COMPREHENSIVE UNIT-BASED SAFETY PROGRAM FOR THE PREVENTION OF CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION

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Introduction

- Central line-associated bloodstream infection (CLABSI) → **most common** and **fatal HCAI** with the use of **peripherally inserted central catheters (PICCs)**.[1-3]

- The growing use of PICCs (long term medication and treatment) has led to ↑ **risk of CLABSIs.**

- UMMC → **11.5%** developed **PICC-associated CLABSI** in a surgical ward resulting in an infection rate of **4.4 per 1000** central line days (2019).

- A Comprehensive Unit-based Safety Program (CUSP) is a quality improvement (QI) measure developed by the **Johns Hopkins University**, United States (U.S.)[4] to **reduce the incidence of CLABSI.**

- CUSP implementation at 350 institutions in 22 states in U.S. resulted in a **35% reduction** in CLABSI incidence, reporting zero or near-zero rates.[5]
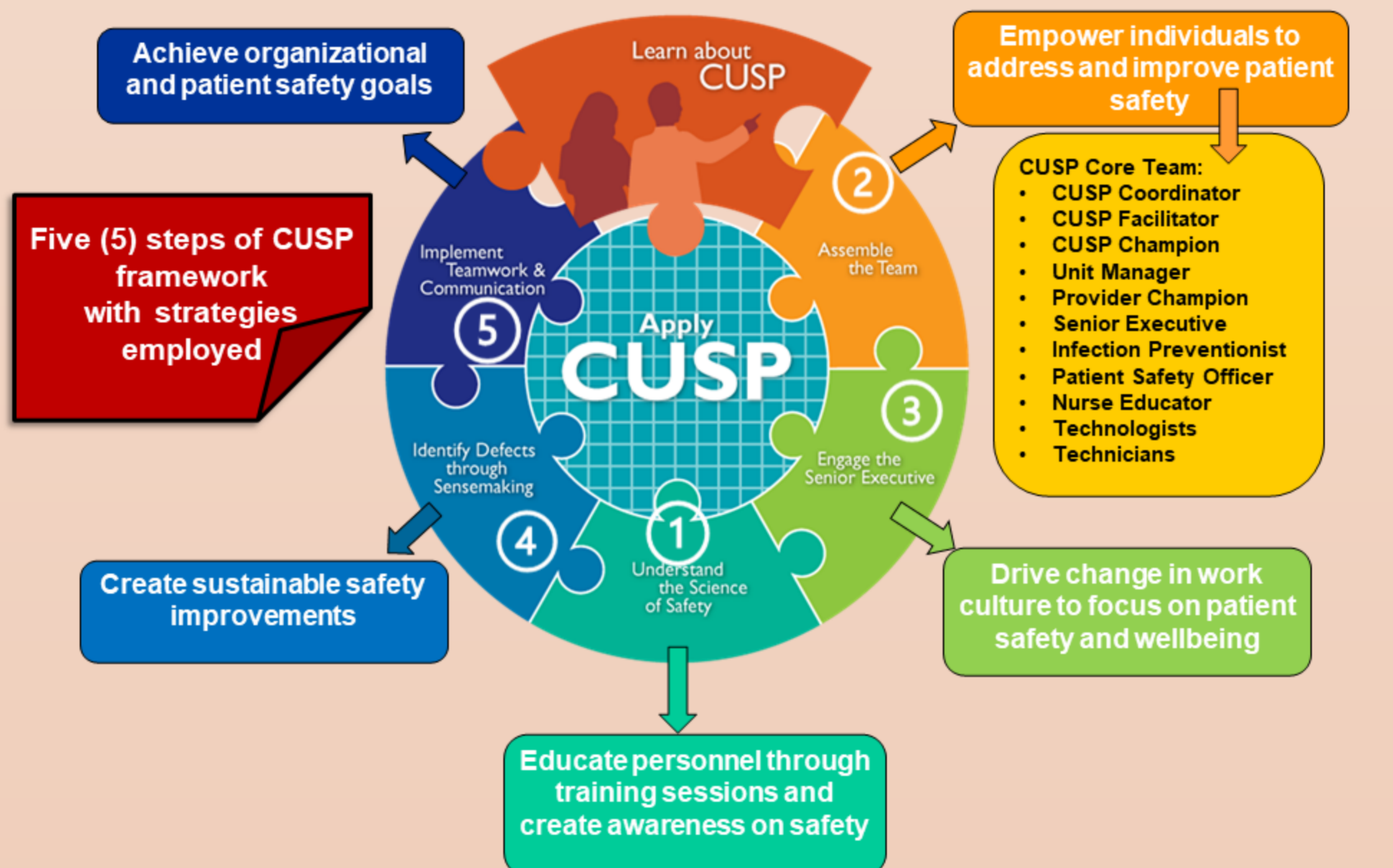
↑ **Benchmark**

