Quality Improvement Report: Safety Program for Prevention of Central Line-associated Bloodstream Infections

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BACKGROUND

- The growing use of **peripherally inserted central catheters (PICC)** has led to the recognition of the risk of **central line-associated bloodstream infections (CLABSIs).**
  - *Historical data (2019) – Incidence of CLABSI per 1000 central line days in a **surgical ward** at a teaching hospital was **high (11.5%)***

- CLABSIs can cause **mortality**, increase **morbidity** and **length of stay**, and result in **higher health costs** *(Rosenthal et al., 2009).*

- **Comprehensive Unit-Based Safety Programs (CUSP)** are sustainable models to reduce CLABSIs
  - *developed by **Johns Hopkins Quality and Safety Research Group** and funded by **Agency for Healthcare Research and Quality*** (*AHRQ, 2017)*

- CUSP can improve **teamwork and safety culture** and help clinical teams **learn from mistakes** through the integration of **safety practices** into daily work (*AHRQ, 2017)*

References:

- *AHRQ. 2017. Learn about CUSP. Agency for Healthcare Research and Quality, http://www.ahrq.gov/professionals/education/curriculum-tools/cusptoolkit/modules/learn/index.html*
- *Rosenthal VD. Central line-associated bloodstream infections in limited-resource countries: a review of the literature. Clin Infect Dis. 2009 Dec 15;49(12):1899-907.*

OBJECTIVE

- To evaluate the implementation of **CUSP** for the reduction of **PICC-associated bloodstream infections (BSI)**

METHODOLOGY

The Five Steps of the Comprehensive Unit-based Safety Program

Step 1: Understand and train staff on the science of safety

- Provide education and awareness of safety issues

Step 2: Assemble the team

- Empower individuals to address and improve safety

Step 3: Engage the Senior Executive

- Drive culture change to create a culture of safety

Step 4: Identify defects through sensemaking

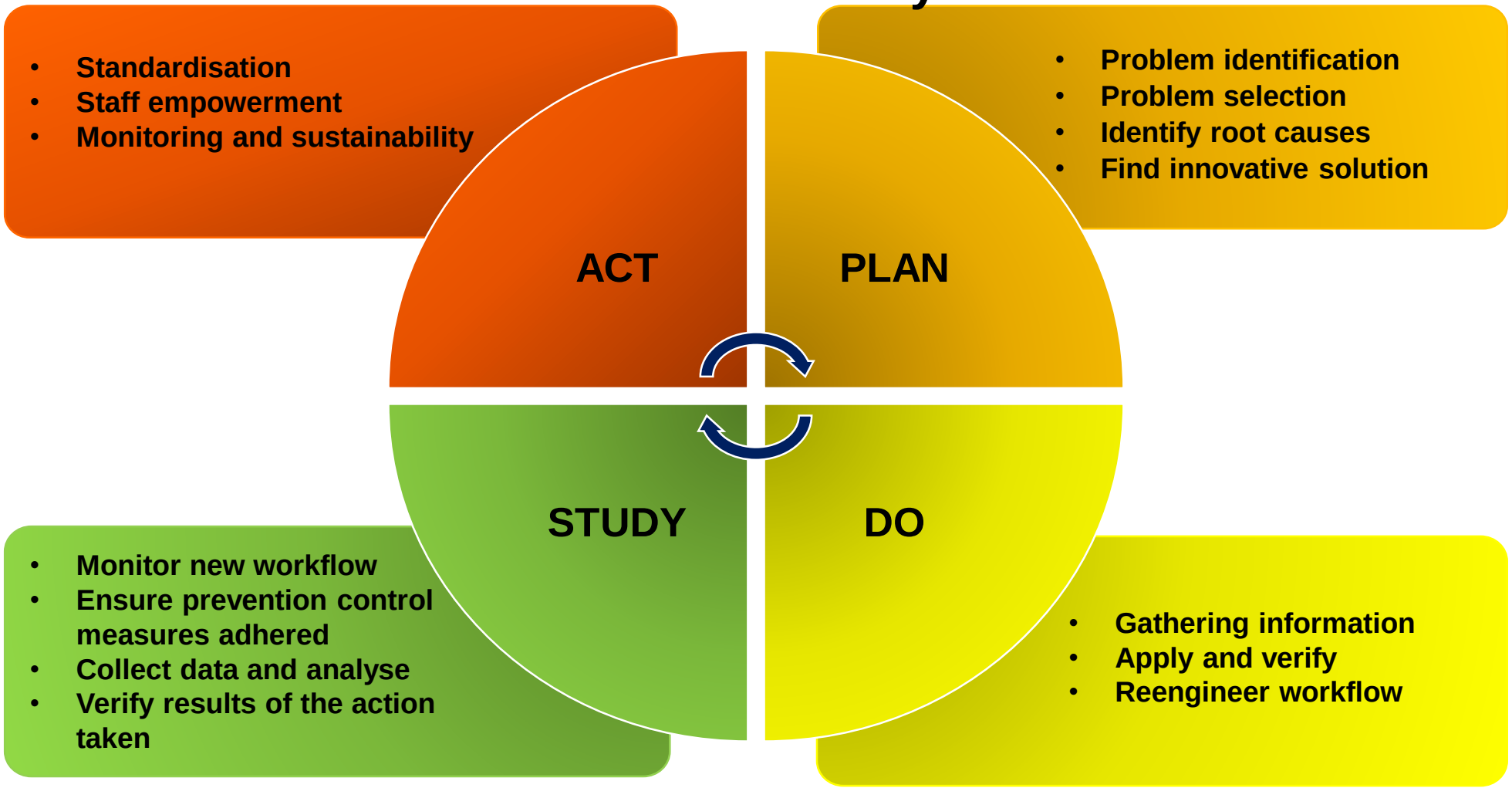
- Create sustainable patient safety improvements

