



## Abstract:

Nearly 90% of pediatric emergency care is provided in a general emergency department (ED) that serve both adults and children. Many children in the United States do not live near an ED with a high level of pediatric readiness and many children are transferred to dedicated pediatric centers. Telemedicine provides an opportunity to impact care delivery systems to allow for children to be treated closer to home while maintaining high quality care. In this article, we will explore opportunities to use telemedicine in the emergency department and discuss incorporating quality improvement methodology to increase utilization of telehealth services.

## Keywords:

Pediatric emergency medicine; Telemedicine; Telehealth; Access to care

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# Telehealth as a Tool for Quality Improvement in the Care of Pediatric Patients in Community Emergency Departments

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The majority of pediatric emergency care in the United States occurs in community emergency departments (ED) that serve both adults and children.<sup>1</sup> Many geographic areas in the United States require families to drive greater than 30-minutes to an ED with high pediatric readiness.<sup>2</sup> Community ED clinicians cite infrequency of pediatric cases, pediatric-specific quality and safety deficits in their systems, and the emotional toll of caring for sick children as challenges in caring for children.<sup>1</sup> The interfacility transfer of children from community hospitals to dedicated children's

hospitals has become increasingly common.<sup>3</sup> Transfer to dedicated children's hospitals has been shown to decrease morbidity and mortality for high risk conditions, however it may not provide equal benefit for all pediatric patients and families who can be safely cared for in their own communities (treated in place).<sup>4-6</sup> Interfacility transfers have been associated with redundant care and increased financial costs.<sup>7</sup> Telemedicine provides an opportunity to impact care delivery systems and allow for children to be treated in place while maintaining high quality care.

Telemedicine is defined as the remote delivery of healthcare services and clinical information using telecommunication technology.<sup>8</sup> Telehealth, a term often used interchangeably with telemedicine, encompasses additional applications including education, advocacy, research, and quality improvement. To date, telemedicine has been employed as a tool to deliver a broad array of pediatric services from mental health services to critical care consultation in rural areas.<sup>9,10</sup> In this article, we will explore opportunities for using telemedicine to connect pediatric emergency medicine specialists to emergency care providers in community EDs and incorporate quality improvement methodology as part of a broader telehealth strategy to optimize telemedicine utilization and evaluate programs.

## THE VALUE-ADD OF TELEMEDICINE

Telemedicine provides multiple opportunities to impact quality of care for pediatric patients seen at community EDs. Published benefits include improved outcomes for critically ill patients, decreased rates of medication errors, and improved disposition planning.<sup>9,11,12</sup> Other potential benefits include improved compliance with pediatric-specific clinical care guidelines and coordination of appropriate subspecialty follow up. Each is discussed in more detail below.

Following implementation of a telemedicine video-consultation service connecting rural EDs to pediatric critical care physicians, significant improvement in quality of care metrics has been demonstrated.<sup>9</sup> Referring clinicians from rural EDs report changes in diagnostic studies and therapeutic interventions following telemedicine consultation more than 50% of the time.<sup>9</sup> Pediatric weight-based medication errors are not uncommon occurrences in rural EDs, and telemedicine has been shown to decrease physician-related medication errors among acutely ill children.<sup>11,13</sup> These studies involved consultation with a pediatric critical care physicians; however, similar results may be expected when connecting pediatric emergency medicine

physicians to community EDs. This is an area of ongoing study.

Telemedicine also provides an opportunity to improve disposition determination to decrease potentially avoidable interfacility transfers of non-critically ill children and reduce financial and emotional burden for families.<sup>7,12</sup> A study of interfacility transfers to a pediatric academic emergency department reveals that over one-third of transfers are discharged directly from the ED or were discharged within 24 hours of inpatient admission.<sup>6</sup> When a transfer to a higher level of care is warranted, telemedicine can aid in facilitating direct admissions to the appropriate unit and improve information transfers during hand-offs.

Telehealth provides an opportunity to increase adherence to published clinical care guidelines for common pediatric illnesses through the sharing of clinical care pathways during telemedicine consultation. Examples include American Academy of Pediatrics guidelines for bronchiolitis, asthma, and fever in children <60 days of age, which are regularly updated due to new data or evidence. Videoconferencing with a pediatric emergency physician may reduce unnecessary admissions, medication exposures, procedures, and diagnostic imaging. Pediatric emergency medicine physicians at children's hospitals also often have direct access to pediatric medical and surgical subspecialists who can aid in determining appropriate management for specific concerns (eg, type of splint and timing of follow up for a specific fracture).

Finally, an additional potential benefit from the use of telemedicine involves coordination of appropriate subspecialty follow-up. Dedicated support staff for telemedicine programs may assist families in establishing timely follow-up for additional diagnostic evaluation and subspecialty follow-up (eg, electroencephalogram scheduling for complex febrile seizures and neurology follow-up). The support offered to community-based emergency providers by this type of care coordination may reduce transfers and admissions of low-risk patients.

