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Reframing Disaster Planning with Quality Improvement Methodology Using Family Reunification as a Case Study

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Abstract

Comprehensive planning for family reunification following a disaster is complex and often underdeveloped, especially in hospitals. The 2013 and subsequent 2021 National Pediatric Readiness Project revealed less than half of hospitals had disaster plans that addressed the needs of children. Leveraging quality improvement (QI) language and methodology allows for alignment and engagement of hospital leaders and personnel unaccustomed to disaster planning. We aimed to create a family reunification plan which would enable child-safe reunification within 4 hours of an event using quality improvement methodology. QI tools such as the fishbone diagram, key driver diagram, and process maps enhanced the planning process. We then utilized the Plan-Do-Study-Act model to test and revise our plan. Active involvement of key stakeholders was crucial. By using quality improvement methodology, hospital personnel unfamiliar with disaster management helped develop and improve our hospital's family reunification plan.

During the day, millions of children in the US spend time away from their caregivers.[1,2] This increases the risk that when a disaster (severe weather, earthquake, mass casualty events) occurs, families will be separated and require reunification. Unaccompanied children may be particularly vulnerable, as they may not be able to identify themselves or their caretakers, further delaying reunification due to developmental age, injury, or psychological distress. Delayed reunification can lead to increased secondary injuries, such as abuse, violence, maltreatment, and psychological stress to both the separated child and family members, resulting in long-standing mental and physical health problems.[3,4] The public expects that, in addition to medical services, hospitals will provide nonmedical resources, such as food, water, shelter, and family reunification during a disaster.[5] However, less than half of hospitals that participated in the 2013 and, later, 2021 NPRP Assessment, had a disaster plan that addressed the needs of children, which included reunification.[6,7] To assist health care facilities with family reunification planning, the American Academy of Pediatrics (AAP) and Massachusetts General Hospital (MGH) Center for Disaster Medicine collaborated to create a toolkit in 2018, "Family Reunification Following Disasters: A Planning Tool for Health Care Facilities."

Quality improvement (QI) methodology has been used in many different industries, including health care, to improve system outcomes and performance.[8] Quality improvement is well-established in health care, with both the Centers for Medicare and Medicaid and Joint Commission using it to drive quality outcome measures to improve patient care.[9–11] Furthermore, hospitals have used various QI methodologies and tools to streamline processes and operations. QI aims to use a systematic approach to testing changes, creating outcomes with decreased variability and increased sustainability.[12] The use of QI methodology in disaster planning is emerging but has not been widely applied.[13–15] Incorporating QI methodology and QI tools in disaster planning allows for engagement of hospital leaders and clinical staff who may be unfamiliar with disaster management but understand the core principles of QI. In fact, the QI Plan-Do-Study-Act (PDSA) model is similar to the Homeland Security Exercise Evaluation Program (HSEEP), the standard for disaster exercise planning in non-hospital settings. Both PDSA and HSEEP provide a structure for implementation and iterative testing of processes and plans (Figure 1).

Family reunification planning is complex, requiring coordination through multiple departments and stakeholders within a hospital. We report the use of QI methodology for developing a family reunification emergency operations plan in a tertiary care pediatric hospital, leveraging it as a common language due to its familiarity to health care leadership and existing similarities to

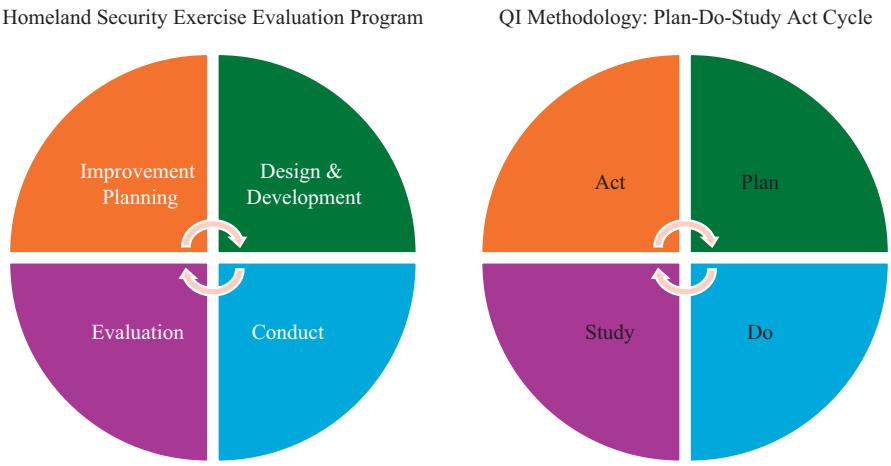

Figure 1. Comparison of the Homeland Security Exercise Evaluation Program and Quality Improvement Plan-Do-Study-Act Model.