Step 5: Implement teamwork and communication

- Achieve organisational and national patient safety goals

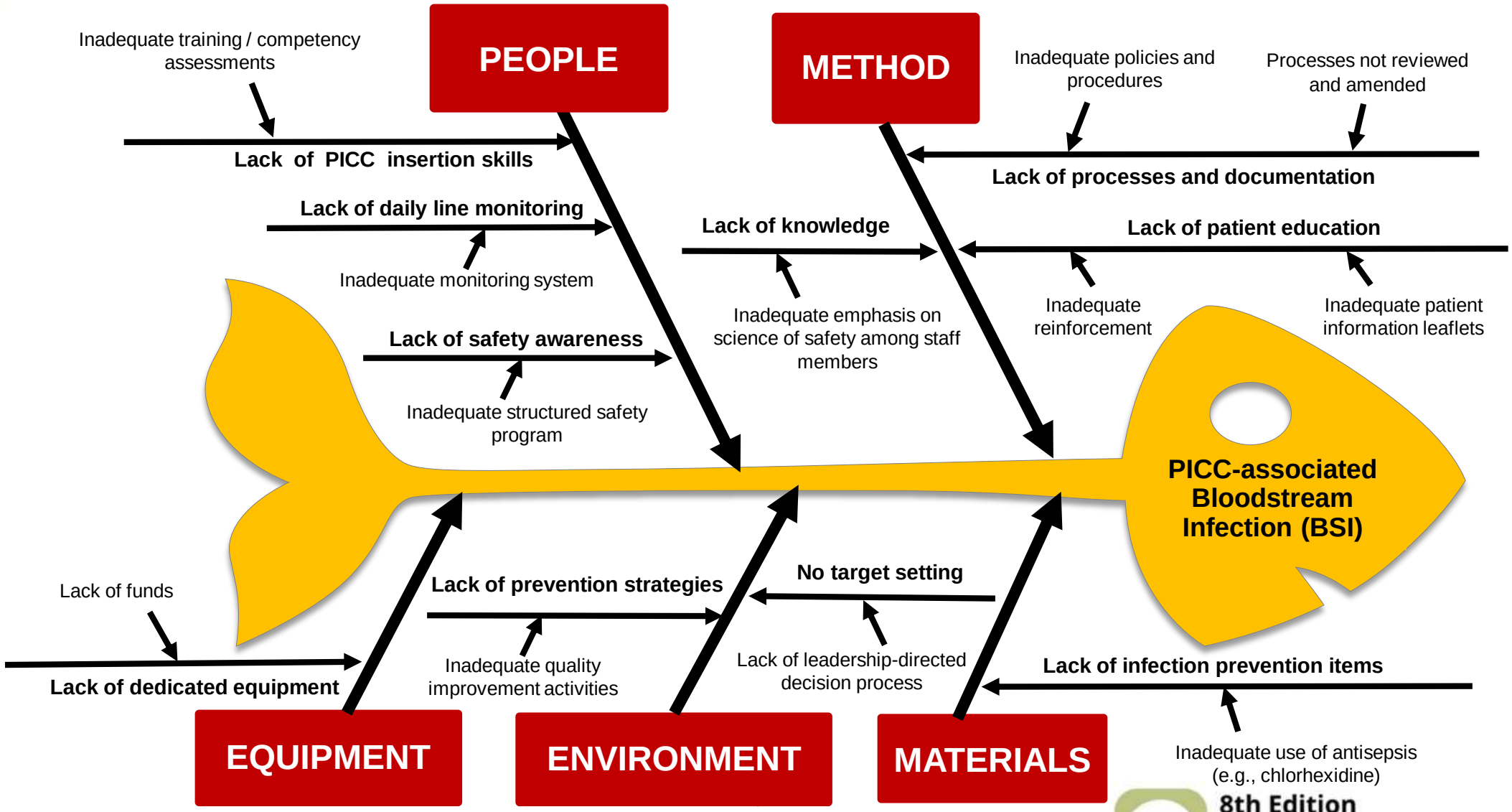
METHODOLOGY

PDSA Process Analysis



METHODOLOGY

Ishikawa fishbone diagram



METHODOLOGY

Potential Root Cause and Their Solutions

Categories of possible root causes	Root Cause	Solution or Intervention	Verification by CUSP team
Method	Lack of processes and documentation	Review and prepare new standard operating procedures	Accepted
	Lack of knowledge and awareness	Provide education on science of safety	Accepted
People	Lack of PICC insertion skills	Conduct coaching sessions for personnel	Accepted
	Lack of monitoring system	Establish daily monitoring system, initiate documentation, and perform data analysis	Accepted
Equipment	Lack of US unit for interventional radiology suite	Procure additional US machine	*Rejected
Environment	Lack of infection prevention strategies	Conduct quality improvement activities	Accepted
	No target setting to reduce CLABSI	Carry out leadership buy-in and set target to reduce incidence	Accepted
Materials	Lack of infection prevention items	Enforce chlorhexidine bath and skin antisepsis	Accepted

Note. - PICC = peripherally inserted central catheters, US = Ultrasound, CUSP = comprehensive unit-based safety program, CLABSI = central line-associated bloodstream infections.