## Measuring Impact of Telehealth Programs in Community Emergency Departments

As the impact and scope of telehealth programs continues to grow, the National Quality Forum (NQF) published a framework for the development of telehealth measures in 2017. Within this framework, *access to care*, *financial impact/cost*, *experience*, and *effectiveness* were listed as domains with multiple subdomains within each broader

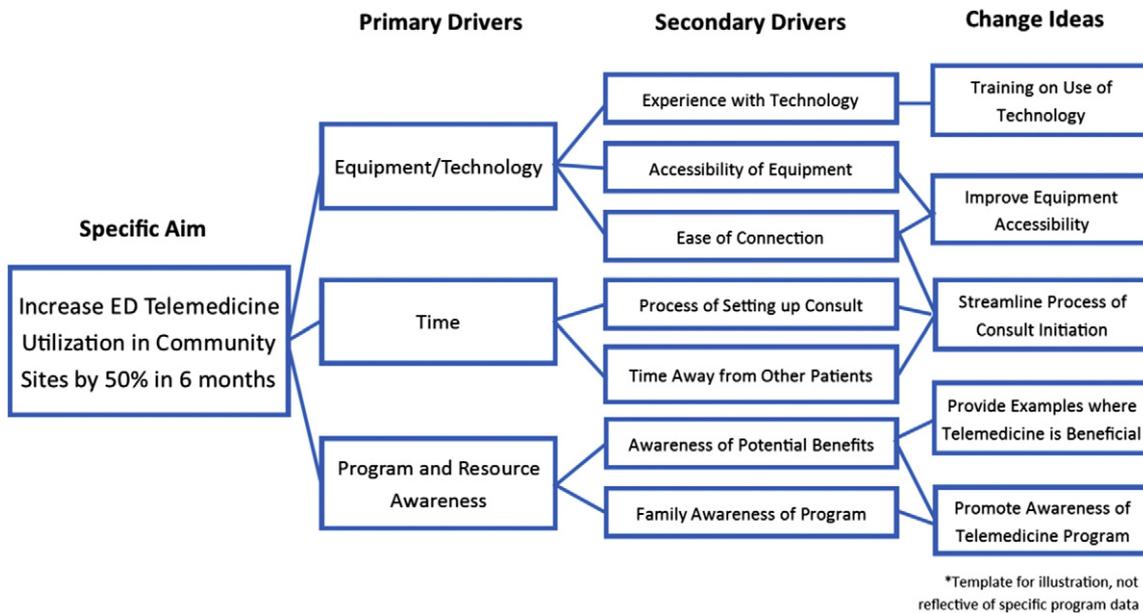


Fig. 1. Key Driver Diagram: Telemedicine Utilization\*

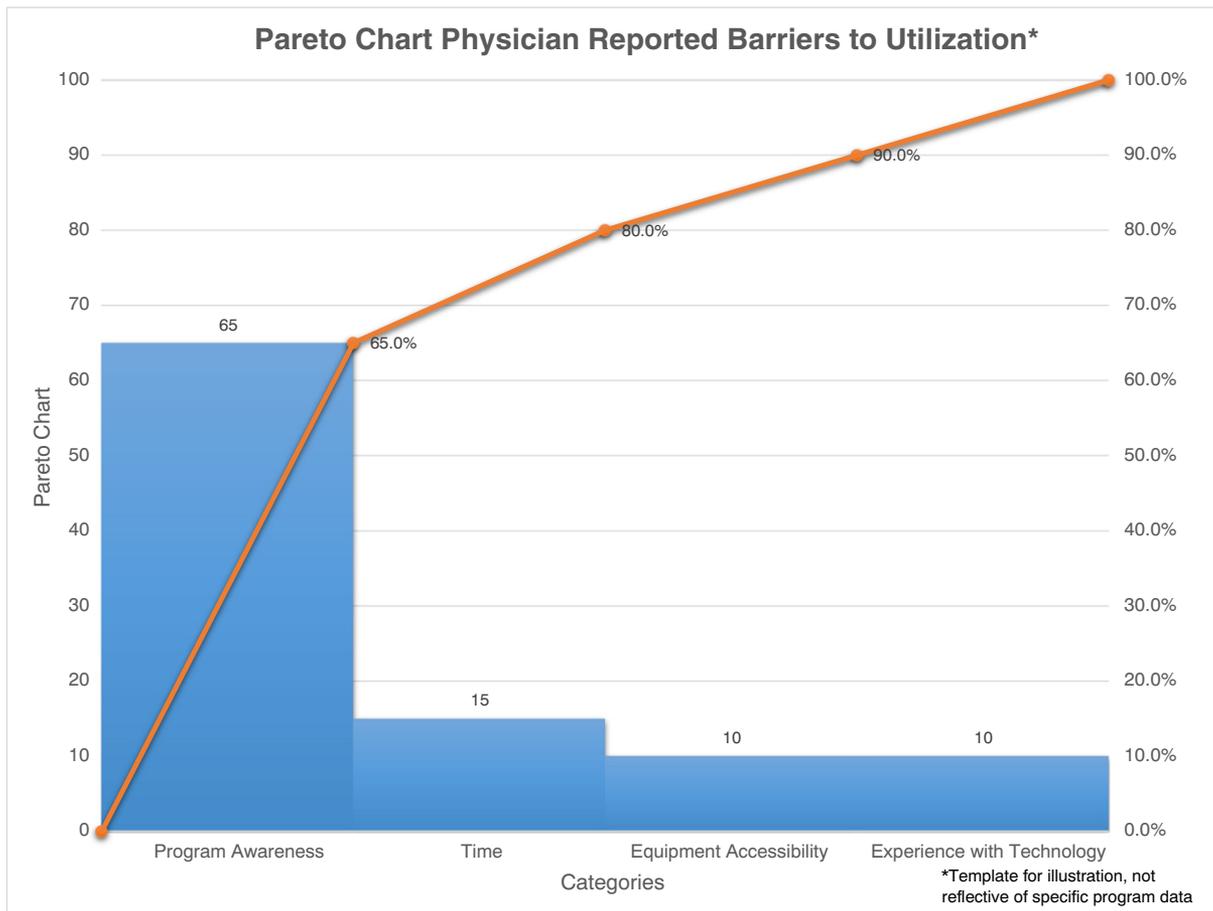


Fig. 2. Pareto Chart Physician Reported Barriers to Utilization\*

category.<sup>14</sup> Distance traveled, time, and cost savings are frequently reported metrics that evaluate the domains of *access* and *financial impact* of telehealth programs in the ED. Patient and family satisfaction as well as provider satisfaction are often measured through surveys and evaluate the *experience* domain for telemedicine programs in the ED.

The *effectiveness* domain presents a unique challenge for metric development and program evaluation. System and operational effectiveness can be ascertained and improved through time studies, process mapping, and other traditional process improvement strategies. However, measurement of clinical quality and effectiveness require additional consideration. Measures to evaluate telehealth program impact on improving disposition determination, decreased medication errors, improved quality of care for critically ill children, increased compliance with clinical care guidelines, and established subspecialty follow up can be created. Many of these are process measures and measuring the true longitudinal outcomes of what initially brought the family to the community ED may be challenging to determine. Additionally, these metrics cannot be applied universally to all patients due to the varied volumes and significant breadth and scope of illnesses of children seen in community EDs as well as variability of pediatric resources available at each referring community site. Finally, intra- and inter-institutional-level considerations present unique challenges. For example, for some measures, the community site would require an investment of clinical and data resources and a commitment to prospectively track and record patients that meet inclusion criteria continuously to create an appropriate denominator for performance assessment. Relatively low pediatric volumes at many community hospitals may not be thought to justify this degree of resource allocation. The