disaster planning approaches. Our aim was to develop and pilot a hospital family reunification plan, which allowed for the reunification process to begin within 4 hours of a disaster event, within 12 months using QI methodology. We describe the implementation process for developing a reunification plan, including the identification of stakeholders, process-mapping, testing, and plan revision.

Design and Development of a Family Reunification Plan (Plan)

We conducted this QI initiative at a tertiary care children's hospital located in an urban setting with level 1 trauma center designation. The annual emergency department (ED) volume is approximately 49 000 pediatric patients with a predominance of public insurance payor mix. The Washington University in St. Louis Institutional Review Board (IRB) deemed the protocol exempt as this work was considered QI. We started the process by first creating a fishbone diagram, followed by a key driver diagram and, lastly, process maps.

Fishbone Diagram Development

A fishbone (Supplemental Material) or Ishikawa diagram is a QI tool often constructed to understand the root causes of a problem or ideas that have an effect on a problem or desired outcome.[16] Adapting this concept and using the AAP Reunification Toolkit as an example, we created a fishbone diagram in meetings with ED physicians and nursing along with hospital emergency management leadership. The goal of the fishbone diagram is to identify and group the basic resources needed for family reunification in a tertiary care medical center. The categories used in disaster management of staff, space, stuff, and systems were used to address what necessary resources were needed to meet the aim.[17] Within each category, more detailed planning to include the needs of families (chargers, food) and children (safe places) was considered (Figure 2).

Stakeholders in our hospital system were identified, including social work, child life, chaplain services, emergency management, security, maintenance/facilities, center for families (a division that provides families with the resources they need away from home during their child's hospital stay), family partners (a volunteer group of families that provides support and mentorship to families with a currently admitted child), patient access, volunteers, physicians, and nursing staff. During these initial meetings, we determined that the trigger of greater than 10 unidentified children presenting to the ED would activate the Reunification Plan (Figure 3). Separate meetings were conducted with each stakeholder's department to create individual plans regarding their role in the process. This was then reviewed by department leadership with further revisions as needed.

Driver Diagram Development

After identifying and organizing the resources needed for a reunification plan, a key driver diagram was then developed. A key driver diagram is a QI tool used to visualize the relationship between the overall aim of the project and change ideas that contribute to achieving the aim. Primary drivers are broad categories directly contributing to the aim, while secondary drivers are more detailed and impact the primary drivers, followed by intervention strategies that allow for the secondary drivers to be accomplished.[18] We used the emergency management framework of "space, staff, stuff, and systems"[19] as primary drivers in creating a family reunification plan. Secondary drivers included education, safety and security, internal stakeholders, external agencies/plans, nature of event/disaster, and notification to activate the process. Specific interventions that would be necessary to succeed in our aim included multidisciplinary meetings with all stakeholders to engage in planning, creation of process maps for reunification of families, sharing of plans internally and externally, and conducting drills or exercises to test the process (Figure 4).

Process Map Development

Process mapping is a tool that provides a visual picture of the specific steps in a process and can be used to identify strengths and weaknesses, opportunities, and system complexities within a workflow.[16] The process maps for our family reunification plan were developed using the AAP toolkit recommended areas and internal hospital stakeholders' input of the current process of family reunification. We addressed 2 challenges in reunification by creating individual process maps that followed both the unidentified minor and the family members seeking a missing minor.

