From Risk to Resilience: Leveraging Simulation to Prevent Hospital-Acquired Conditions

Nationwide Children's Hospital

Simulation and Outreach Education Program

Center for Clinical Excellence

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Meet the Team

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Conflicts of Interest

We have no perceived conflicts of interest that relate to this presentation.

Objectives

1

Understand how simulation can be used as a diagnostic methodology to assess and understand the root causes of Hospital-Acquired Conditions (HACs).

2

Demonstrate how simulation-based education improves and maintains adherence to best practices and institutional policies that help prevent Hospital-Acquired Conditions (HACs).

3

Present a scalable strategy for expanding simulation-based interventions across hospital units to reduce Hospital-Acquired Conditions (HACs) system-wide.

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Hospital-Acquired Conditions (HACs)

Preventable • System Driven • High Impact

CLABSI
Central Line Infection
Line access & maintenance

CAUTI
Urinary Catheter Infection
Prolonged use

UE
Unplanned Extubations
Communication & workflow

Why It Matters

Patient harm & increase LOS

Driven by system gaps (not individuals)

Opportunity for simulation-based improvement

What is Simulation?

- A technique that creates a situation or environment to allow persons to experience a representation of a real event.
- Four Main Purposes
  - Education
  - Assessment
  - Research
  - Health System Integration

Lioce L. (Ed.), Lopreiato J. (Founding Ed.), Anderson M., Deutsch, E.S., Downing D., Robertson J.M., Diaz D.A., and Spain A.E. (Assoc. Eds.), and the Terminology and Concepts Working Group (2024), Healthcare Simulation Dictionary–Third Edition. Rockville, MD: Agency for Healthcare Research and Quality; January 2025. AHRQ Publication No. 24-0077. DOI: https://www.ahrq.gov/patient-safety/resources/simulation/terms.html

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Why Simulation? Driving HAC Prevention Through Experience

Learning from Experience: Key Insights

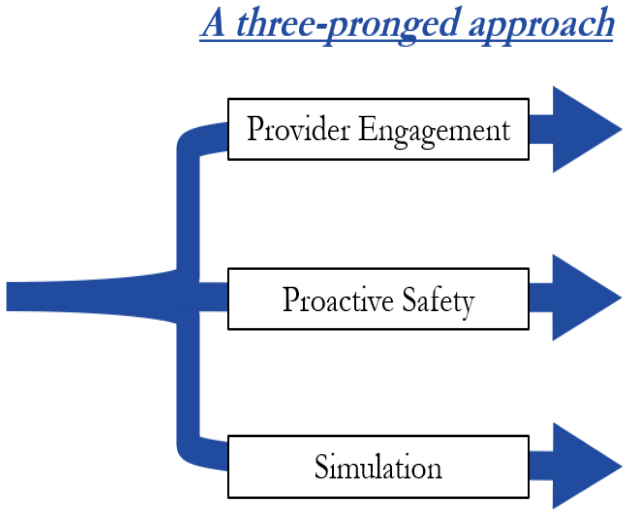
- HAC Champions
- Increased provider engagement
- Opportunities for risk mitigation through Proactive Safety
- **Simulation is a strong and growing component of HAC**

Why Simulation Works

- "Perfect" practice makes perfect
- Learn faster, be safer
- Knowledge Retention

Our Approach: A Three-Pronged Strategy

- Provider Engagement
- Proactive Safety
- Simulation



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What does simulation look like?

Task Trainers

Role-play or standardized patients

Mannequin-based (low or high fidelity)

Virtual reality

Table-top or scenario based

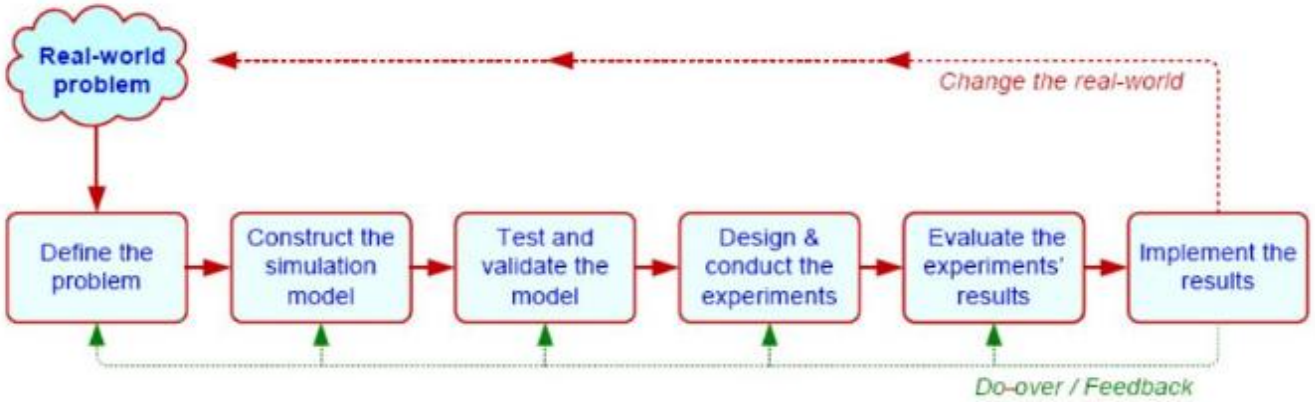
Where does simulation occur?

Simulation lab

In-situ

Simulation Methodology

- Model real system and conduct repetitive experiments.
- Steps:
  1. Define problem
  2. Construct simulation model
  3. Test and validate model
  4. Design experiments
  5. Conduct experiments
  6. Evaluate results
  7. Implement solution

