



Blood Culture QI Project in the NICU



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Background

Blood cultures are the gold standard test for detecting blood stream infections. Blood culture contamination (and negative blood cultures) are problematic as they result in:

- Diagnostic uncertainty
- Inappropriate or prolonged antimicrobial therapy
- Increased morbidity, mortality, and extended hospital stay
- Increased cost burden to the health care system.

Neonatal blood culture contamination rates vary widely with coagulase negative staphylococci (CoNS) being the most commonly isolated contaminant. Baseline data collection in 2020 identified 42 CoNS-positive cultures (6.2%), of which (n=29) 70% were contaminated.

SMART Aim

To reduce the percentage of CoNS blood cultures in the NICU by 20% (from 70% to 50%) through the implementation of a blood culture collection policy and provision of nursing education by March 2024.

Methodology

Study Design: Prospective longitudinal Quality Improvement (QI) Study

Study Population: Infants admitted to the NICU requiring a blood culture for the investigation of sepsis during the study protocol

Main interventions: (1) Standardized Blood Culture Collection Policy (2) Standardized Weight-based Blood Culture Volumes (3) Standardization of Nursing Documentation (4) EPIC OrderSet Revisions (5) Education of Health Care Providers

Outcome measure: % contaminant CoNS blood cultures

Process measure: Compliance to nursing policy elements: (1) volume, (2) collection technique, (3) documentation

Balancing measure: Change in nursing workload post implementation

PDSA Cycle and Change Plan

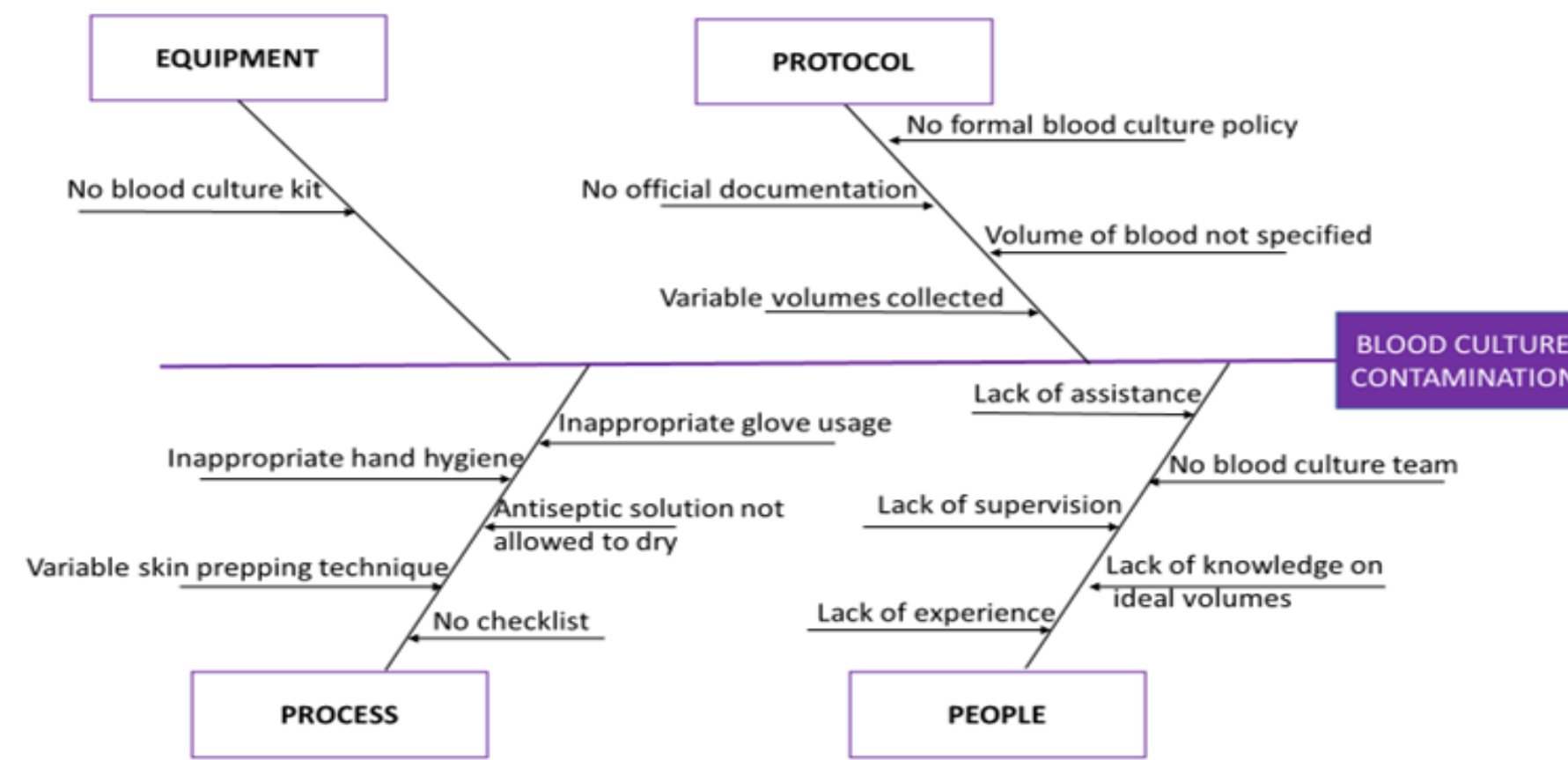
PLAN: Multidisciplinary working group formed to standardize blood culture collection policy (including standardization of weight-based blood volume, blood culture collection technique, and nursing documentation)

