

SUPPLEMENTAL MATERIAL

All learning networks that informed the Learning & Improvement Framework are listed below. Additional information on each of the pathways as well as examples from NPC-QIC and SPS are also provided in this supplement. Of note, while the framework was designed based on experience with existing LNs such as NPC-QIC and SPS, the projects highlighted here were not developed using this framework.

LEARNING NETWORKS

Listed below are all learning networks that informed the creation of the Learning & Improvement Framework based on experiences the coauthor group has had with each of them. Additional information about learning networks supported by the James M. Anderson Center for Health Systems Excellence is available at <https://www.cincinnatichildrens.org/research/divisions/j/anderson-center/learning-networks>.

- All Children Thrive: actcincy.org
- American Society of Hematology Sickle Cell Disease Learning Community:
www.ashresearchcollaborative.org/s/article/Sickle-Cell-Disease-Learning-Community-Launches
- Autism Care Network: autismcarenetwork.org
- Cystic Fibrosis Learning Network: cff.org
- Fontan Outcomes Network: fontanoutcomesnetwork.org
- Ohio Perinatal Quality Collaborative: opqc.net

- National Pediatric Cardiology Quality Improvement Collaborative: npcqic.org
- Pediatric Acute Care Cardiology Collaborative: pac3quality.org
- Pediatric Cardiac Critical Care Consortium: pc4quality.org
- Solutions for Patient Safety: solutionsforpatientsafety.org

NETWORK-WIDE PROJECTS

Network-wide projects require a rigorous structured process for design, implementation, and sustainment, including clear expectations for project leaders and participating sites at each stage. After the idea for a network-wide project is formally proposed, LN leadership evaluates the proposal for alignment with its mission and vision, potential impact, and resource availability. Once approved, LN leaders partner with the network-wide project leaders to recruit subject matter experts to participate in a formal design process, including development of an improvement theory and the data collection plan. Next LN sites are invited to apply to participate in the learning cohort, which consists of a small number of volunteer sites who agree to participate actively by participating in regular meetings, submitting process and outcome data, and testing interventions. If the network-wide project identifies specific ideas that improved outcomes when implemented reliably, these ideas are then formally spread to the remainder of the LN with regular data collection, active improvement work, and regular network-wide sharing. Following completion of the spread phase, all LN sites work to sustain the improvements. Throughout all phases, network-wide project leaders connect regularly with LN leadership to report on results and ensure alignment with LN priorities.

Additional Examples of Network-wide Projects

NPC-QIC's mission to improve outcomes for hypoplastic left heart syndrome exemplifies a network-wide approach to address a small patient population. This congenital heart defect affects approximately 1350 infants born in the US annually,[1] precluding any single congenital heart center from identifying optimal evidence-based best practices.[2] In its first improvement effort, dozens of NPC-QIC centers collaborated to develop methods for evaluating and monitoring these infants during a particularly high risk outpatient period between surgical operations ultimately resulting in lowering the mortality rate during this high risk interstage period by more than 40% from 9.5 to 5.3%.[3]

SPS has a well-defined, rigorous process for network-wide projects, which typically focus on identification and spread of a bundle of practices that prevent occurrence of a healthcare acquired condition, thus contributing new knowledge to the field. SPS describes this work as progressing through three stages (Pioneer, Aviator, and Orbiting) which correspond to the network-wide project progression.[4] The Pioneer phase begins after the SPS Clinical Steering Team selects a proposal that fits predefined selection criteria, including alignment with the LN mission, proof of concept, and potential impact. After selection, leaders and a design team of experts are identified and convened to discuss strategy and tactics. After defining the anticipated resource requirement and timeline, SPS hospitals are invited to participate in the Pioneer phase. Typically, a subset of 20-50 hospitals agree to collect data on outcomes as well as use of potential interventions in a structured way that allows for statistical analysis to determine which potential interventions effectively prevent the harm. Once these volunteer Pioneer hospitals have achieved statistically significant improvement, potential interventions with evidence of significant impact are included in the bundle either as required or recommended practices depending on the strength of the evidence. In the Aviator phase, the bundle is shared with all