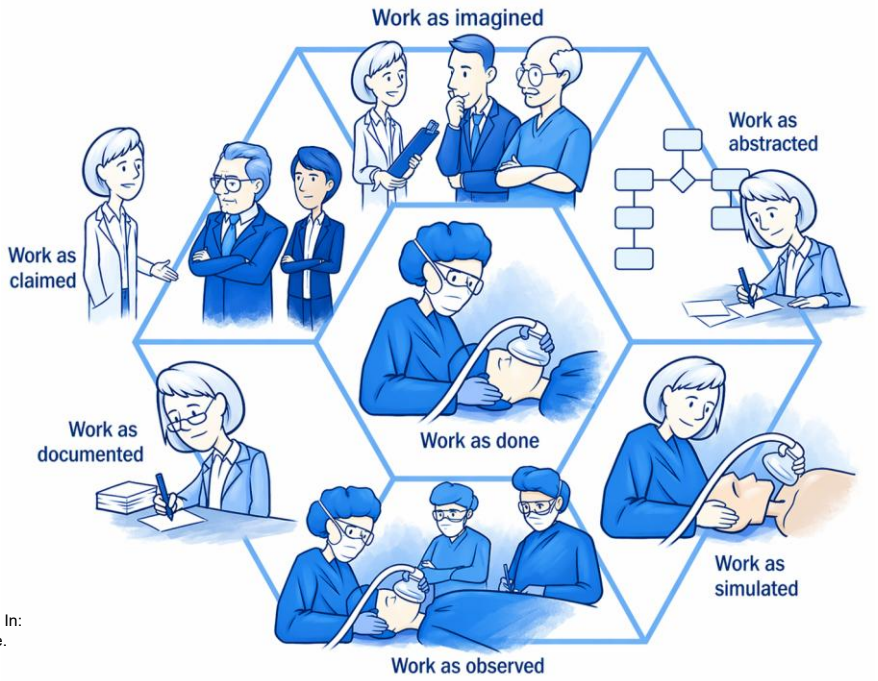


Banks, J., Carson, J. S., Nelson, B. L., & Nicol, D. M. Discrete-Event System Simulation (5th ed.). Pearson, 2010.

Simulation as a Diagnostic Tool

System *as imagined* vs. System *as FOUND*

- Utilizing simulation to identify clinical deviations in everyday practice to help decrease HAC rates
- Learners help unearth knowledge and educational gaps, process and protocol deficiencies, and frontline obstacles via simulation



Hollnagel E. Prologue: Why do our expectations of how work *should* be done never correspond exactly to how work *is* done? In: Braithwaite J, Wears RL, Hollnagel E, editors. Resilient Health Care. Vol. 3. Reconciling work-as-imagined and work-as-done. Boca Raton (FL): CRC Press, Taylor & Francis Group; 2017. p. xvii-xxv.

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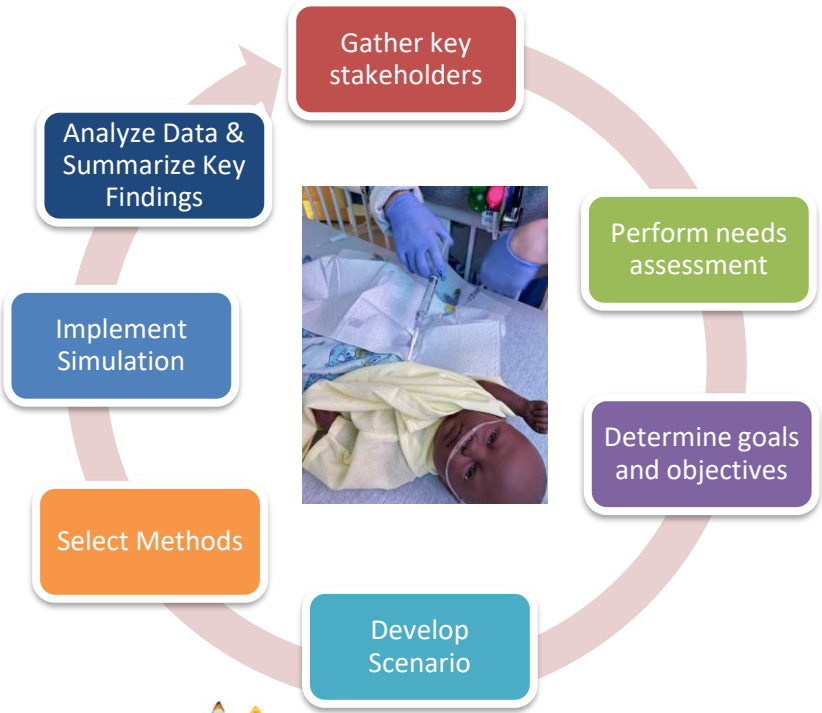
Diagnostic Simulation Process



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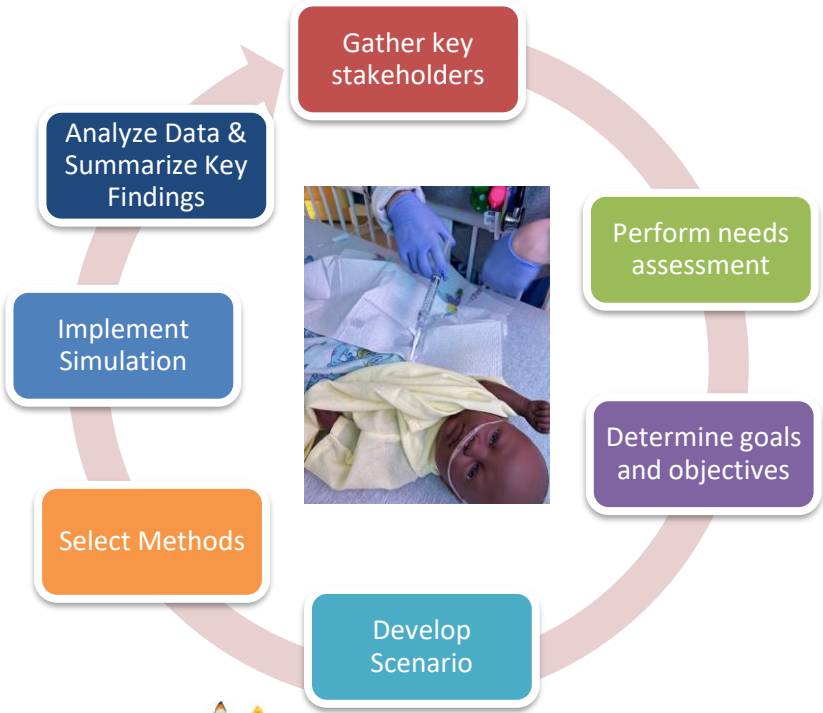

- Medical & Nursing Directors
- Unit Management
- Educators
- Quality and Data Analysts