DO: New blood culture policy including weight based volumes and standardized technique created, policy approved, health care provider education, and policy implementation in March 2023. Nursing SmartPhrase created for documentation.

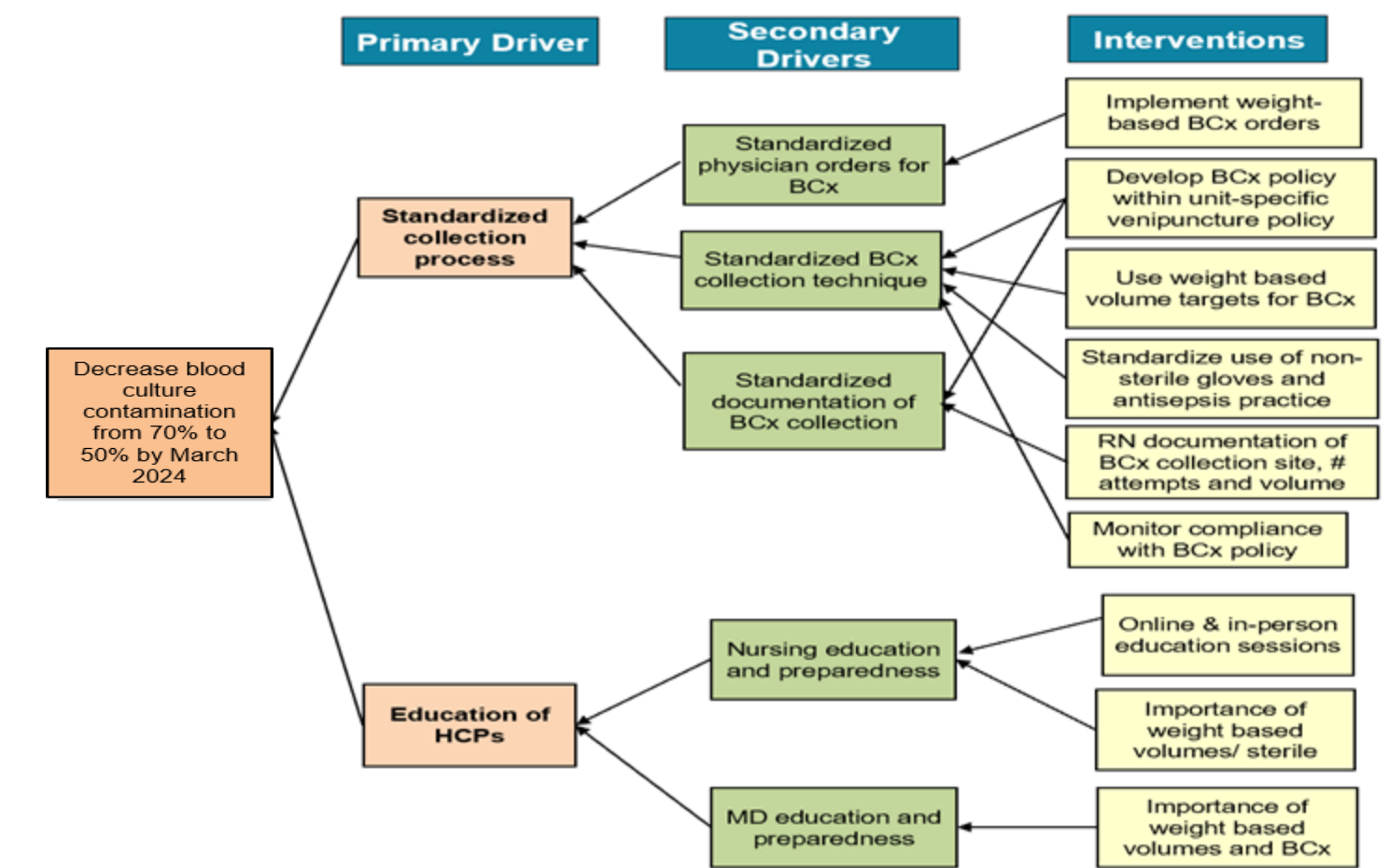
ACT: Identified education barriers, clinical impact, challenges/changes and suggestions moving forward. Challenges included technological change during quality improvement project. Changes were made, including EPIC OrderSet, SmartPhrase revision, and staff re-education.