SPS network hospitals, who are then expected to submit outcome and process data as well as implement the bundle practices. Once network-wide improvement goals are achieved, the effort moves to the Orbiting or sustainment phase.[4,5] Using this methodology, SPS has reported successful reduction of several hospital acquired conditions, including adverse drug events,[6] catheter-associated urinary tract infections,[6] surgical site infections,[7] and unplanned extubations.[8]

INCUBATOR PROJECTS

Incubator projects represent promising ideas that require further testing before consideration for a network-wide project. As independently driven efforts, incubator projects begin with local idea generation and planning by leaders from 1-3 LN sites (Table). Incubator project proposals are then submitted to LN leaders for approval, likely through a formal evaluation mechanism due to the need to allocate limited LN resources. Testing and learning is then conducted locally at 2-5 sites including monthly project calls and regular updates to LN staff and leadership. Once the testing and learning phase is complete, incubator project learnings are shared at the network level and then sustained by the participating sites. Effective incubator projects may be considered either for informal spread to all LN sites or for a formal network-wide project.

As a result of limited LN support, incubator project leaders ideally have experience designing and leading effective single site improvement efforts. Leading an incubator project provides emerging local leaders with valuable experience in designing and leading multisite improvement on a smaller scale. LNs may choose to provide ad hoc QI or data coaching, particularly at the time of project initiation to ensure that the project is effectively scoped and

appropriate measures are chosen. Additionally, the LN may provide logistical assistance with scheduling phone conferences, a commons space for information exchange, and templates for data analysis such as statistical process control charts.

Additional Examples of Incubator Projects

Because SPS and NPC-QIC have not used the L&I framework prospectively, to date they provide somewhat limited examples of incubator projects. As an example of how incubator projects may represent a specialized subset of larger network-wide improvement projects, several years into SPS's work to reduce the incidence of central line associated blood stream infections, representatives from oncology wards recognized that their patient population had unique challenges and asked to form a subgroup within the larger network-wide project. Similarly, after learning about NPC-QIC's work with pediatric cardiac surgeons to improve surgical processes of care, pediatric perfusionists recognized a unique need to form a group of their own to study variation in management of cardiopulmonary bypass across sites and develop multisite QI efforts.

SHARE & ADAPT LOCALLY ACTIVITIES

Share & adapt locally activities occur organically throughout the LN structure, although there are opportunities to formalize these interactions as illustrated in the examples below.

Additional Examples of Share & Adapt Locally Activities

SPS recognizes some forms of share & adapt locally learning in its "Discovery" phase wherein individuals or small groups of innovators develop ideas that may progress to the Pioneer

phase, thus becoming a network-wide project for the LN.[4] Each SPS national learning session includes multiple breakout sessions as well as a poster session where individual teams share local improvement work, whether related to ongoing SPS projects or other related topics. Finally, SPS includes a program that supports both virtual and in-person site visits between participating hospitals with a goal to observe processes related to preventing harm.

One example of share & adapt locally learning that has spread informally through NPC-QIC is the development of a dedicated “single ventricle” clinic for infants with hypoplastic left heart syndrome. This approach was shared at a LN meeting and described briefly in single site reports,[9,10] but received no further support for dissemination from NPC-QIC central resources. Regardless, this approach has been adopted by 70% of NPC-QIC sites, according to internal data. Similarly, after NPC-QIC researchers analyzed registry data and identified digoxin prescription as a potentially protective measure to reduce mortality, findings were shared and discussed during an NPC-QIC learning session and subsequently published[11] as were similar results using analyses from other registries.[12] Use of digoxin was added to the NPC-QIC’s suite of reported outcomes but in keeping with the share & adapt locally learning approach, no further network-wide efforts were made to encourage sites to increase rates of digoxin prescription. Despite this less formal mechanism to implement improvement ideas, rates of digoxin prescription increased significantly according to internal NPC-QIC data as well as external studies.

References

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