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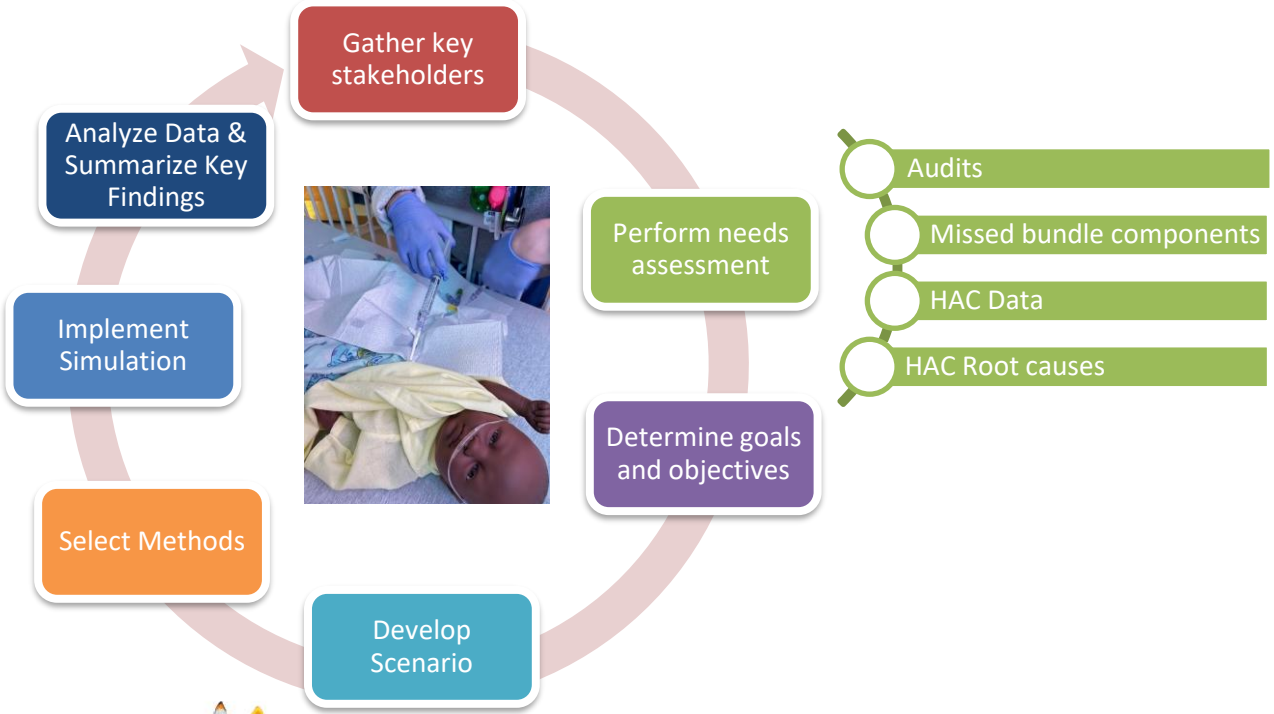
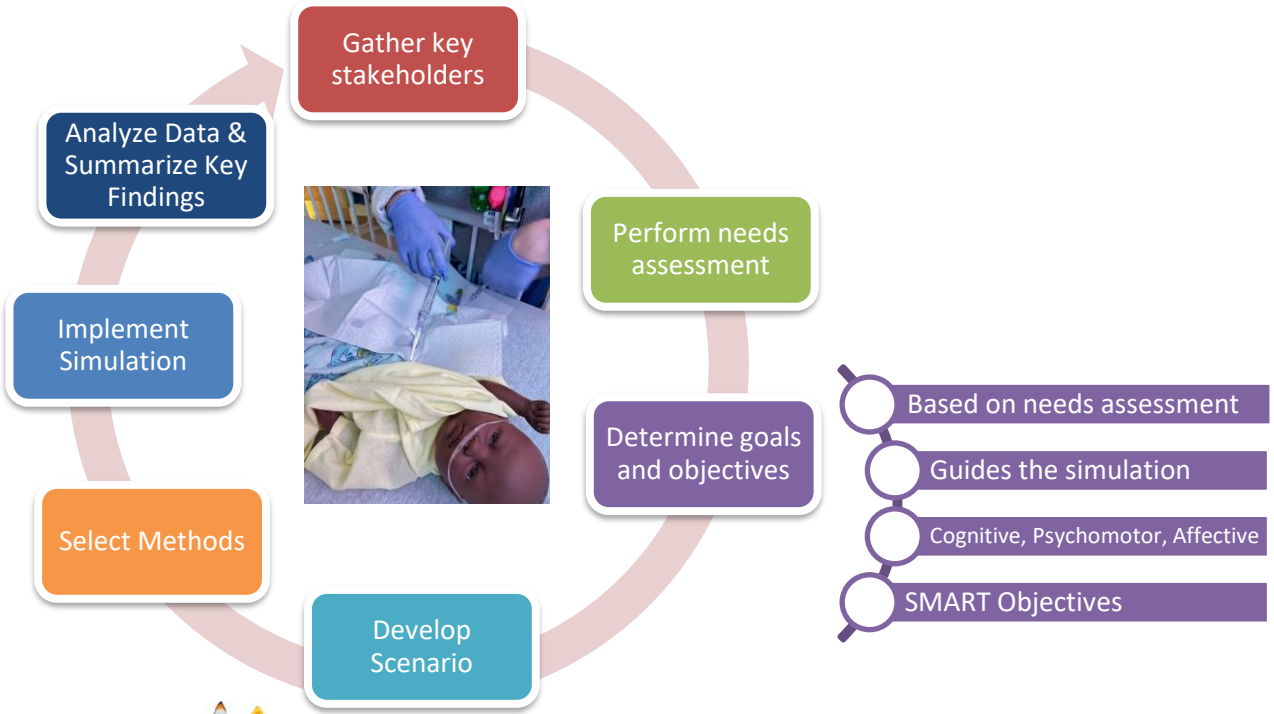


Diagnostic Simulation Process



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Diagnostic Simulation Process

- Gather key stakeholders
- Perform needs assessment
- Determine goals and objectives
  - Driven by objectives
  - Specific to clinical area
  - Include policy and procedure
- Develop Scenario
- Select Methods
- Implement Simulation
- Analyze Data & Summarize Key Findings

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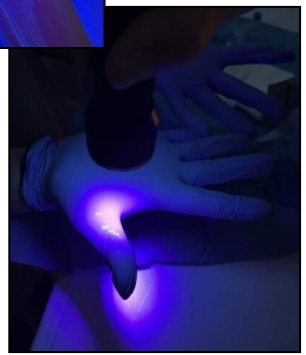
- Low-fidelity mannequins
- Task trainers
- Distractors
- Glo Germ™
- Insitu simulations