Reunification of the Unaccompanied Minor

While many children can self-identify, there will be a group of children who cannot. Many factors influence a child's ability to self-identify, including developmental age, intellectual ability, language

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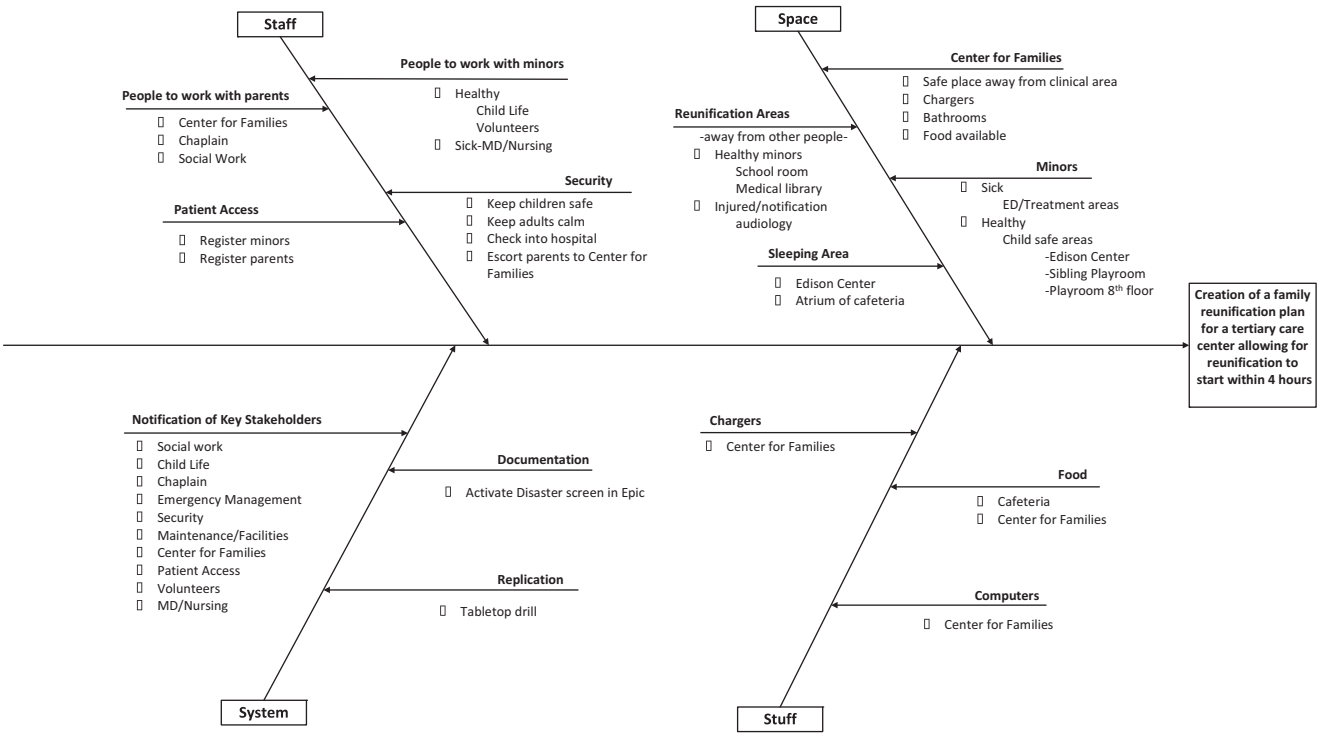

Figure 2. Fishbone Diagram for Family Reunification Needs.

