BATTLING THE BUGS: REDUCING EARLY CATHETER-RELATED BLOODSTREAM INFECTION IN HAEMODIALYSIS PATIENTS

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Mission Statement

We aim to reduce early catheter-related blood stream infection (BSI) in haemodialysis (HD) patients with newly inserted tunnelled dialysis catheter (TDC) by 80% over a sustained period.

Team Members

	Name	Designation	Department
Team Leaders	Yeo See Cheng	Consultant	Renal Medicine
	Chan Siew Mie	Senior Nurse Manager	Renal Unit
Team Members	Timothy Koh	Consultant	Renal Medicine
	Benjamin Khoo	Senior Resident	Renal Medicine
	Jiang Nan	Nurse Clinician	Ward 9A
	Ooi Swee Ling	Assistant Nurse Clinician	Renal Unit
	Pua Uei	Senior Consultant	Radiology
	Gabrielle Chia	Senior Staff Nurse	Infection Control
	Koh Zhi Min	Executive	CSI
Sponsor	Adrian Liew	Head of Department	Renal Medicine

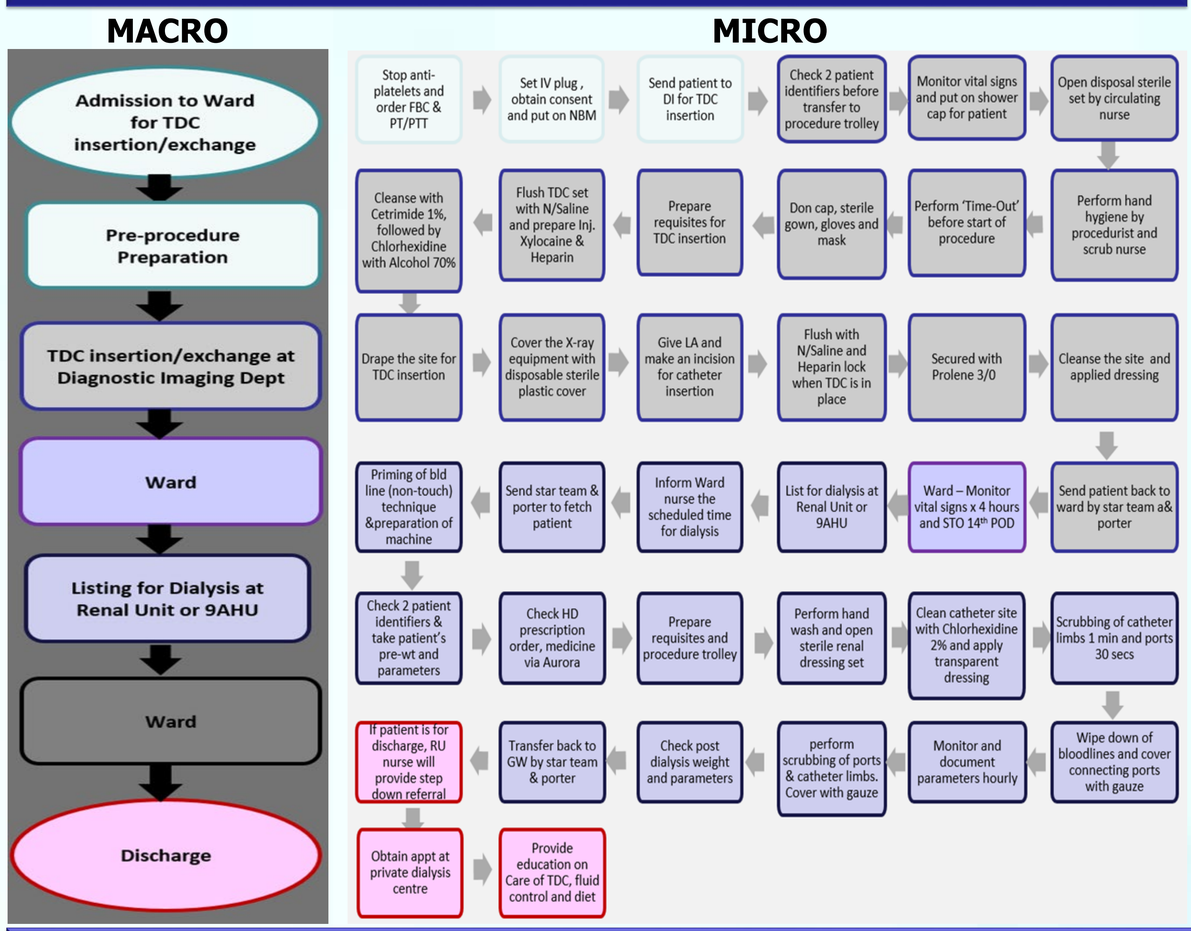
Evidence for a Problem Worth Solving

Dialysis catheter-related BSI is a leading complication in HD patients, associated with increased risk of mortality, additional invasive procedures, additional hospitalisation and/or increase in length of stay.

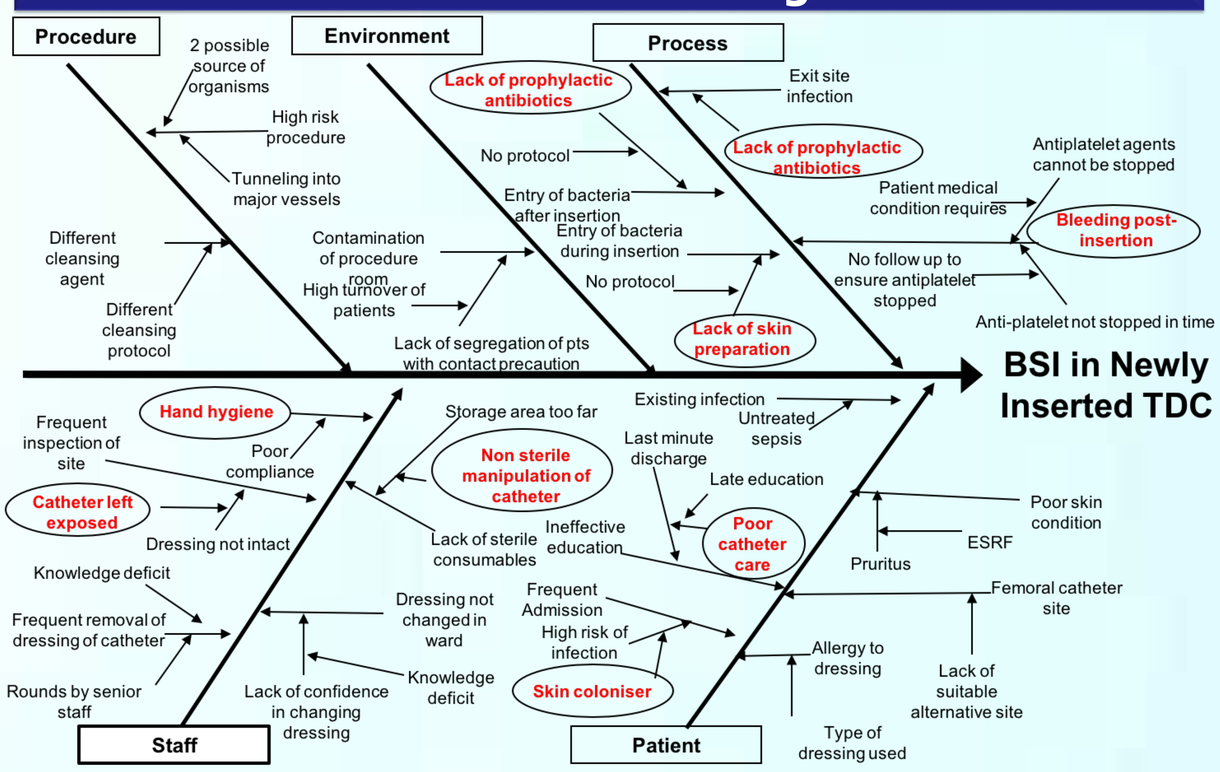
Current Performance of a Process

In 2014 and 2015, there were an annual average of 11.5 episodes of catheter-related BSI in HD patients that occurs after a newly inserted TDC in TTSH – a rate of 1.9 infections per 100 catheters inserted i.e. 1.9% of newly inserted TDC were infected.