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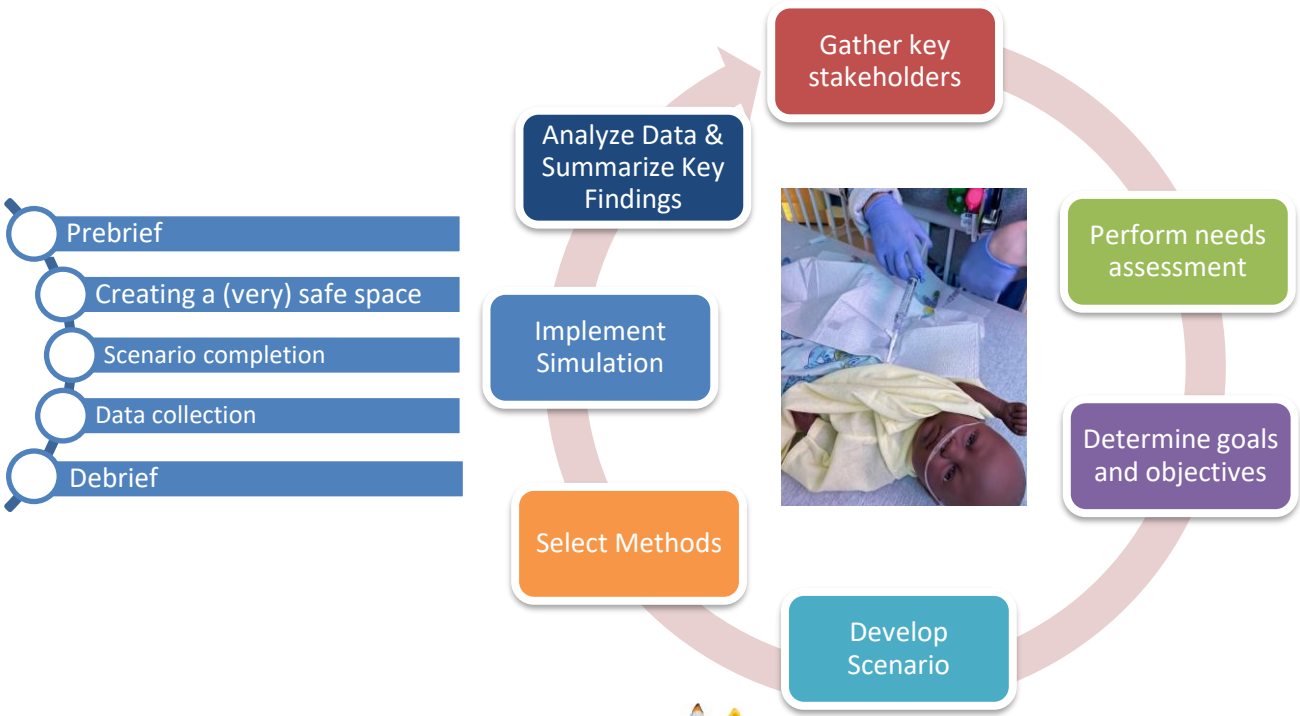

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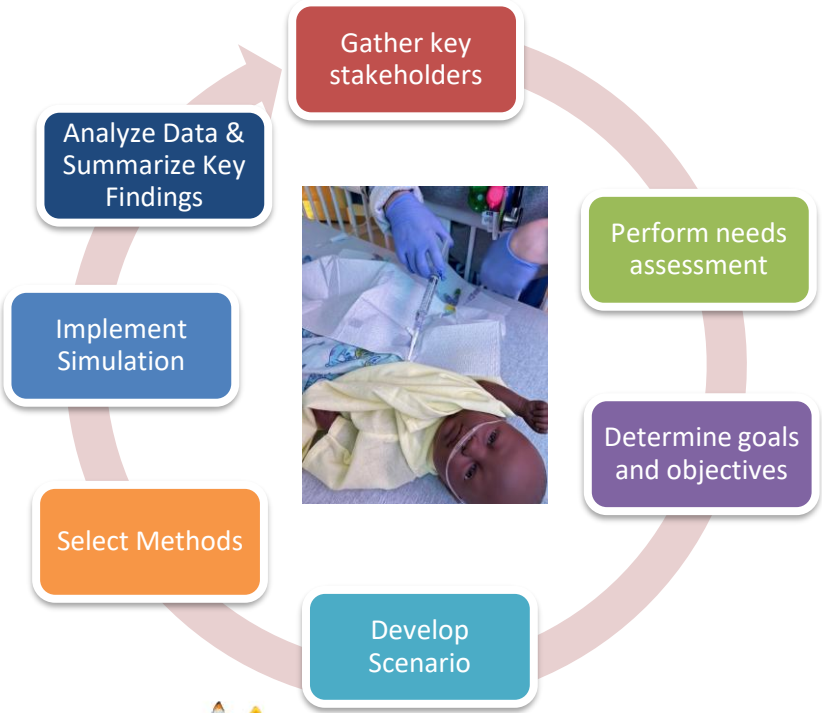
Diagnostic Simulation Process

- Analyze objective data
- Analyze subjective data
- Summarize key findings
- Present to key stakeholders
- Guide future education



