Proactive, Transdisciplinary Systems Design for Safer Patient Care Through Inquiry, Integration, and Innovation

2017 HQI Vanguard Award
– Application –

Patient Safety
(Area of focus for this application)

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To whom it may concern:

I hereby endorse Stanford Health Care’s Advancing Patient Safety Program’s application for the 2017 Hospital Quality Institute Vanguard Award. This program exemplifies HQI’s vision of leading the nation in patient safety and quality performance with high reliability and zero defect in care. This program also supports Stanford Health Care’s mission of preeminent clinical outcomes through elimination of preventable harm, wherein:

• Patients/families, frontline staff, and organization leaders are active participants and have shared accountability for safe, evidence-based clinical care.

• Safety science methodologies from Human Factors and Ergonomics, Systems Engineering, Design Thinking, and Clinical Simulation disciplines are employed to redesign clinical systems thus reducing unnecessary complexities and cost.

• Reflections and learning from all improvement efforts are fostered to better understand how to advance systems safety science as well as evidence-based clinical design and management.

I sincerely appreciate your consideration of my organization’s application and truly believe that Stanford Health Care Advancing Patient Safety Program is deserving of this award.

Respectfully,

[Signature]

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EXECUTIVE SUMMARY

Stanford Health Care is pushing the boundaries of modern medicine by pioneering innovations in healthcare. Treating the sickest patients in such a dynamic environment results in a complex system that is at risk for unintended variabilities and errors.

Complex problems require a systems approach, hence, the idea to build a structure that embeds the systems safety science experts into the operational heart of the system was born. Adapting the human-centered design approach, a team of engineers, physicians, and nurses have developed and implemented a novel, proactive method to design safe patient care.

Since July 2016, the team has conducted projects to improve blood administration, to standardize set-up and management of cerebrospinal fluid drainage systems, to reliably communicate critical radiology results, and to prevent hospital-acquired infections in patients undergoing extracorporeal membrane oxygenation (ECMO) care.

The program’s accomplishments include the systematic examination and comprehensive description of systems, their components and interactions, successful collaboration throughout the organization, engagement of patients/families, and the redesign of IT, devices, workflows, and policies. To track the improvement, the program utilizes existing and new metrics.

To successfully replicate the program, requisite elements must be in place, e.g., proactive culture of safety, supportive leadership, dedicated frontline staff, experienced safety science experts, and engaged patients and families.
BACKGROUND AND RELEVANCE

Stanford Health Care (SHC) is pushing the boundaries of modern medicine by pioneering innovations in healthcare. Treating the sickest patients in such a dynamic, academic environment results in a complex delivery system that is at risk for unintended variabilities and errors. By funding the SHC Advancing Patient Safety Program with its unique structure, the SHC top leadership demonstrates their pioneering spirit and their commitment to propel a proactive safety approach as a fundamental contributor to deliver preeminent care. The resources provided to the program allow the expert teams to interact more meaningfully, to create synergies, and thus, to successfully adopt systems methodology. Tools and design principles that were proven to promote safety in other industries can be tested and further developed to tailor them to the organization’s needs.

Today, most health care systems can be described as “compliant organizations” on the path of safety maturity: they try to prevent incidents before they occur by discussing near-misses, providing training and raising awareness, conducting risk assessments, and performing causal incident analysis based on events. However, as the Patient Safety movement continues to prosper, many institutions and scholars have proposed to evolve from the currently often reactive approach towards a more proactive one that better addresses risks and prevents harm.

High reliability organizations are proactive, resilient, and are characterized by an “ownership culture”. Such organizations show engagement on all hierarchical levels, facilitate a higher level of training and awareness, and perform proactive formal risk assessments. In summary, they continuously study the system to proactively engineer out process and equipment inadequacies.

Although solutions to complex problems seen in healthcare require a systems approach, little is known on how to adapt existing methods and tools to design resilient systems in a practical manner. The integration of safety science disciplines, such as Systems Engineering, Human Factors and Ergonomics, or Design Thinking in clinical operations promises to deliver a breakthrough in proactive, safer healthcare delivery systems design. SHC is trailblazing by integrating such safety science experts into clinical practice who work in tandem with clinicians to design work systems for safer, more effective, patient-centered care.
DESCRIPTION OF THE EFFORT

To address the organizational challenge of becoming a resilient and proactive organization, the idea was born to build a structure that embeds the required safety science experts into the operational heart of the health care system. Thus, the SHC Advancing Patient Safety Program was started in the fall of 2016.

The program’s vision is to design evidence-based, adaptive, and resilient healthcare delivery systems that leverages on innovation and technology. The program’s mission is to achieve preeminent clinical outcomes through elimination of preventable harm.