primary pediatric site could retrospectively collect the data for these types of clinical effectiveness and quality measures, but this requires appropriate data-use agreements between the institutions to permit access to the electronic health record. The ultimate goal is improvement of these measures, which requires additional investment and collaboration among tertiary pediatric centers and community hospitals. Metric development for clinical effectiveness and quality in telehealth programs is an area for future academic inquiry that may require a customizable approach based on individual originating site needs.

## Quality Improvement Methodology: A Tool to Increase Telemedicine Utilization in Community Sites

An initial area for utilizing quality improvement methodology in the community ED with modest resource investment may be in understanding and improving utilization at the community site. Multiple barriers exist for widespread implementation of telemedicine programs in these sites. Many clinicians are hesitant to utilize new healthcare technology, including telemedicine.<sup>15</sup> Quality improvement methodology can be used to perform focused barriers assessments with community emergency medicine teams, determine key drivers to low utilization, and map out appropriate interventions (Fig. 1). Prioritization of the most pertinent barriers can be ascertained using a Pareto chart to determine interventions with the highest potential impact (Fig. 2). Baseline utilization can be plotted over time on run or statistical process control charts. Interventions to increase utilization can be implemented and modified iteratively over time in response to the impact. ☒

## SUMMARY

Telehealth carries tremendous potential to improve the quality of care for children treated in EDs in the United States. There are numerous clinical scenarios where telemedicine has potential or already proven benefits to improve clinical outcomes, access to care, and financial savings. Strong collaboration is required between telehealth programs and community EDs to address changing needs, new barriers, and allow for a culture of continuous improvement.

Clinical effectiveness of telehealth programs designed for children in the emergency department remains an area of ongoing and future study and metric development. Data sharing between institutions and data support systems will be essential for sustained growth, evaluation, and improvement of care delivery through telehealth programs. ☒

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