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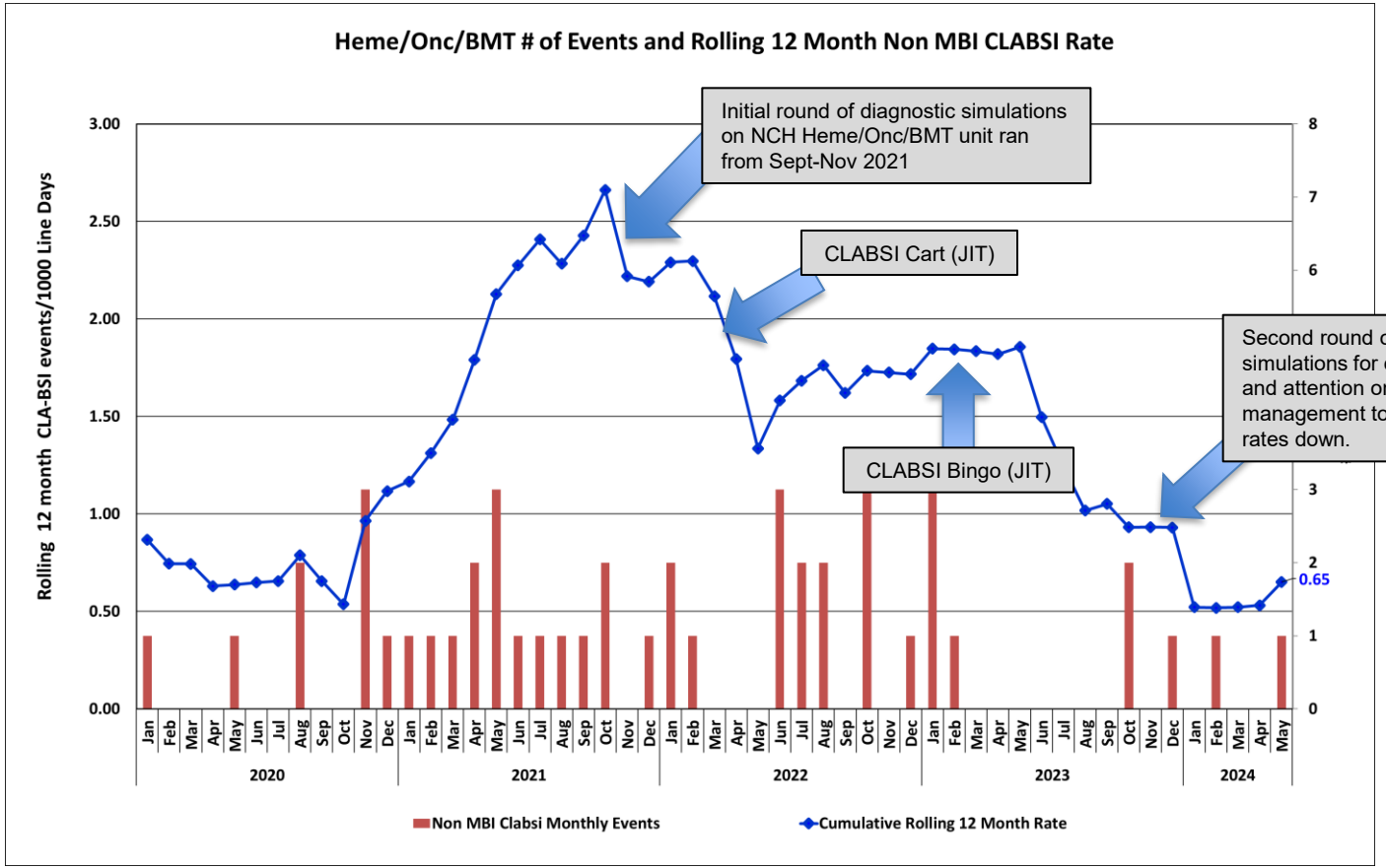
Potential Barriers

- Leadership and unit buy-in
- Mandatory vs. optional participation
- Nursing and staff shortages
- Increased patient acuity
- Reaching night shift staff

Case Study:
CLABSI Diagnostic Simulation Key Findings

2021	2023
• 80% of staff performed a controlled dressing	• 0% of staff performed a controlled dressing • 100% of staff recognized non-occlusive, reinforced dressing and verbalized dressing change needed
• 50% of staff would not change a dressing if they can wipe away visible spill or stain from window	• Not assessed during this round of simulations
• Uncertainty regarding Chloraprep scrub time	• 100% of staff scrubbed with Chloraprep and Prevantics for correct amount of time per policy
• Central line dressings with tunneling can be reinforced if tunneling does not reach the window	• Not assessed during this round of simulations
• Not assessed during this round of simulations	• Approximately 60% of the learner population did not utilize a sterile towel when accessing the line
• Not assessed during this round of simulations	• Not all staff certain about what defines “high touch surface areas”



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Just-In-Time (JIT) Training

A learning approach that meets the learner's needs during or just before it is needed to maximize an educational outcome.

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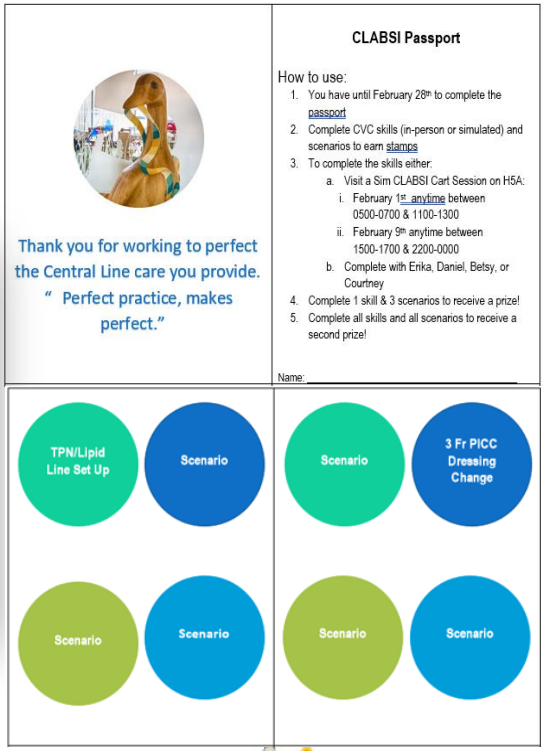
Purpose & Goals

- Right training, right place, right time
- Immediate readiness for care teams
- Improving teamwork and communication
- Identifying latent safety threats
- Supporting safe and effective real-time performance

JIT Training



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JIT Training

CLABSI BINGO

B	I	N	G	O
Port access (Skills check off) Dressing change (Skills check off)	Risk factors for CLABSI	Scenario #3: Assessing port site.	Components of the hygiene bundle? Where are the HTS areas?	Scenario #5: cap change after blood product administration.
To date how many CLABSIs has H12 had in the last year?	Cap change (Skills check off) Disinfection of Cap (Skills check off)	What is the difference between MBI and non-MBI CLABSIs?	CLABSI Facts (Mortality, morbidity, line pulls, cost, etc.)	Scenario #1: expired PCA syringe, cracked/leaking cap/tubing.
Soiled dressings (Stool, vomit, urine, blood and more!)	Scenario #5: Swelling at the port site.	FREE SPACE	Nonocclusive dressings	Scenario #7: Pt comes to the ED with PICC.
60 minutes >< or less for ABX administration	Scenario #9: Multiple reinforcements	Scenario #4: Accessing with a micro gripper	Aseptic line set up (skills check off)	Scenario #10: Lifting/lifted dressings
Scenario #2: Propofol through infusing line.	Proactive planning with sweaty dressings.	Scenario #8: Sequential scrubbing, use of a protective barrier	Scenario #11: Leaking insertion site	TPA: What, why, when, who, how?

*Staff were required to complete at least one of the highlighted items.