STUDY: Data collection revealed 79.5-89.2% adherence to adequate volume, 88-100% compliance with technique, and 62.9-83% adherence to nursing documentation. Balancing measures including the Nursing Task Load Index were implemented to gauge feedback from key stakeholders.

Fishbone Diagram



Driver Diagram



Policy

Blood Culture Policy Checklist

- ✓ Hand hygiene/non-sterile gloves
- ✓ Sterile disposable towel on bed
- ✓ Cleanse skin for 15 secs, dry for 60 secs
- ✓ Obtain weight-based blood volume (see chart)
- ✓ Cleanse rubber top for 15 secs, dry for 30-60 secs
- ✓ Change blunt tip needle/decant BC first (only decant once); change blunt tip needle between aerobic/anaerobic
- ✓ Use 10ml syringe for larger infants
- ✓ Document procedure .NICUBLOODCULTURE.
- ✓ Outline any steps missed as above in note
- ✓ Enter blood volume on EPIC when scanning sample

Recommended Blood Culture Volumes

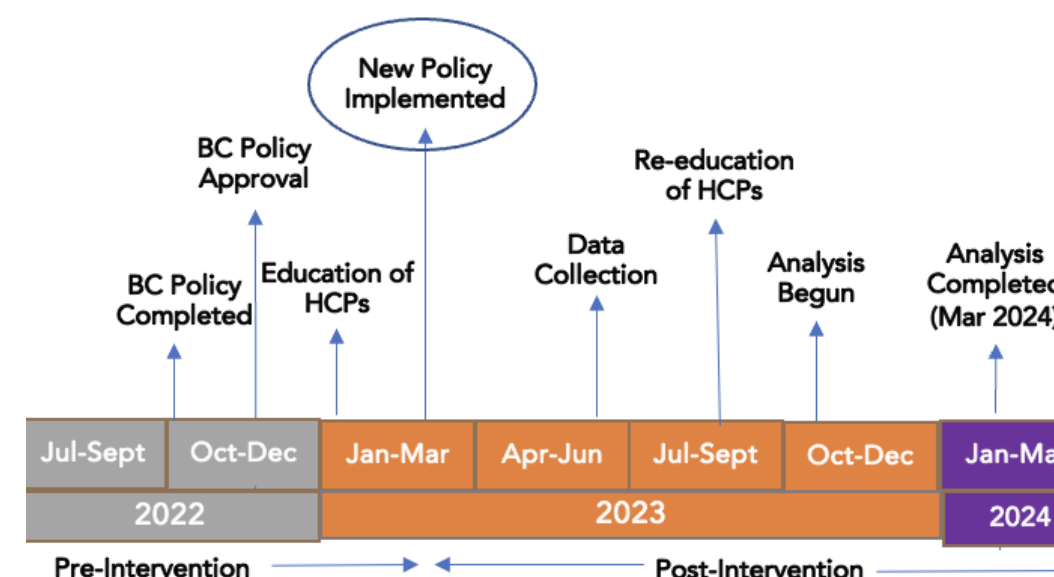
BACT/ALERT PF PLUS aerobic bottle (Yellow Top)
Minimum volume: 1ml
Maximum volume: 4mls

Weight (kg)	Total Blood Volume (ml)
<1.0kg	1.0
1.0-2.0kg	1.5
2.1-3.0kg	2.0
3.1-4.0kg	3.0
>4.1kg	4.0

If anaerobic and aerobic cultures are required, please draw aerobic culture first and use the following weight based blood volume chart:

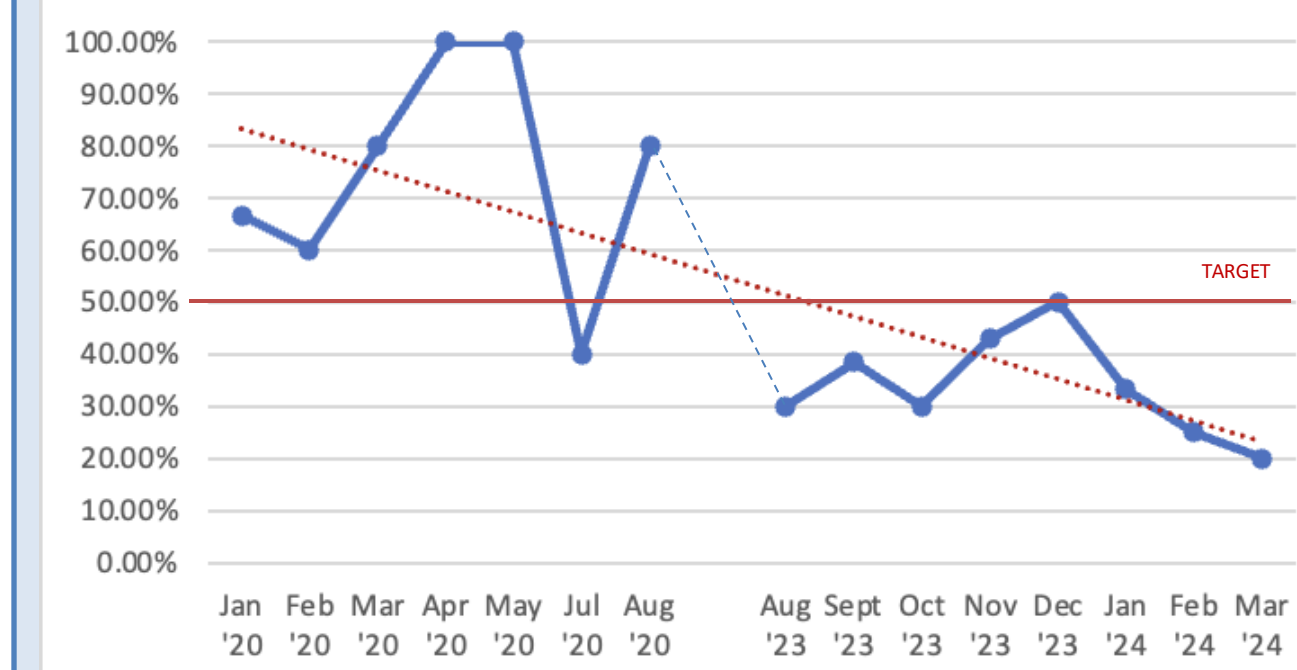
Weight (kg)	Total blood volume (ml)	Aerobic bottle (Yellow top)	Anaerobic bottle (Orange top)
<1.0kg	1.0	0.5ml	0.5ml
1.0-2.0kg	1.5	0.75ml	0.75ml
2.1-3.0kg	2.0	1.0ml	1.0ml
3.1-4.0kg	3.0	1.5ml	1.5ml
>4.1kg	4.0	2.0ml	2.0ml