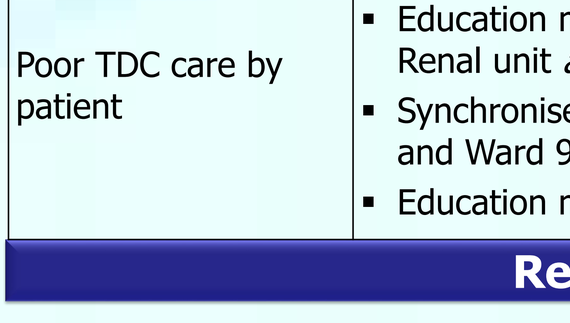
Flow Chart of Process



Cause and Effect Diagram



Pareto Chart



A	Lack of prophylactic antibiotics
B	Inadequate skin preparation before insertion
C	Poor catheter care by patient
D	Non sterile manipulation of catheter
E	Skin colonisation

Implementation

CAUSE	INTERVENTION
Lack of prophylactic antibiotics	▪ Prophylactic IV antibiotics before insertion ▪ Topical gentamicin to newly inserted TDC exit site
Inadequate skin preparation before insertion	▪ Chlorhexidine wash to skin before insertion of TDC ▪ Nasal decolonisation for MRSA carriers
Poor TDC care by patient	▪ Education on care of TDC *before* TDC insertion ▪ Education message reinforced in Ward 9A/11A and Renal unit *after* insertion ▪ Synchronised education message from Renal unit and Ward 9A/11A ▪ Education material to show pictures for clarity

Results

In the pilot phase (April-December 2016), there was an 86% decrease in rate of dialysis catheter-related BSI from 4.4% to 0.6%.

In the sustaining phase, we conducted a hospital-wide cohort study. Between April and June 2017, patients receiving the interventions had an infection rate of 0.4 infections/1000-catheter-days, compared to 5 infections/1000-catheter-days in patients not receiving the interventions, representing a 92% reduction in dialysis catheter-related BSI.

Number of cases of dialysis catheter related BSI/Number of dialysis catheter insertion

	Intervention Arm (Ward 9A & 9B)	Control Arm (All other locations, including MAC and ICUs)
April	0/34	2/21
May	0/29	5/30
June	1/24	3/22
Total	**1/87 (1.1%) 0.4 infections per 1000 catheter-days**	**10/73 (13.7%) 5 infections per 1000 catheter-days**

Cost Savings

Each episode of catheter-related MRSA bacteraemia is estimated to have a direct increased cost of $5,645.81 to the patient (increased length of stay, additional invasive procedures and treatment). Given that the interventions implemented cost $53.52 per patient and assuming 50 interventions are necessary to prevent one episode of bacteraemia (historical infection rate of 1.9% and 600 new catheter insertions per year), the cost savings per episode of catheter-related BSI avoided is $2,969.81 and the annual cost savings is estimated to be $34,152.82.

The actual additional marginal healthcare cost of TDC-related BSI is likely higher (reported ~USD$30,000 per episode of MRSA infection) and it is expected that the overall healthcare cost savings is substantial.

Strategies to Sustain

Improve reliability of applying required processes / interventions:

1. Refine & simplify standardised protocol & checklist for interventions
2. Process measure to document reliability of applying interventions
3. Micro-processes audits and forced function to ensure adherence

We are also identifying interventions that are key to improving outcome measures to refine the processes.