## Health Care System
Jefferson Health

## Hospital Name
Abington Hospital

## Title of Initiative
Aligning Serious Safety Event Evaluations with Modern Safety Science to Eliminate Preventative Harm

## Abstract
Nothing defines an organizations commitment to patient safety better than how it responds when harm reaches a patient. It is clear that investigatory methods used in healthcare RCAs are ineffective at preventing the recurrence of harm because they fail to capture the intricateness in Serious Safety Events (SSE). When harm occurs, safety teams utilize classic linear descriptions that follow Boolean cause and effect relationships (i.e. Swiss-Cheese modeling, fishbone diagrams, 5-why tools) which have proven inadequate portrayals of the complexity involved in adverse events.

Addressing these challenges to SSE evaluations, we adopted the aerospace industry technique for how they learn from accidents and integrated a novel approach of capturing system complexity, such as resonance, emergence, drip, coupling, ambiguity, and other phenomenon native to safety event investigations, called IBIS mapping.

This methodology enables deeper investigations. It captures system complexity better with identification and appreciation of the interactions of various system pieces, variability of processes and conditions, environmental vulnerabilities, time-dependent invariant sequences, and the relationships between these seemingly unrelated issues. This leads to identifying contributing factors not seen with linear methods, and also the ability to design and engineer out harm with stronger action items.

We achieved significant reduction in our immediate response time, increased depth of investigations, and improved our leadership engagement for SSEs. All of our RCA investigations have at least 1 strong action item and our implementation of action items has significantly increased. The success of this investigative process is now the standard methodology utilized at over 14 hospitals.

## What were the goals of your initiative?
Redesigning our RCA system by incorporating innovative methods from the fields of human factors and systems engineers. Ensuring a clear process for effective design & deployment of stop gaps, disclosure, patient/family centered equitable care, and second victim support while increasing leadership engagement to mitigate risks. This methodology allows deeper insights into our SSE to generate strong action plans. This profound understanding of the complexity and relationships of the interactions among multiple systems, processes, technology, environment and people leads to more effective optimization of clinical operative systems, with

more staff engagement, accountability, and implementation of impactful actions to eliminate harm.

## What was the baseline assessment and/or data that indicated there was an opportunity for improvement?

As our healthcare system grew, there was a need to align and standardize the approach to managing adverse events in a time manner. There were several variations in the process with no consistent oversight of how, what, and why action plans were determined, or if they were actually implemented and sustained. We questioned if the action plans from previous SSEs truly addressed all of the potential contributing factors to engineer out the threat of harm and prevent recurrence.

We obtained baseline data from each hospital in our health system to determine basic key performance indicator metrics from SSEs. The data showed the time between the event occurrence date and the RCA initiation date took an average of 19 days. The average percentage of at least 1 strong action items for a RCA was 13%. The average execution rate of implementing the action items was 40% and lastly, the total time from initiation of RCA to completion was on average 165 days.

Our goal was to significantly decrease our response time to initiate and develop approved action plans to within 45 business days for all SSEs. We recognized the importance of leadership support of SSEs sooner and to improve the strength of action items to incorporate less dependence on human vigilance and more focus on system changes. We set a goal to have at least 1 strong action item for all RCAs, up from the only 13% from our baseline. Another key factor in patient safety was improve the implementation rate.

## Describe the interventions that were instrumental in achieving the results for your initiative.

Interventions that were instrumental in achieving these results include implementing weekly Enterprise-wide SWAT team meetings with all Safety and Risk team members to share best practices, key learnings, and develop standard tools and techniques with quality assurance. Launching a new Safety Management System where we created new standardized workflows to improve the SSE evaluation process with a system safety focus in a timelier manner. We provided extensive training on safety science methodology and how to utilize the IBIS map in SSE evaluations. We continued to evolve and expand the nomenclature used to display the safety science issues and relationships between the complex system domains involved in the adverse events. We created standard symbols and language to use in our legend key for the IBIS maps that demonstrate the utility of applying a visual display to illustrate complexity of emergence, resonance, coupling, and drip that connects the relationship of contributing factors. In developing action items to mitigate the risk of recurrence of contributing factors, we designed our own hierarchy of actions to include super strong actions that focus on system interventions to engineer out the threat of preventable harm. The super strong actions incorporate forced functions, architectural or physical changes that prevent human deviation,

and actions that test human/system interactions of products or equipment to prevent user errors.
Another innovative intervention we include in our SSE process is to apply a risk priority number to evaluate the severity, frequency of occurrence, and detectability for near miss events to prevent outcome bias.