Adapting the human-centered design approach, a team of engineers, physicians, and nurses have developed and implemented a novel, proactive method to design safe patient care. The program structure consists of two core expert groups: Systems safety experts (professionals trained in Human Factors and Ergonomics, Systems Engineering/Operations Research, Design/Design Thinking, and Clinical Simulation) and Clinical Safety Champion Dyads (co-funded by the program; consisting of pairs of nurses and physicians representing key hospital areas- Emergency Department, Medicine, Surgery, and Critical Care.)

To understand, describe, and design complex clinical systems, the teams utilizes an array of methods and tools to:
1) identify and analyze systems-related issues proactively and comprehensively,
2) search for and test a variety of solutions,
3) select the best options,
4) implement solutions successfully, and
5) monitor sustainability of improvement.

To fully understand the “work-as-imagined” (what organization leaders believe happens or should happen at the frontline) vs. “work-as-done” (how tasks are accomplished), the team performs an in-depth systems analysis of the issue at hand using data triangulation (review of relevant documents, interviews, and simulations of workflows). “Pain points” (challenges) and ideas for improvement are solicited from the interviewees (frontline staff, patients/families, and other stakeholders). Data are synthesized and then validated by patient safety clinical champions and other stakeholders.

Deviances and workarounds are not necessarily perceived as failure of human behavior, but as indicators of adaptability and poor systems support and as potential sources of innovation. Based on the findings, the team generates a “catalog of requirements” (improvement ideas from the interviewees and overall recommendations). The action items are distributed to the appropriate “leads” or subject matter experts and
their “collaborators” from all involved departments who then conduct the improvement work and sustainability monitoring in collaboration with the program’s team.

SHC promotes organizational learning and development by conducting projects with distinctive time spans, depths, and reflection levels and improves healthcare delivery systems proactively through preventative, and if necessary, corrective measures. The program also facilitates “thinking-outside-the-box” to implement innovative systems to provide safe patient care. And lastly, the program promotes reflections and learning from all improvement efforts to better understand how to advance systems safety science and evidence-based design and management.

The SHC Advancing Patient Safety Program is a novel endeavor that analyzes systems issues in an organization-wide manner, executes improvement work in a comprehensive and integrated fashion, is a conduit for innovation, and is a medium for breaking through boundaries and silos thus fostering deeper collaboration among disciplines.

DESCRIPTION OF THE RESULTS OF THE EFFORT

Since its inception in July 2016, the program’s team has conducted projects that are systemic in nature: to improve blood administration, to standardize set-up and management of cerebrospinal fluid (CSF) drainage systems, to reliably communicate critical radiology results, and to prevent hospital-acquired infections in ECMO patients.

The program’s accomplishments so far, include the systematic examination and comprehensive description of work systems, their components and interactions, successful collaboration with clinical and support services throughout the organization (e.g., Nursing, MDs, OR, IT, Transfusion Services, Facilities), and the redesign/standardization of IT systems, EMR components, devices, and nursing procedures.

The program utilizes existing metrics collected by other stakeholders, e.g., Nursing Quality, etc., and generate new metrics to track success of our improvement efforts related to care processes, service processes, and IT/EPIC EMR systems.

The monthly metrics for blood administration are the incidence of blood administration-related adverse patient events, Nursing and Transfusion Services quality indicators, and related litigation data. In addition, the program’s team also performs quarterly tracer audits starting from the processing of blood in the
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Transfusion Services up to when a patient receives the blood product. Since the completion of this project, there has been no blood administration-related adverse patient event, no associated litigation, and the Nursing and Transfusion Service quality indicators are within the satisfactory target range.

Based on the usability study for the CSF drainage systems standardization, 14 requirements to customize one device as a standard for all applications were defined. Through frontline staff engagement, 5 different set-ups that are being used were identified. CSF management workflows comprising of 6 tasks which revealed 20 device-related safety issues and 16 other safety-related issues were described. Leveraging on our device-related analysis and the expected device standardization, SHC Purchasing specialists were able to renegotiate and reduce the device pricing by 50%. Order sets were revised to standardize format/language and to improve associated practice/workflows. Nursing procedures were revised to reflect the proposed device and practice improvements. In addition, we developed clinical management protocols to clearly delineate related tasks/roles in all phases of care. Implementation of the standardized device and improvement support tools is scheduled for July of 2017. The incidence of related adverse events and litigations will be monitored for this project.