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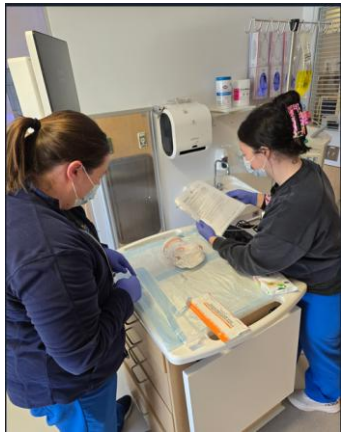
JIT CAUTI Simulations

- Presenting material in-situ
- Structured to highlight foley catheter care
- Include media-based content
- Pre- and post-simulation surveys
- Opportunity for qualitative data



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Challenges & Considerations

Operating within units with busy workflow

Staff engagement and availability

Psychological safety

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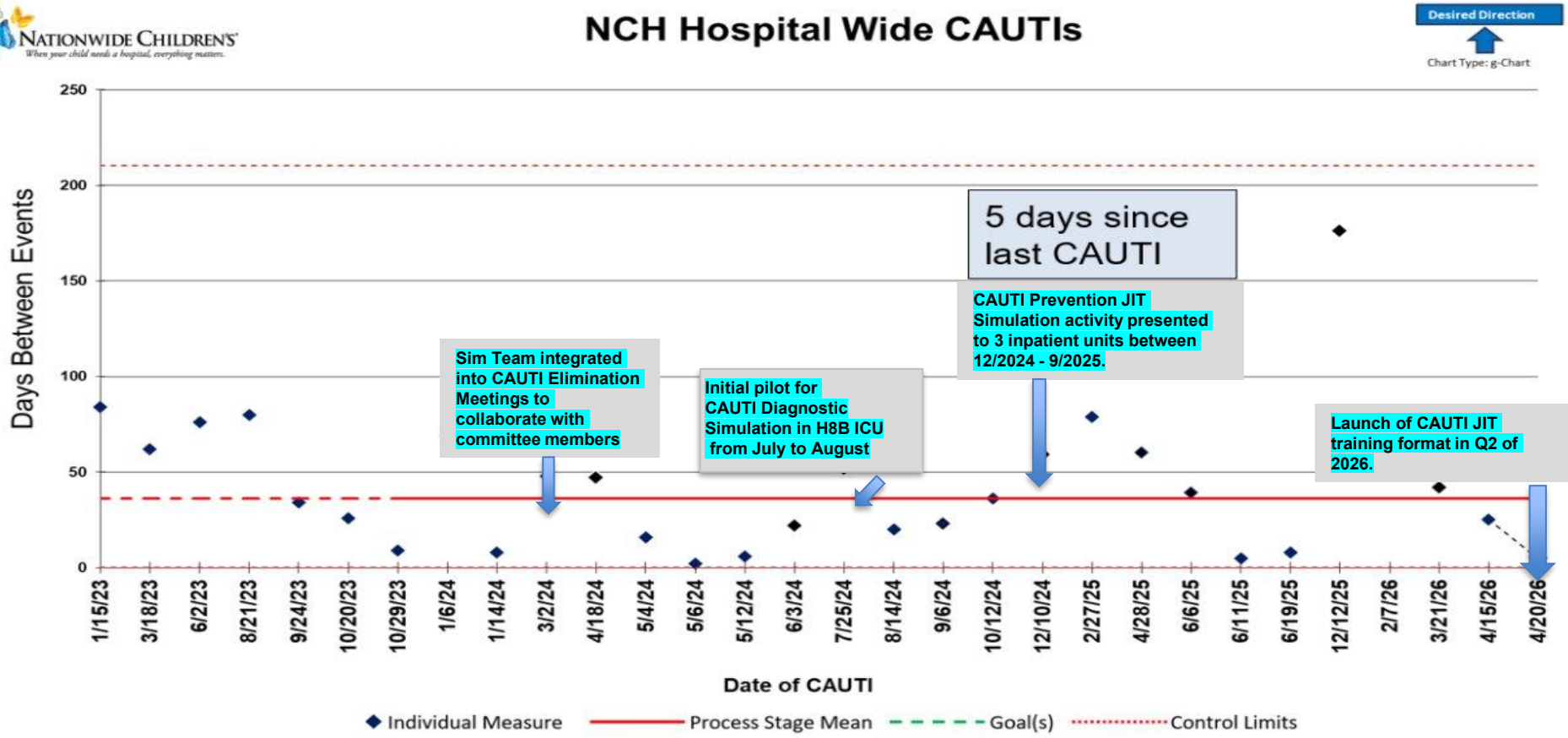
CAUTI Simulation Key Findings

2024	2025
• The highest marker missed during the initial pilot year showed that most learners did not place an alcohol cap on the aspiration port of the collection bag. (70% of nurses)	• Learners were encouraged to safely question orders for Foley placement when the order may not be appropriate.
• Expectations were not clear for PCA staff in terms of peri care responsibilities. This brought attention to most units as the expectations for PCA staff members varied between units.	• 18% of learners demonstrated incorrect techniques when attempting to inflate the balloon on the catheter. Learners were informed to that the amount of saline to inject was located on the distal end of the catheter. (in mLs)
• Foley cleaning procedure bolstered and verified across the organization. ("One Wipe. One Swipe." Via Personal Cleansing Peri-Cloth)	• EMR markers embedded in EPIC charts for patients with Foley catheters. (Reminders for maintenance care and assessment)

NCH Hospital Wide CAUTIs



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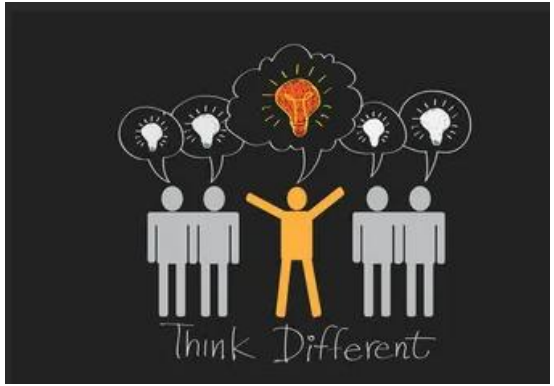
Future Directions

- **Key Takeaways**
  - Importance of addressing Hospital-Acquired Conditions (HACs)
    3% reduction from 2025 to 2026
  - Role of simulation in improving patient outcomes
  - Commitment to continuous education and quality improvement
  - Safety I transition to Safety II
- **Future Directions-innovations**
  - Advances in simulation technology
  - Integration with other educational methodologies (e.g., learning teams)
- **Ongoing Efforts**
  - Updates and expansion of research and evidence-based practices
- **Call to Action**
  - Engage in simulation training
  - Advocate for best practices