## What were the results of your initiative that demonstrate a notable level of improvement?

After aligning SSE evaluations with modern safety science, the response to time to initiate an RCA decreased from 19 to 2 days. The engagement and support of operational and executive leadership helped improve the completion (165 days down to 30 days) and implementation (40% up to 68%) of action plans. The focus on strengthening action items with system changes, led to greater impact on sustainable patient safety improvements from 13% to 100% of RCAs with at least 1 strong action item. The redesign of our SSE evaluations, resulted in over 150 system changes in 9 months to improve patient safety.

## Explain how the initiative demonstrates innovation.

It is an over-supplication that leads to reductionism and event recurrence when we investigate all serious safety events, in the same way. To remedy this, we deployed a new SSE evaluation system with, scalable tools and methods, starting with an Apparent Causal Analysis, a Deep Causal Analysis, and up to a Comprehensive Root Causal Analysis. The tools are applied based on the complexity of the micro systems being evaluated, varying the depth and types of techniques utilized, such as ethnography, contextual inquiry, and cognitive interviewing to map out the socio-technical systems and interactions that contributed to the event.

## How was health equity embedded into your initiative to improve health outcomes in marginalized communities?

It is difficult to fully appreciate the contributing factors in a serious safety event without understanding the complexity of care as it relates to language barriers, cultural norms, family and staff interactions, disability, sexual orientation, and cognitive bias, both implicit and explicit. Our cRCA system ensures we are receiving this specific type of information. Specifically, we utilize “cognitive interviewing” techniques, that enables the attainment of more unbiased information, and we provide templates that safeguard how we ask specific diversity, equity, and inclusion (DEI) related questions as related to the SSEs.

## How did your initiative engage patients and families?

There is a strong partnership with our Patient Experience and Patient Safety team that enables service recovery with patients and families. We monitor complaints and grievances for safety-related information or trends and include the Patient Experience team in our patient safety meetings to provide insights into safety action plans and include them in deployment. There have been initiatives to provide ‘speak-up’ education to patients and families to enhance safety advocacy. The PFAC provides unique insight into patient/family needs to guide development of

strong, patient/family specific action items for vulnerable populations to ensure that we are addressing any health care disparities.

## How does this initiative demonstrate collaboration across care settings within your health system?

This comprehensive approach to clarifying complex ill-defined problems, better enables the capture of system complexity. This spans across all care settings within a health system. Staff interviews and observations are conducted that include staff from various disciplines across the organization, including data analytics, SME, and risk management. IBIS mapping is a dynamic process, which creates a visual picture of interactive questions and answers available along the SSE evaluation. It elucidates what is still unknown, where there is ambiguity, where there is certainty, and where there are connections not realized prior by visualizing the contributing factors graphically in a non-linear way.

## Explain ways in which senior leadership exhibited commitment to the initiative.

Senior leadership is actively involved and engaged in the evaluation of SSEs and safety science methodology. Our new SSE process includes a leadership debrief call within 3 days of a confirmed RCA to keep the leaders informed on the event and stop gaps in place to mitigate immediate risk. Findings and contributing factors from the IBIS map are presented to senior and operational leaders for consensus before action plans are developed. Senior leaders' sign the final action plans to show their commitment, support, and accountability on implementation of the action items and are also presented to the Patient Safety Committee.