Based on the systems analysis for the communication of critical radiology results, the program provided improvement recommendations not only regarding the communication of critical and clinically significant results, but also for the ordering process including appropriateness of studies, communication of relevant clinical history and pretest probability for suspected diseases and injuries, and the clarification of roles and responsibilities including for rapid responses to life-threatening findings. Improvement efforts have commenced this summer. The incidence of related adverse events and litigations will be monitored for this project.

Systems analysis related to the hospital-acquired infections on ECMO patients project is ongoing. Some improvement efforts have already been initiated. Implementation of other improvement initiatives is projected to occur in the fall of this year. The incidence of hospital-acquired infections in ECMO patients will be monitored for this project.
DISCUSSION OF THE SIGNIFICANCE OF THE RESULTS

The highly complex and dynamic patient care is often at risk for unintended variabilities and errors. To succeed in preventing harm, provide quality care, and decrease cost, a deliberate and integrated effort to examine the interrelationship between components of the highly complex healthcare delivery system is imperative. Synergistic, interdependent teams that allow flow of information and ideas unhindered by professional turf issues must be instituted. Work must be designed so units and teams can work together in an integrated way to achieve the speed, flexibility, integration, and innovation that is needed in this new world. Obstacles to systems improvement, e.g., hierarchies, silos, and boundaries must be overcome.

The program focuses on systems-related, highly complex issues with recurring patterns, with potential for improvement and innovation, and with possible solutions that span across the organization. Depending on the topic, additional subject matter experts from the middle management are drawn into the projects, not only to provide insights, but also to lead the implementation efforts and to advocate for the necessary changes.

The program leverages findings from systems and complexity science by adapting and applying evidence-based methodology and design principles to study, describe, and design clinical work systems. With our systems thinking approach, we foster collaboration between experts by developing a shared understanding across disciplines, professions, and hierarchies. The comprehensive description of the system provides transparency about roles and responsibilities as well as functions, polarities, and trade-offs, which helps to overcome hierarchical barriers and interpersonal conflicts.

DESCRIPTION OF SUSTAINABILITY AND SCALING OF THE ACHIEVEMENTS

There are requisite elements that must be in place to achieve a successful replication and scalability of this program: an organizational culture of safety, leaders who are able to look beyond the fiscal gains and who fully support change and innovations, workers who are dedicated to what they do and are valued for their contributions, teams who are able to work collaboratively despite different perspectives and priorities, and patients and families who are engaged in their care.

Of equal importance is the engagement of safety sciences and systems design experts with experience in healthcare (sub-specialized Human Factors engineer, Systems engineer, Design Thinking expert, Clinical simulationist) who are fully embedded within the day-to-day operations and who can lead the analyses and
improvement of systems. These experts, together with the clinical champions as equal partners, generate the synergies necessary to cope with the complexity and to succeed in sustaining improvement efforts.

In summary, sustainability of SHC’s improvement efforts is achieved because:

- Redesigned systems reduce unnecessary complexities leading to work systems that make it easier to perform work and more difficult to make mistakes.
- Boundaries and silos among teams are overcome despite differences in opinions and priorities leading to unrestricted flow of ideas and innovations across the organization.
- Frontline staff feel safe to express their ideas and can participate in improvement work without fear of reprimand or punishment.
- Staff take pride of and are recognized by leaders and peers for their contributions to improvement work.
- Patients and families are fully engaged and feel that their contribution to care matters.

DESCRIPTION OF KEY LESSONS LEARNED

These are the overall lessons learned since the inception of the SHC Advancing Patient Safety Program:

- Break down the culture of silos and cross team boundaries by engaging all stakeholders (frontline staff, leadership, patients and families) in improvement work and who have embraced the sense of shared accountability for safe, evidence-based clinical care.
- Integrate systems safety experts (Human Factors and Ergonomics engineer, Systems Engineer, Design Thinking consultant, and Clinical Simulationist) into the day-to-day clinical operations to assist in ensuring that work systems are designed so it is easier to do things right and it is more difficult to make mistakes.
- Utilize an array of evidence-based methods, tools, and systems design principles to identify and analyze system problems in a comprehensive and integrated fashion, to seek for and test a variety of solution options, to engineer and implement novel solutions successfully, and to monitor sustainability.
- Workarounds are not necessarily indicative of human behavior failure. They can also be indicators of systems adaptability and creativity due to poor systems support and/or dynamic and complex environment, and should be considered as potential sources of innovation.
- Systems improvements are not static. What is relevant to practice now may not be relevant tomorrow. Constant systems monitoring and readjustments as needed must be instituted to ensure “work-as-imagined” and “work-as-done” are aligned.
- Perform reflections and learn from improvement and implementation failures to better understand how to advance systems safety science as well as evidence-based clinical design and management.
- Celebrate success!