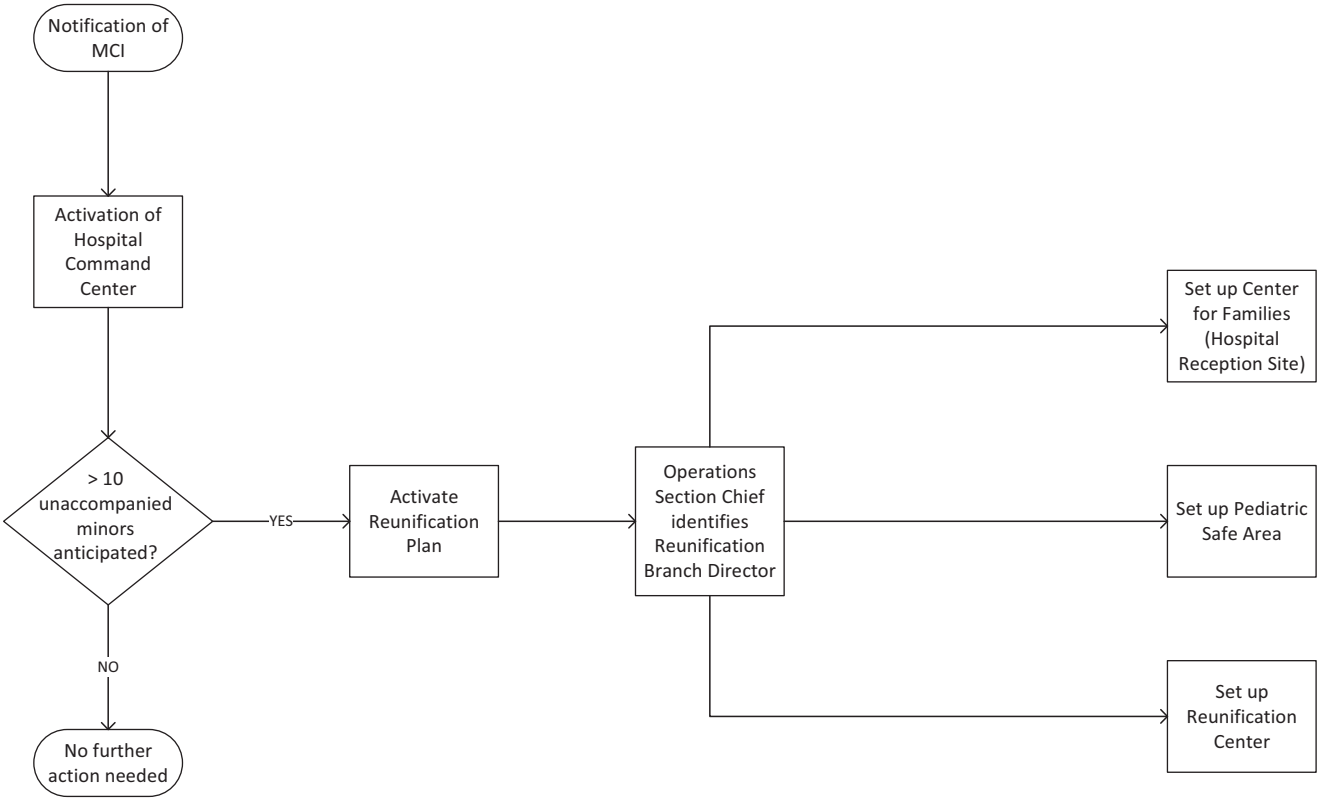

Figure 3. Activation of family reunification plan.

proficiency, mental/behavioral health status, and/or injury. The inability to self-identify complicates reunification and may result in delays. Information to aid in reunification, such as their name, date of birth, parent/caregiver names, phone numbers, and addresses can be gathered through interviews. To house this information, we designed a Reunification section which can be activated