Thank you

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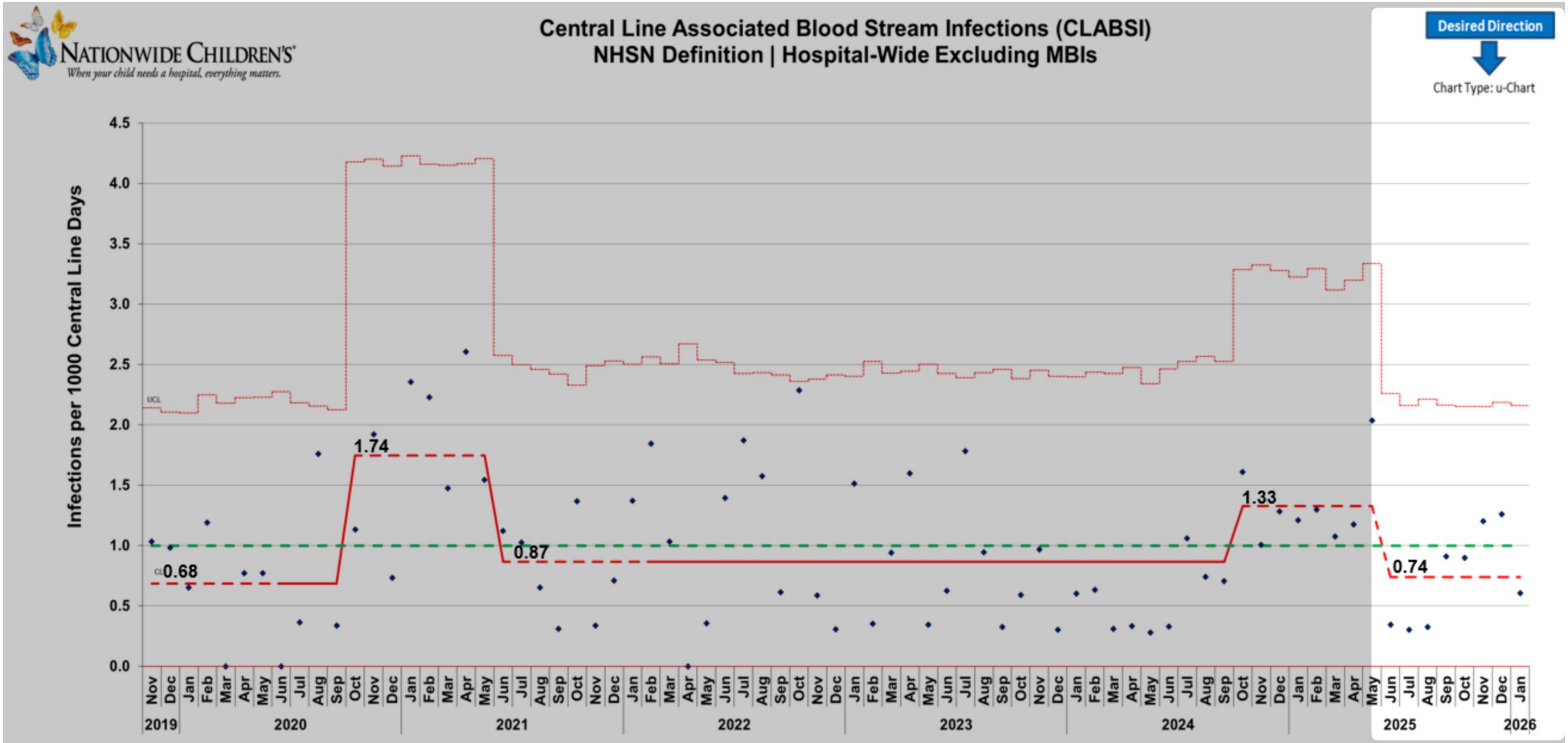
Appendix



# of CLABSI	3	3	2	3	0	2	2	0	1	5	1	3	5	2	6	6	4	7	4	3	3	2	1	5	1
Central Line Days	2906	3046	3074	2523	2760	2594	2588	2429	2740	2844	2963	2652	2602	2725	2549	2694	2710	2686	2592	2675	2931	3065	3222	3653	2957

# of CLABSI	2	4	5	3	0	1	4	6	5	2	8	2	1	5	1	3	5	1	2	6	3	1	2	3	1
Central Line Days	2822	2920	2713	2907	2396	2795	2866	3204	3177	3254	3498	3413	3252	3300	2832	3188	3130	2911	3206	3365	3182	3073	3388	3096	3313

# of CLABSI	2	2	1	1	1	1	3	2	2	5	3	4	4	4	4	6	1	1	1	3	3	4	4	2
Central Line Days	3328	3166	3209	3006	3593	3053	2831	2700	2837	3103	2981	3122	3311	3714	3402	2945	2886	3302	3071	3291	3341	3328	3176	3298

◆ Individual Measure — Process Stage Mean - - - Goal(s) ······ Control Limits

- **Latent Safety Threat Discovery:** Using simulation to identify system vulnerabilities contributing to HACs, such as workflow inefficiencies, equipment access barriers, or environmental constraints.
- **Iterative Testing and Quality Improvement:** Applying simulation in continuous design–test–refine cycles to evaluate interventions before clinical implementation.
- **Interprofessional Collaboration:** Engaging multidisciplinary teams (nursing, respiratory therapy, anesthesia, pharmacy) to standardize processes and reinforce shared mental models.
- **Data-Driven Decision Making:** Leveraging simulation findings and post-event analysis to generate actionable metrics that inform patient safety initiatives and policy updates.
- **Sustained Practice Change:** Translating simulation insights into durable system improvements—such as adherence to sterile protocols, and maintenance of role clarity during emergencies.