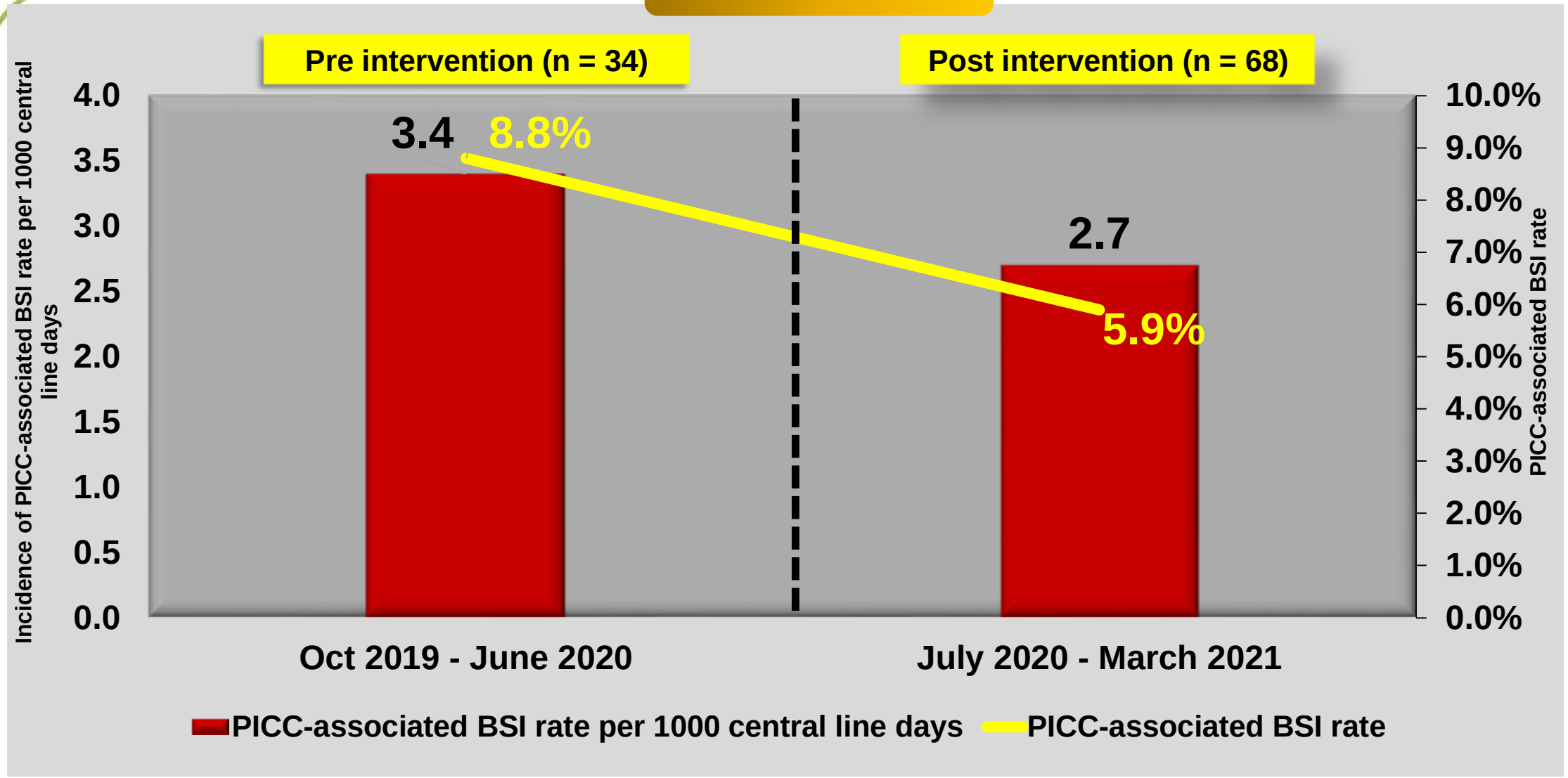
*Rejected = due to financial constraints

Processes and activities carried out before and after CUSP intervention

Timing	Activity	Before Intervention	After intervention
Before procedure	**Implementation of chlorhexidine bath**	No	**Yes**
Before procedure	IR checklist	Yes	Yes*
During procedure	Hand hygiene	Yes	Yes†
During procedure	Maximal sterile barrier precautions	Yes	Yes†
During procedure	Chlorhexidine skin antisepsis	Yes	Yes†
During procedure	**Dressing standardization**	No	**Yes**
After procedure	**Patient education using PILs**	No	**Yes**
After procedure	**Safety rounds by IR team**	No	**Yes**
After procedure	Daily monitoring of line and dressing	Yes	Yes‡

Note. - IR = interventional radiology, PIL = patient information leaflet.
* New IR checklist
† Documented in new IR checklist
‡ Documented in electronic medical records

RESULTS


Pre intervention (n = 34)
Post intervention (n = 68)
Incidence of PICC-associated BSI rate per 1000 central line days
PICC-associated BSI rate
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
10.0%
9.0%
8.0%
7.0%
6.0%
5.0%
4.0%
3.0%
2.0%
1.0%
0.0%
3.4
8.8%
2.7
5.9%
Oct 2019 - June 2020
July 2020 - March 2021
PICC-associated BSI rate per 1000 central line days
PICC-associated BSI rate

CONCLUSION

- CUSP intervention was effectively implemented, and **reduced BSI associated with PICC-lines** inserted at a medical imaging department of a teaching hospital.

- Such interventions should be considered in other medical imaging departments, as it involves **minimal cost** with potentially **large impact** on PICC-associated BSI which are potentially **life-threatening.**

- It is believed that the results of this quality improvement study will **improve healthcare and safety practices**, which will be manifested in measurably **better outcomes** for patients.

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