Objective

- To evaluate the implementation of a **Comprehensive Unit-based Safety Program (CUSP)** for the reduction of PICC-associated CLABSI.

Approved by
Medical Research Ethics Committee, UMMC
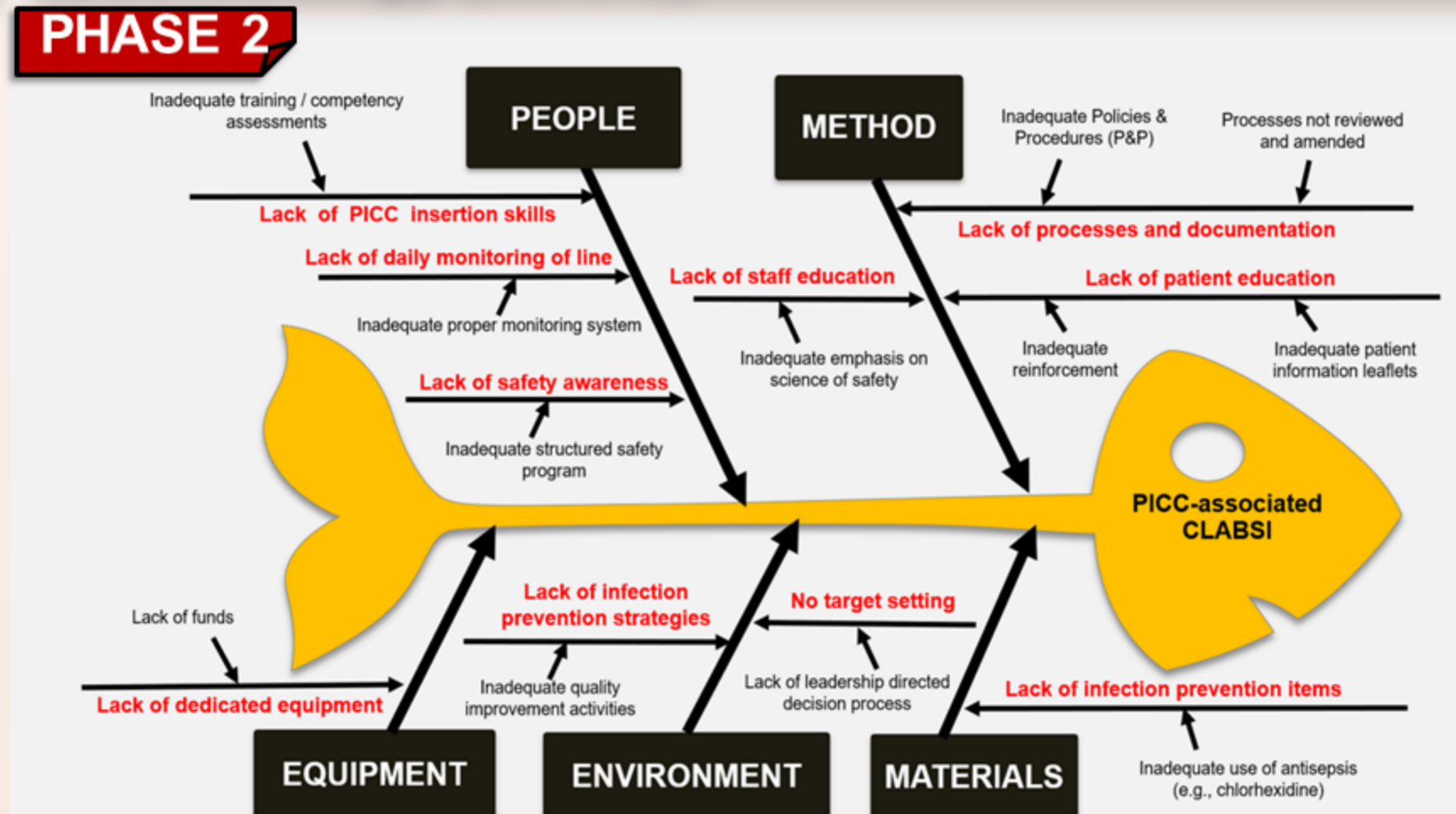(MREC ID NO: 20181022-6767)