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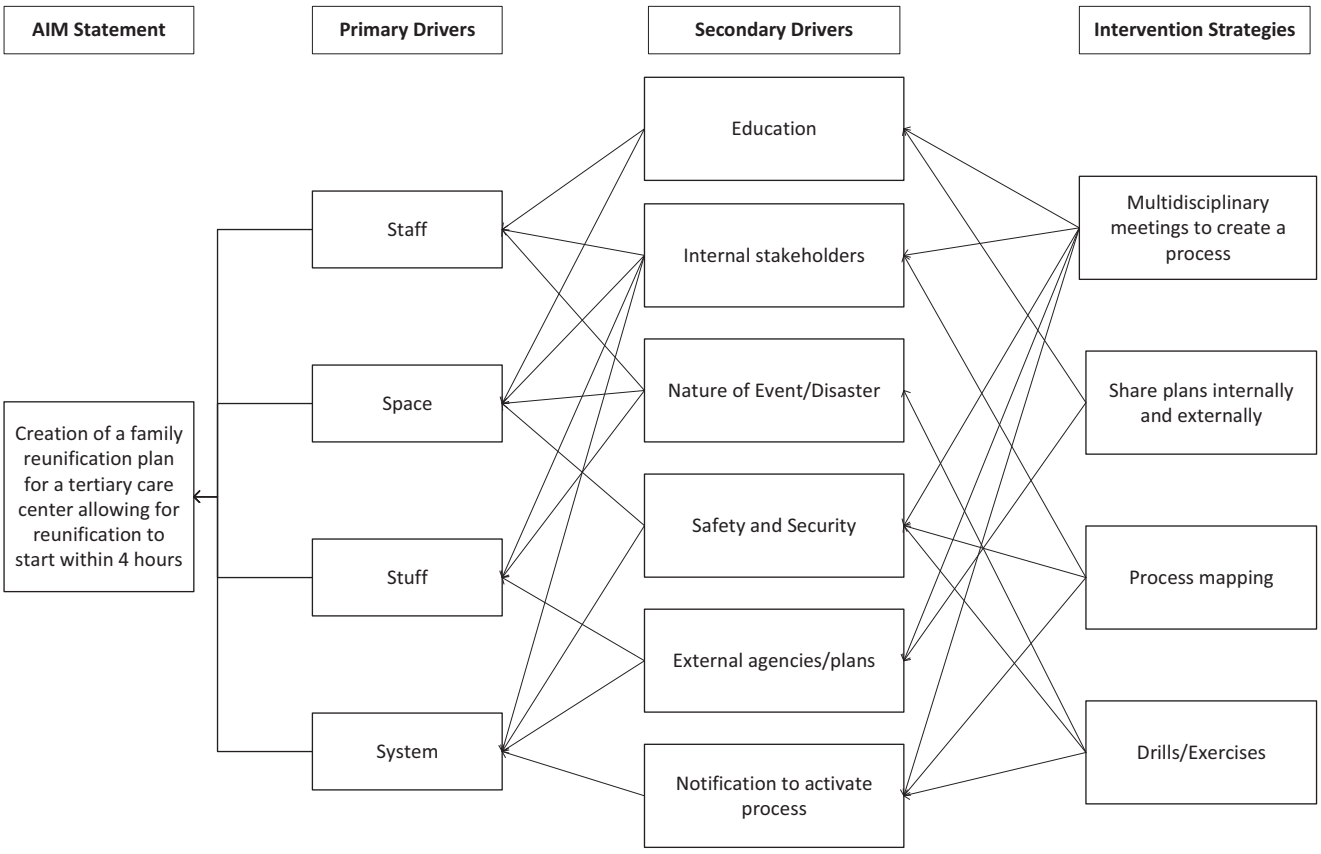

Figure 4. Key Driver Diagram for family reunification planning.

for an MCI within our electronic health record. Early involvement with social work and documentation of photos or identifying marks is imperative. Figure 5 follows the process for reunification of an unaccompanied minor.

Family Members Seeking a Missing Child

Previous events demonstrated that caregivers will present to EDs looking for their child, which can further stress overwhelmed staff at hospitals if there is no prior family reunification planning. Many hospital disaster plans assume 8-10 family members will present to a hospital seeking information on decedents/survivors of an incident.[20–22] Figure 6 follows the process for family members seeking reunification with missing child (Figure 6).

Conducting a Family Reunification Tabletop Exercise (Do)

Successful planning and testing for family reunification required multidisciplinary key stakeholder involvement. We tested our family reunification plan using a tabletop exercise. Initially, we conducted the exercise with 16 participants representing the departments below:

- Emergency Department
- Emergency Management
- Patient Access
- Social Service
- Child Life Service
- Center for Families
- Visitor Management
- Public Safety
- Chaplaincy
- Volunteer Services
- Family Partners

We presented the scenario of a kindergarten class consisting of 30 children and 4 teachers on a field trip to a large park and zoo following a detonation of an explosive device, causing the school bus to overturn. Emergency Medical Services (EMS) respond to the scene and start transporting children to the closest hospital.

During the tabletop exercise, all stakeholders identified their roles in the above scenario and described their department's plan for a reunification scenario. This included identifying how their department would increase staffing, the space used for reunification, equipment needed, how patients will be tracked, how the media will be handled, crowd management, and collaborating with school officials as a resource.