Emerging 2025 HAC Challenges

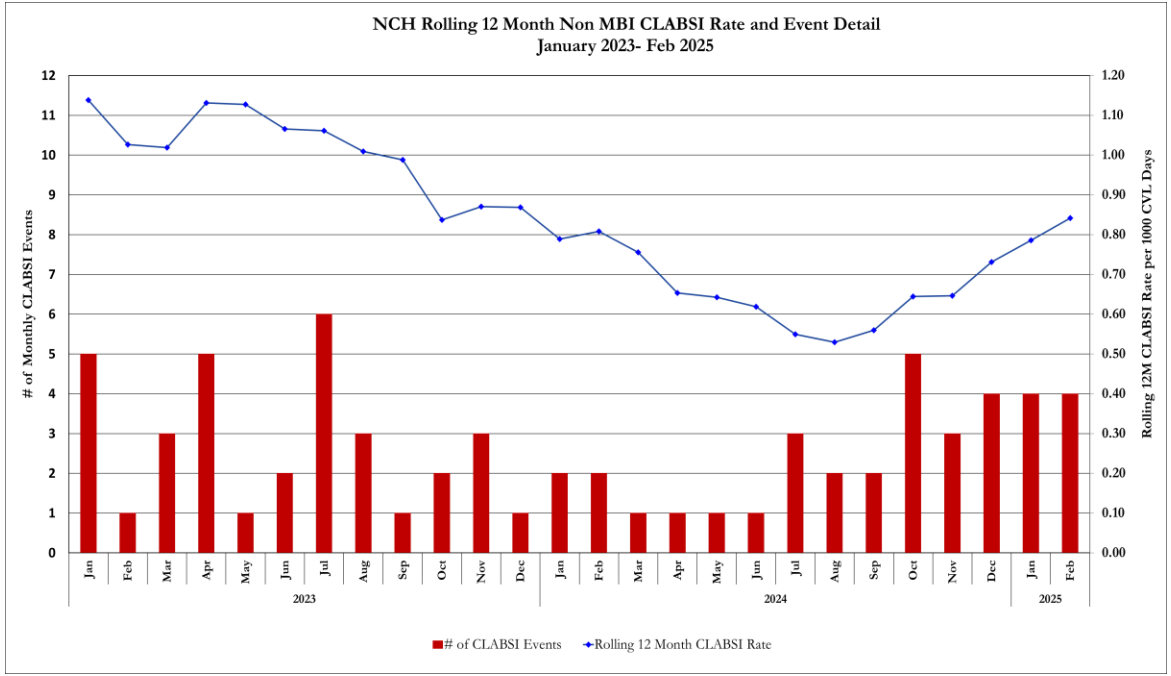
Central Line-Associated Blood Stream Infection

Observations

- 12 events thus far (45% of 2024 total)
- Skin flora over-represented in recent events (~66% of events)

Huddle Findings

- Zero-sum trade off expressed: CLABSI v PIVE
- Bundle nonadherence
- Opportunity for increased provider awareness/engagement
- Some events occurred in kids with atypically high risk: "we *knew* this kid would get a CLABSI"



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Celebrations and Opportunities

Celebrations

- **Centerline shift**
- Unit nursing
- Cross-functional partnerships
- Clinical Value Analysts
- NICU KDD Effort
- Units with >1,000 line days since CLABSI
  (among those who've had one in last 10 years)
  - C4C – 2,171 days
  - H4A – 1,577 days
  - H5A – 1,478 days
  - H9A – 1,264 days
  - H12 – 1,221 days
  - H11B – 1,200 days
  - H8A – 1,118 days

Opportunities

- Strengthen communication pathways
- Explore new tools and techniques
  - Devices
  - Education
  - Bundle reliability assessment
- Pull back interventions that haven't added value
- Proactively anticipate and mitigate risk
- Resilience and change management
- **Hold the line!** (after washing your hands!)

On The Horizon

- SPS Proactive Safety Huddle Cohort
  - Criteria
    - History of CLABSI
    - Preferred language for care *not* English
    - Staff concern
  - Collections
    - Reason for huddle
    - Mitigation strategies implemented
    - Huddle participants (roles or disciplines)
    - User satisfaction / perception of utility
- Novel tools and communication strategies to improve engagement
- Prevantics scrubs (ethanol *and* CHG)
- Documentation burden review and revision

2025 Summary CAUTI

What went well

- Significant reduction in events from 13 to 6
- Continued and expanded Simulation Center engagement
- Implementation of PICU Rounding Checklist

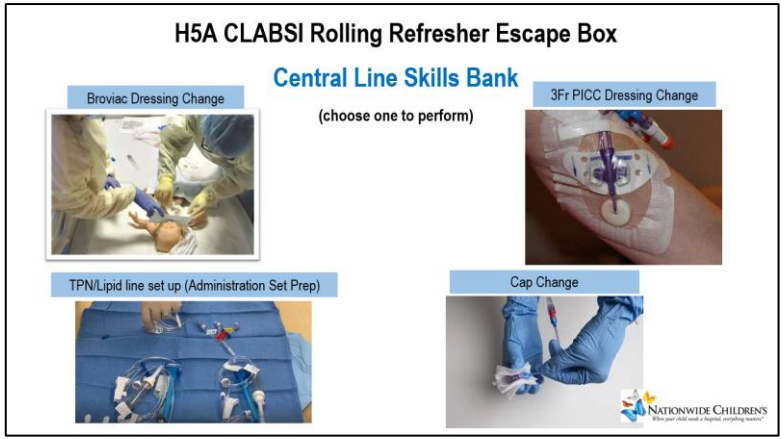
Challenges

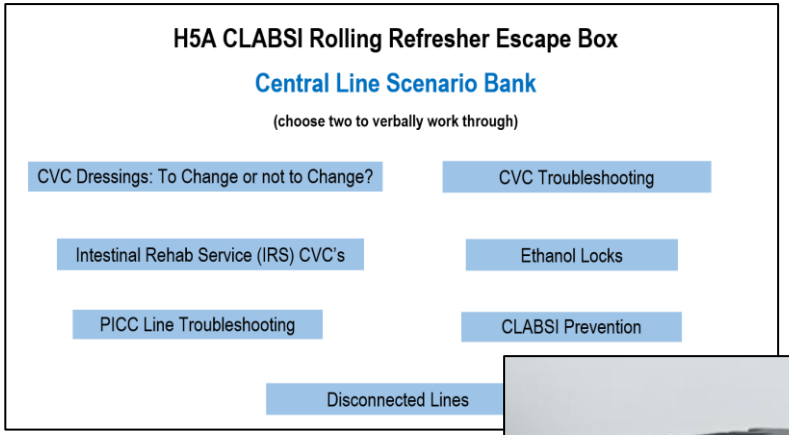
- Stalled nurse driven/initiated protocol
- BPA project
- How to take lessons learned in PICU housewide

2026 Goal and Interventions

- 6 CAUTIs or fewer (rate <1.2 infections/1000 catheter days; SPS 1.16)
- Ongoing Simulation Center Involvement
- Diagnostic Stewardship
- Dashboard usage vs EPIC monitor (PICU specific)
- Where do we go with nurse driven protocol

CLABSI Escape Box





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