## Describe the key steps required to successfully replicate this initiative throughout the region.

Leadership support and front line staff involvement are 2 key drivers to successfully replicate this initiative throughout the region.  IBIS methodology provides critical information that can improve patient safety and drive change. The creation of a handbook that defines key steps and documents needed for successful implementation and weekly SWAT team review of all SSEs in the health system to help strengthen action items was critical to success. Once the safety team creates an IBIS map with opportunities identified by integrating the safety science and human factor principles, local leaders can deploy sustainable action items based on the information unfolded.

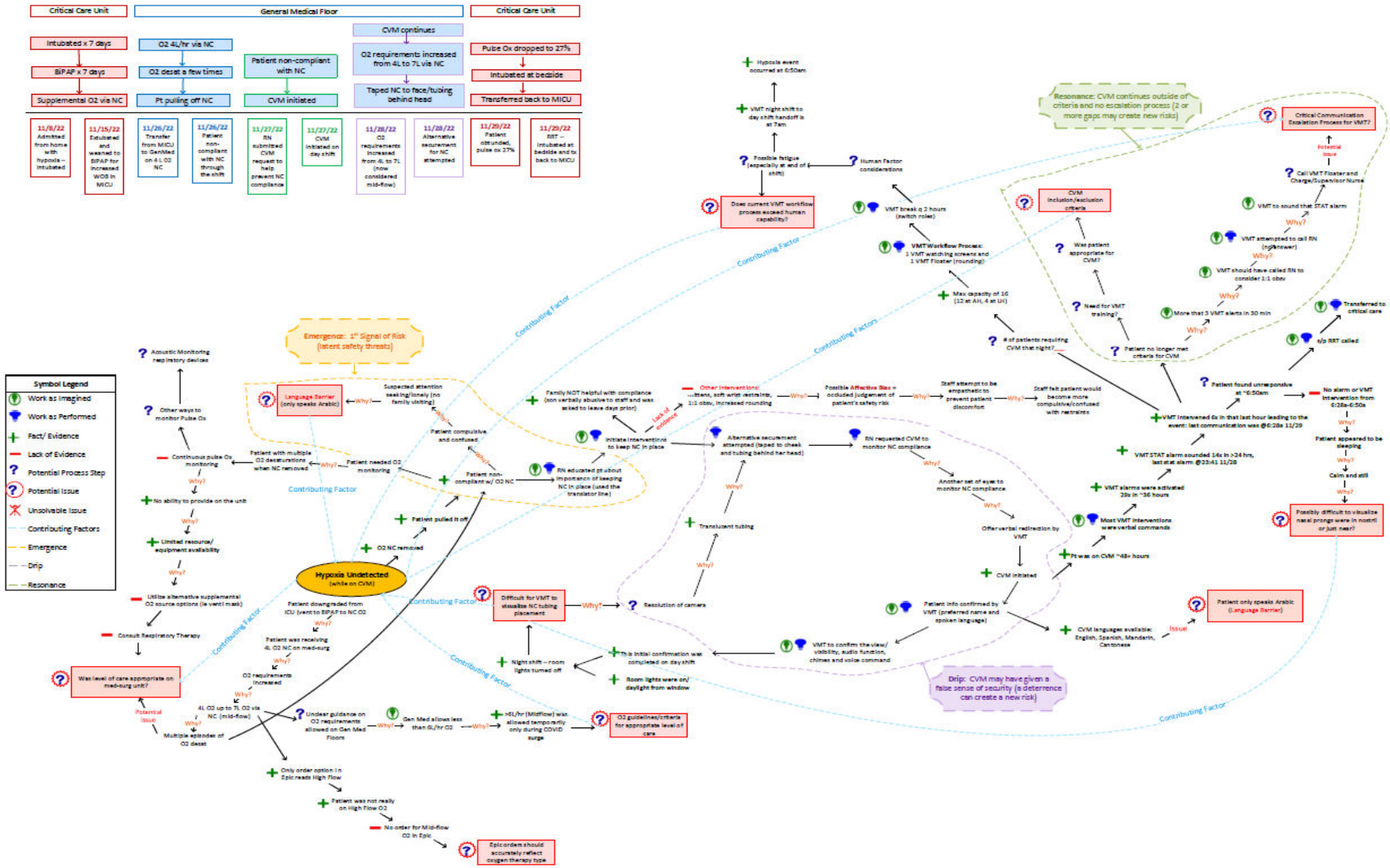
# Serious Safety Event (SSE) Key Performance Indicators