Evaluate the Family Reunification Plan (Study)

We identified several areas for improvement during a debriefing session with all stakeholders after the tabletop exercise (Table 1). This was followed by a smaller meeting with ED physicians, nursing, and emergency management to further define areas for improvement. Most importantly, communication was identified as a major deficiency. Communication across multiple areas of the hospital, with families, and other area hospitals was lacking.

Improving the Family Reunification Plan (Act)

After the tabletop exercise, all departments then met separately to review and revise their response plans. We reconvened all stakeholders

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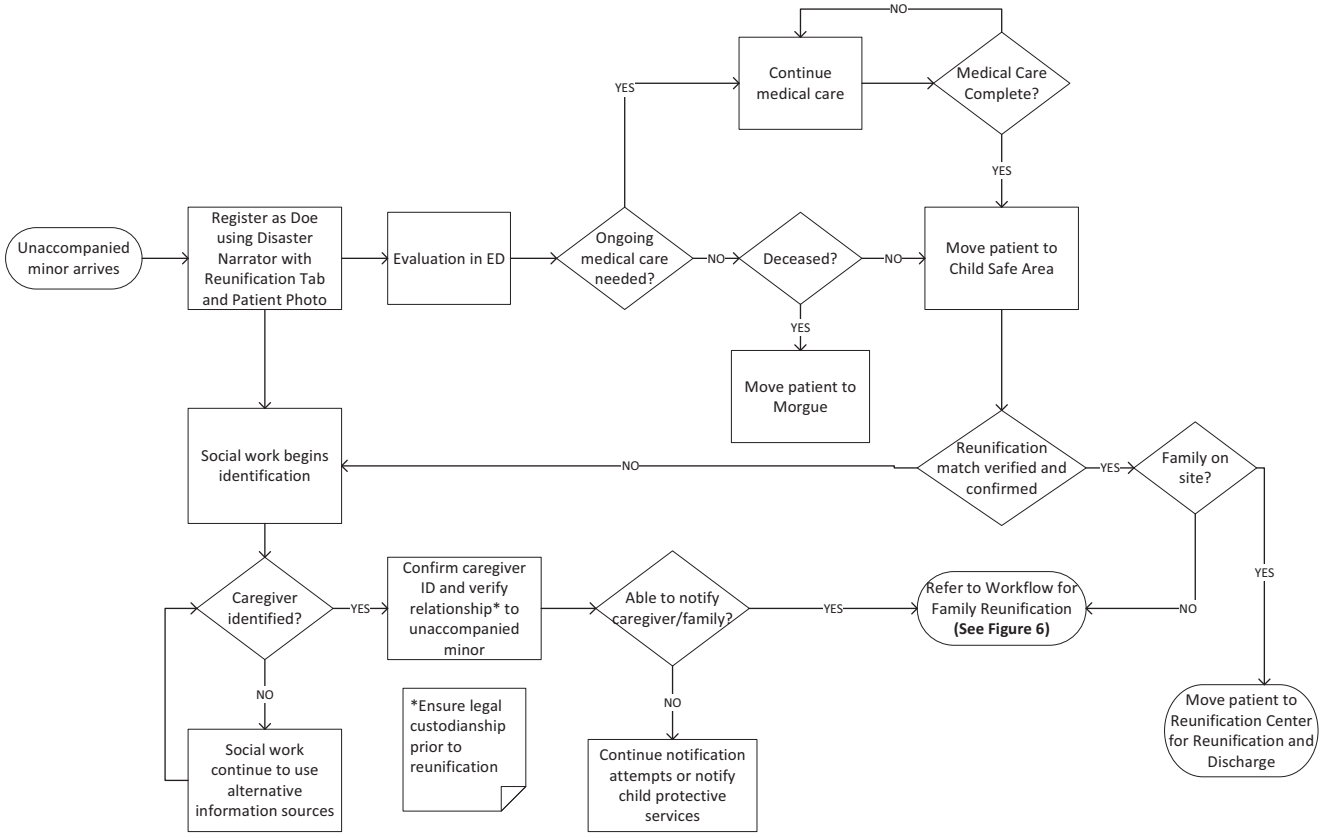

Figure 5. Workflow for presentation of unaccompanied minor.

to create a unified master protocol, which included individual protocols from stakeholders and a description of all roles necessary during an activation. Prioritization of time to create, revise, and meet was a barrier identified by stakeholders. We overcame this barrier by highlighting the need for this in our Mass Casualty Plan, director level support in emergency management, and dedicated champions who progressed the planning process through frequent reminders and setting deadlines.