Methodology

CUSP model	Pre-CUSP	Implementing CUSP	Sustaining CUSP	
Phase	Phase 1 (baseline)	Phase 2	Phase 3a	Phase 3b
Study Duration	October 2019 to June 2020	July 2020 to March 2021	April 2021 to March 2022	April 2022 to December 2022
Data Analysis	$CLABSI\ rate = \frac{CLABSI\ identified}{Central\ line\ days} \times 1000$ $DUR = \frac{Number\ of\ device\ days}{Number\ of\ patient\ days}$ • Quarterly rates for each CLABSI → **device days** and **patient days** • The rate ratios for each phase were compared with the **baseline period**			
Inclusion criteria	• PICC insertions referred to the medical imaging department from a **surgical ward in UMMC** • **Primary** CLABSI [*Bloodstream Infection (BSI) in a patient that had a central line within 48 hours period before the development of BSI and is not related to an infection at another site]*[1]			
Exclusion criteria	• **Secondary** CLABSI (develop from a detectable area of infection as the source of the bacteremia)[1]			

Achieve organizational and patient safety goals
Learn about CUSP
Empower individuals to address and improve patient safety

CUSP Core Team:
- CUSP Coordinator
- CUSP Facilitator
- CUSP Champion
- Unit Manager
- Provider Champion
- Senior Executive
- Infection Preventionist
- Patient Safety Officer
- Nurse Educator
- Technologists
- Technicians

Five (5) steps of CUSP framework with strategies employed

Apply CUSP

Implement Teamwork & Communication
Assemble the Team
Identify Defects through Sensemaking
Engage the Senior Executive
Understand the Science of Safety

Create sustainable safety improvements
Drive change in work culture to focus on patient safety and wellbeing
Educate personnel through training sessions and create awareness on safety

PHASE 1

- Standardization
- Staff empowerment
- Monitoring and sustainability
- Problem identification
- Problem selection
- Identify root causes
- Find innovative solution

ACT | PLAN
STUDY | DO

- Monitor new workflow
- Ensure prevention control measures adhered
- Collect data and analyze
- Verify results of the action taken

- Gathering information
- Apply and verify
- Reengineer workflow

Acknowledgements

Methodology (cont'd)

PHASE 2

The Ishikawa fish bone diagram was utilized to identify stages of PICC placement process which could contribute to the development of CLABSI

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

PHASE 3

EDUCATION | TRAINING AND DEMONSTRATION | EDUCATION MATERIAL

Education session on *Silver Alginate (SA) dressing | Dressing demonstration in the ward | QR code to the video

