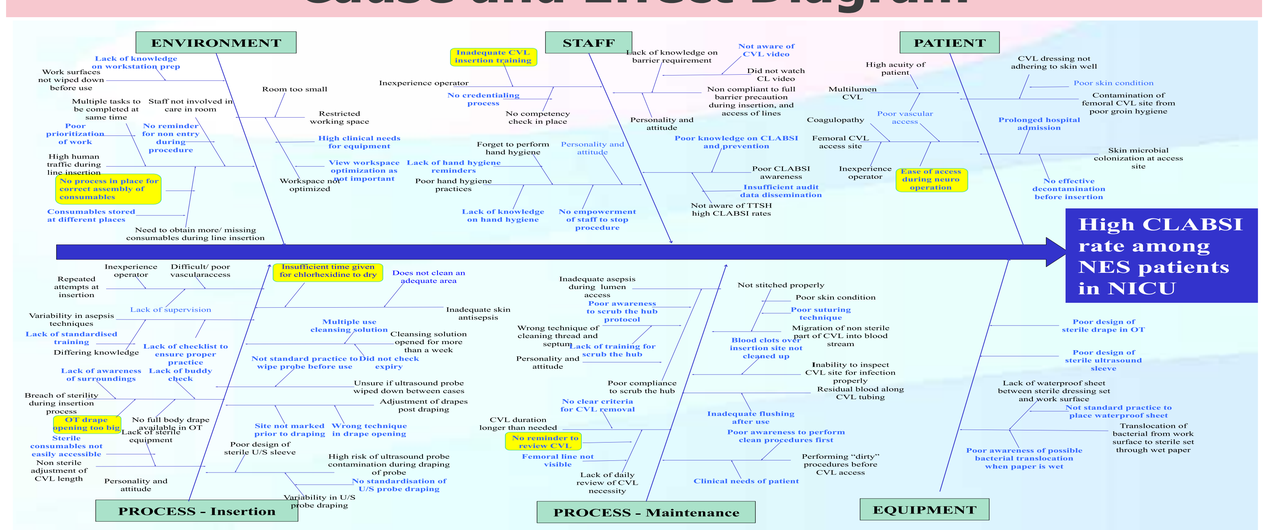
MACRO-Flow

NES Patient admitted to OT/NICU
↓
Assessment for need for CVL
↓
CVL insertion in OT/NICU
↓
CVL care in NICU
↓
Review for need for CVL
↓
Discharged from NICU

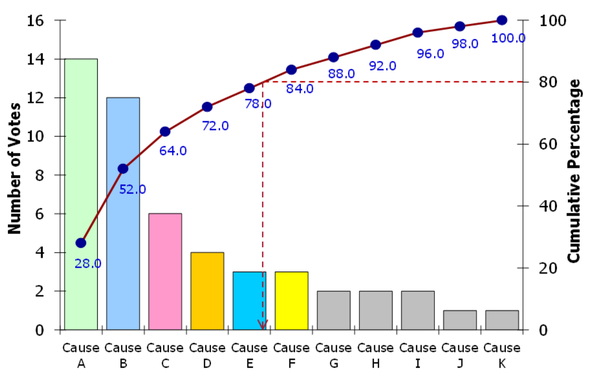
MICRO-Flow on CVL insertion in OT/NICU



Cause and Effect Diagram



Pareto Chart

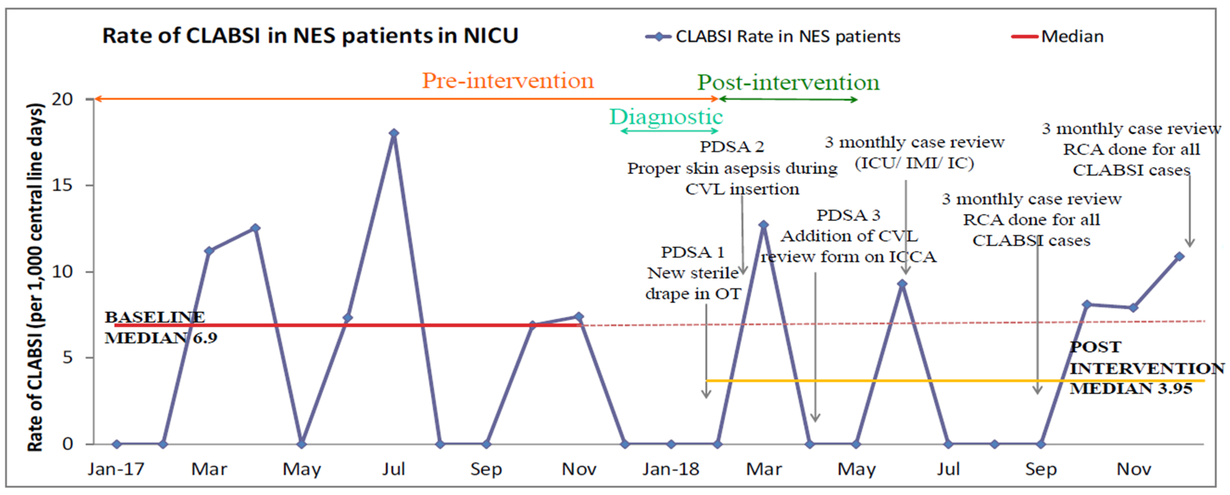


Cause	Root Cause
Cause A	**Insufficient time for chlorhexidine cleansing solution to dry prior to CVL insertion**
Cause B	**Big opening of OT sterile CVL drape**
Cause C	No process in place for correct assembly of CVL consumables prior to insertion
Cause D	**Lack of daily review of CVL necessity**
Cause E	Inadequate CVL insertion training
Cause F	Femoral access site

Implementation

CAUSE / PROBLEM	INTERVENTION	DATE OF IMPLEMENTATION
Big opening of OT sterile CVL drape	Changed current OT sterile CVL drape to a full body sterile drape with small circular opening (Halyard central venous catheter patient cover)	7th Feb 2018
Insufficient time for chlorhexidine cleansing solution to dry prior to CVL insertion	Increased awareness through education ▪ Video ▪ Departmental CME ▪ CVL insertion courses	26th Feb 2018
Lack of daily review of CVL necessity	Addition of CVL review field into ICU daily ward round form on ICCA	9th Apr 2018

Results



	Jan'17	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan'18	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
No.	0	0	1	1	0	1	2	0	0	1	1	0	0	0	1	0	0	1	0	0	0	1	1	1

Cost Savings

	CLABSI	No CLABSI
Average ICU Length of Stay per NES Patient	14 days	5.8 days
ICU Bed Days Savings per Prevented Infection:	5.8 – 14 = **-8.2 days**	
Total Cost of Care per NES Patient	14 x $2080 = $29,120	5.8 x $2080 = $12,064
Cost Savings per Prevented Infection:	$12,064 - $29,120 = **-$17,056**	
Estimated Treatment related Cost per Patient per CLABSI	$1,699.39	$0
Treatment related Cost Savings per Patient per Prevented Infection:	**$1,699.39**	

Summary

Our interventions successfully reduced the median rate of CLABSI, resulting in reduced morbidity and cost savings for patients.