Following all revisions, we planned and conducted a hospital-wide, full-scale mass casualty exercise, which included the implementation of the family reunification plan. We used an active shooter scenario involving a school nearby with 20 victims, ranging in age from 3-12 years. During this exercise, we found that we had successfully addressed many areas identified in Table 1. While we met the aim of activating and exercising the reunification plan, communication amongst all members of the family reunification team was identified as a continued area for improvement. Not all staff were aware of how to access resources, and there was some confusion as to permissions and processes around viewing of deceased patients. Additionally, we need to create a concrete plan for updating patients and families. We also discovered that we need to refine the path of travel during reunification, as there is only 1 entrance/exit to the family reunification center. These areas will be addressed in a subsequent family reunification exercise.

Sustainment of the family reunification plan included uploading the final documents into the online Emergency Management system for the hospital so that it is readily available. This plan will be reviewed and revised biyearly per hospital regulations and incorporated into hospital wide mass casualty exercises with planned reunification components. If needed, we can conduct additional drills focused on family reunification. We plan to share our reunification plan with community hospitals associated with our tertiary care center to strengthen family reunification beyond our health care system.

Limitations

First, this family reunification plan was formulated at a single setting at large tertiary children's hospital and may not be generalizable to other hospital settings. Specifically, hospitals differ in resources and may not have dedicated staff for emergency management or pediatric experts available for planning. Additionally, our patient population is primarily English fluent, decreasing our need for language services. In communities with more diverse language needs, inclusion of cultural awareness and language interpreters should be incorporated into initial planning. The focus of this tabletop was the evaluation of our hospital based family reunification plan rather than cascading disasters associated with limited resources due to infrastructural incapacity (i.e. power outage, network downtime, unavailability of external resources). Future exercises can be planned to incorporate these salient disaster issues.

We were able to successfully create and implement a family reunification plan with engaged hospital personnel, but this type of project may require executive sponsorship in a different setting, as both time and commitment are needed to complete it. By sharing our approach using the AAP toolkit and QI methodology, we hope to help decrease time and effort for other hospitals in developing family reunification plans.