Project Timeline



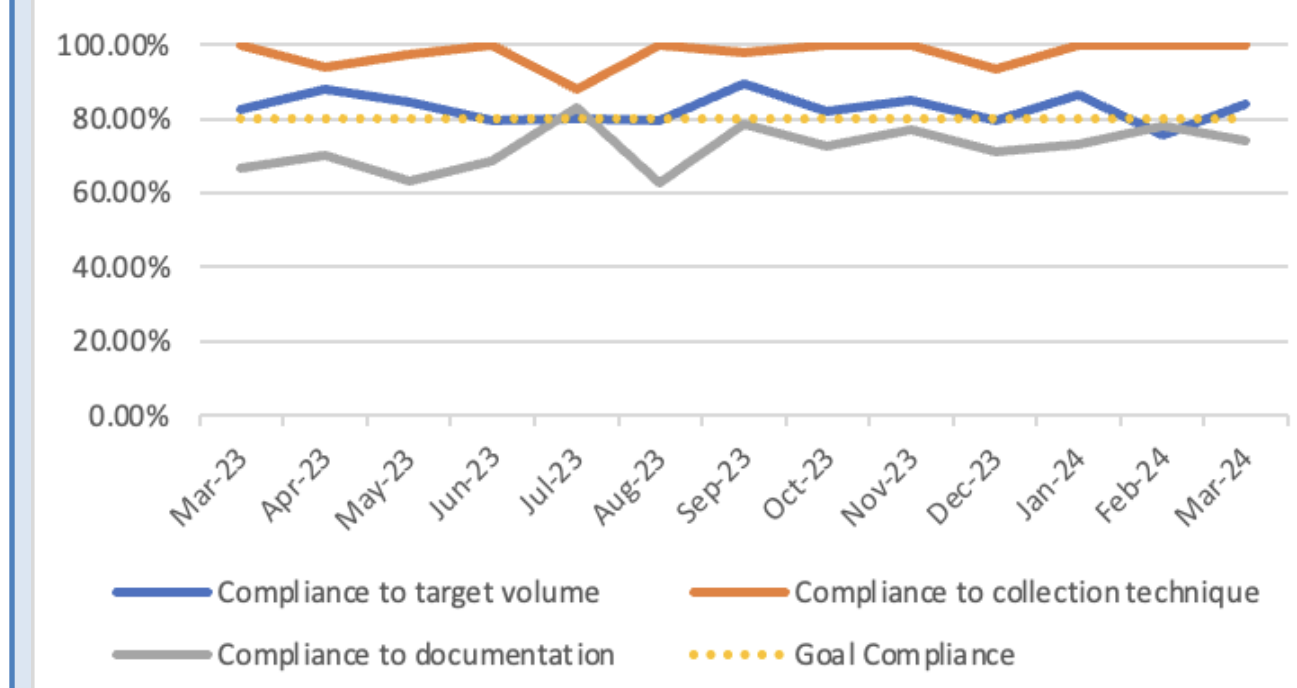
Data/Results

Outcome Measure: CoNS Contaminant Rate



As per above analysis, we were able to exceed our goal and decrease the rate by 31.7% (from 66.7% to 35%).

Process Measure: Compliance to Nursing Policy

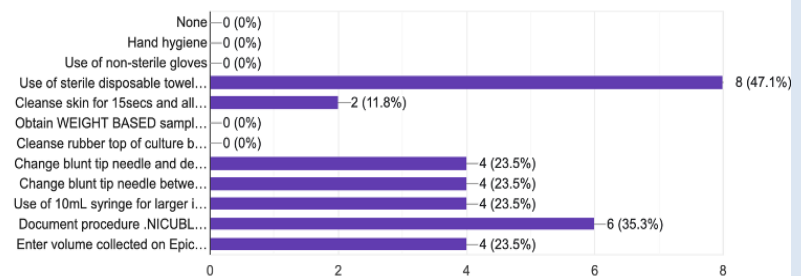


Balancing Measure: Nursing Task Load Index

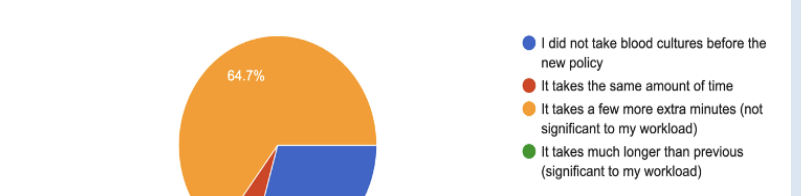
Which of the following steps are you aware of or have been educated on regarding the blood culture policy? Please select all that apply



Which step(s) of the blood culture policy are most easily forgotten?



Compared to previous blood culture collections (with no policy i.e. before March 2023), how much longer does it take you to complete a blood culture now with the addition of the new policy?



Survey circulated to blood culture collection nurses outlining understanding of policy and highlighting challenges. Of note, the addition of the policy did not add significant time to workload.

Challenges

Challenges include technological changes with the introduction of EPIC documentation. Innovative solutions included EPIC SmartPhrases for nursing documentation and OrderSets for medical staff. Other challenges include short staffing and lack of non-clinical work support, inhibiting regular staff re-education and knowledge dissemination.

Lessons Learned / Next Stage/ Plan

LESSONS LEARNED: Protocol Consistency
Necessity for standardization protocols across all stages of blood culture (collection, volumes, documentation)

LESSONS LEARNED: Technological Integration
Use of automated systems and advanced technologies (EPIC SmartPhrase) significantly improved efficiency

LESSONS LEARNED: Collaboration Across Teams
Effective communication and collaboration between NICU, infectious diseases, staff, and project champions

LESSONS LEARNED: Data-Driven Decisions
Leveraging data analytics has proven invaluable for identifying areas of improvement and streamlining workflows

NEXT STAGE: Continuous Education Program
Standardized training program implementation to ensure individual protocol, precision, and impact on care

NEXT STAGE: Ongoing Evaluation&Feedback
Continuous monitoring of standardization efforts through audits, metrics, and feedback allow identification of gaps

PLAN: Collaboration with External Experts
Knowledge dissemination at global level through presentation at conferences to ensure practices align with international bodies