Activities on Silver Alginate dressing: **education, training and demonstration for standardisation**
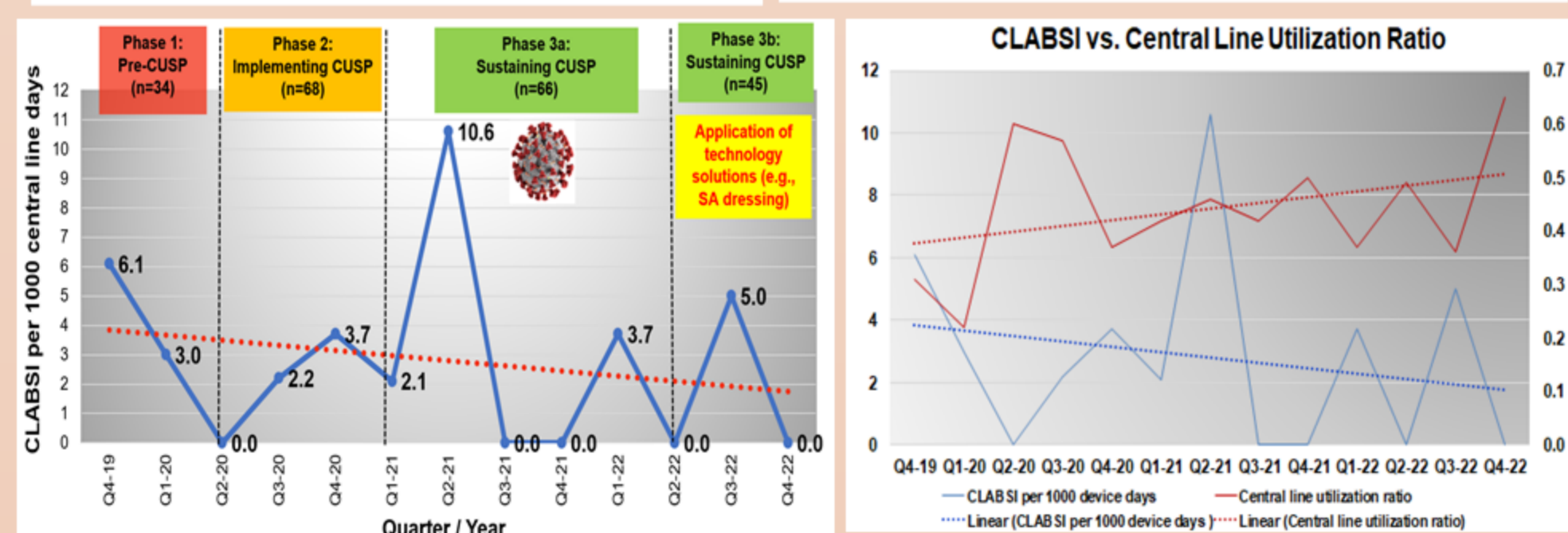
*Silver Alginate Catheter Dressing is a sterile dressing of **2 layers**: an absorbent of wound exudate and an ionic silver alginate with **broad spectrum antimicrobial effectiveness** to prevent **contamination from external bacteria***

Results

Demographic variables

Gender	N (%)
Male	128 (60)
Female	85 (40)

PICC	N (%)
TPN*	86 (40)
ABX[¥]	127 (60)

CLABSI rates and rate ratio per device days and patient days

Phase	n Infections	Device days	CLABSI rate per 1000 device days	Rate ratio per device days (vs baseline) (95% CI)	Patient days	CLABSI rate per 1000 patient days	Rate ratio per patient days (vs baseline) (95% CI)	Device utilization ratio (dev days/pt days)
1	34 3	903	3.3	nil	3030	1	nil	0.3
2	68 4	1480	2.7	0.82 (0.47, 1.40) P=0.443	3421	1.2	1.17 (0.89, 1.54) P=0.249	0.43
3a	66 5	1114	4.5	1.36 (0.85, 2.21) P=0.177	2570	1.9	1.95 (1.53, 2.51) P<0.001	0.43
3b	45 2	1107	1.8	0.55 (0.29, 0.99) P=0.037	2329	0.9	0.86 (0.64, 1.16) P=0.306	0.48

n, number of patients; CI, confidence interval; CLABSI, central line-associated bloodstream infection

Note. Participants average age were **60.6 years old (SD ±15.46)**
N, number of patients
*TPN, Total Parenteral Nutrition
[¥]ABX, Antibiotics

- Over a 3-year period, the DUR increased by **60%**, however, the CLABSI rates decreased **45%** showing a **declining trendline!**

Phase 1: Pre-CUSP (n=34) | Phase 2: Implementing CUSP (n=68) | Phase 3a: Sustaining CUSP (n=66) | Phase 3b: Sustaining CUSP (n=45)

Application of technology solutions (e.g., SA dressing)

CLABSI vs. Central Line Utilization Ratio

Conclusion

- CUSP implementation with appropriate tools and steps has successfully **reduced PICC-associated CLABSI** in a medical imaging department and is **sustainable.**

- The **technical intervention** further led to reduction with **sustainable improvements**

- Only **minimal costs** required for potentially **large impact** on PICC-associated BSI, which are **life-threatening!**

CLABSI rates decreased to 45%

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