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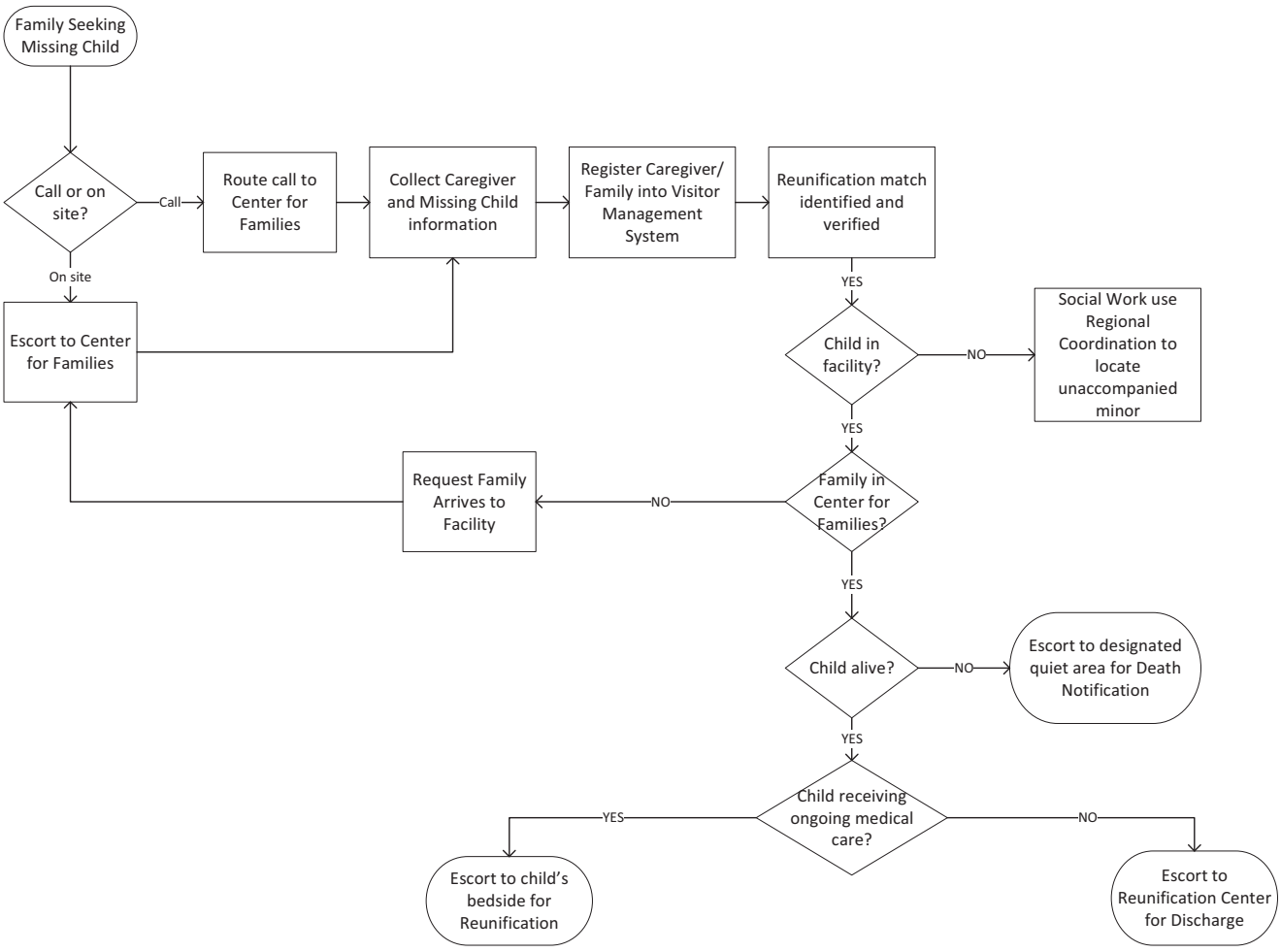

Figure 6. Workflow for family seeking missing child.

Table 1. Areas identified for improvement following tabletop exercise

Need for staff recall backup system
Providing access to the disaster manager setting in the electronic health record (EHR) to proper stakeholders
A plan to communicate information to families
Identifying verification of patient and guardian at discharge
Creation of a telephone script to relay messages to families seeking information
Process for providing information/updates to families
Allowing for reunification documentation through the EHR
Communication with other hospitals in the area regarding unidentified children during a disaster event

Lessons Learned and Conclusions

We successfully developed a family reunification plan for our hospital system using QI tools. We provided visualization of the resources needed for planning using the fishbone and key driver diagrams. We then used the PDSA cycle, like the HSEEP model, for systematic and iterative refinement of our reunification plan. This plan will continue to be refined based on gap findings in after action reports and tested in subsequent full-scale disaster exercises annually, continuing the PDSA cycle. By using QI principles, we achieved the inclusion and engagement of hospital personnel previously unfamiliar with disaster management who contributed to a robust and operational family reunification plan.

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/dmp.2025.52.

Author contribution.

- Dr. Pintea conceptualized and designed the project, conceptualized data collection, coordinated intervention implementation, drafted the initial manuscript, and revised and critically reviewed the manuscript.
- Dr. Lin conceptualized and designed the project; conceptualized the intervention implementation, the data collection instruments; and critically reviewed and revised the manuscript.
- Julie Shelton conceptualized the intervention implementation, provided input on QI tools, and critically reviewed and revised the manuscript.
- Dr. Charney conceptualized and designed the project; conceptualized the intervention, implementation, the data collection instruments, and intervention implementation; and critically reviewed and revised the manuscript.
- Dr. Chung conceptualized and designed the project; conceptualized the intervention, implementation, the data collection instruments, and intervention implementation; and supervised, critically reviewed, and revised the manuscript.

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- All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Competing interest. The authors declare no competing interests.

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