| KPI | Target | BEFORE Redesign of SSE Program | AFTER Redsign of SSE Program |
|---|---|---|---|
| KPI 1: Time from Confirmation to Leadership Debrief Call (cRCA only) | 3 business days | 19 days | 2 days |
| KPI 2 Time from Leadership Debrief Call to Approved Action Plan (cRCA only) | 42 business days | 165 days | 30 days |
| KPI 3 % SSE Evaluation With At Least 1 Strong Action Item (cRCA) | 100% | 13% | 100% |
| KPI 4 % Total Strong Action Items From All SSE Evaluations | 10% | 7% | 14% |
| KPI 5 % Action Item Implemented | >50% in 6 months | 40% | 68% |
| KPI 6 Total # Of System Fixes From SSE Evaluations | TBD | N/A | 158 |

**Level of Serious Safety Event Evaluations/Analysis**

| Area | "cRCA" "Comprehensive Root Causal Analysis" | DCA "Deep Causal Analysis" | ACA "Apparent Causal Analysis" |
|---|---|---|---|
| **Mental Model** | • Catastrophic or Permanent Harm<br>• Pervasive and Frequent System Risk<br>• RPN >450 | • Less Pervasive and less Frequent system risk<br>• RPN >294 | • Contained risk to an area<br>• RPN >80 |
| **Regulatory Considerations** | • TJC: thorough and credible | • TJC: sentinel events | • TJC: non-sentinel events |
| **Senior Leadership Involvement** | • ***Formal Senior Leader*** Leadership Call with C-suite + Operational Leaders<br>• Final ***Formal Senior Leader*** Action Plan Approval (CEO,CMO, CNO, CQO) | • ***Informal*** C-suite Awareness<br>• Formal Operational leader Mechanisms<br>• CQO Sign off only | • ***No*** C-suite Awareness necessary<br>• Director of Safety and Operational Leaders |
| **Who Leads Review?** | • Divisional Safety + HFE | • Divisional Safety Team + HFE | • Departments, SL, Unit, Committee Leads |
| **SSE Investigation Methods & Tools** | • Timeline<br>• WAI Analysis (Policies, procedures, guidelines, protocols)<br>• WAD Analysis (event interviews, SME interviews, Contextual inquiry, ethnography,)<br>• ***IBIS Mapping (complexity, coupling, resonance, drip)***<br>• ***5-Why Causal Analysis*** | • Timeline<br>• WAI Analysis (Policies, procedures, guidelines, protocols)<br>• WAD Analysis ( event interviews, SME interviews)<br>• ***Process mapping***<br>• ***5-Why Causal Analysis*** | • WAI Analysis (Policies, procedures, guidelines, protocols)<br>• WAD Analysis (Brainstorming, SME interviews)<br>• ***Affinity mapping***<br>• ***5-Why Causal Analysis***<br>• ***Fishbone*** |
| **Guiding Principals** | • Human Factors & System engineering (IBIS complexity science)<br>• Ergonomics Analysis (Heuristic and Ux analysis)<br>• Human Centered Design Interviewing techniques and observation tools | • PI (DMAIC) may be sufficient | • Simulation, Education,<br>• Simple PI (PDSA) and PM may be sufficient |
| **Action Item Strength** | • Goal is at least 1 strong action item | • Goal is at least 1 strong action item | • At least 1 intermediate action item |
| **Action Item TimeLine** | • Approved Action plans 40 Business Days | • Approved Action plans 30 Business Days | • Rapid Cycle action plans 25 Business Days |

## Example of a Hypotheical IBIS Map



**IBIS Map Symbol Legend**