Abstract:
The growth of community hospital based pediatric emergency departments has created an opportunity to develop locally formulated quality improvement processes. Inherent challenges, resource and solutions are explored. Building a well-defined QI infrastructure, one that promotes multidisciplinary buy-in and ownership among invested participants, is central to success.

Keywords:
Quality improvement; community pediatric emergency medicine; pediatrics; team formation

Development of a QI Program Within a Community Pediatric Emergency Department

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Throughout the past decade, there has been a trend among pediatric specialty centers, and within the field of emergency medicine, for the development of regional pediatric emergency departments (PEDs) based in the community hospital setting. Many of these PEDs are affiliated with pediatric academic centers, while a growing minority are independent. In many cases, community PED programs are staffed by physicians boarded in pediatric emergency medicine (PEM), with variable pediatric-specific staffing and ancillary services available. Regardless of their affiliation, staffing model or available pediatric services, community programs are unique, often located a significant distance from the tertiary pediatric specialty center, and are populated by faculty whose primary focus is on direct clinical care. In establishing a community-based program, one of the central questions becomes, how does a community PED assess, refine and evolve their care delivery processes to assure continued excellence in the delivery of care for pediatric patients served? This article describes one institution's experience in implementing a robust quality improvement

(QI) process within a community hospital based PED. In describing our QI journey, we will review the unique barriers faced and potential solutions towards successful deployment within the community hospital setting.

PROGRAM DESCRIPTION

Central Dupage Hospital (CDH), a community hospital located approximately 30 miles west of Chicago, began an affiliated PED with Ann & Robert H. Lurie Children's Hospital of Chicago (formerly Children's Memorial Hospital) in 2006. As many satellite programs do, the program at CDH began with limited hours of operation and a small core group of PED staff; the PED grew substantially over its first half decade. By 2012, the program had transitioned into a dedicated 17-bed unit staffed by pediatric specialty nurses and medical personnel, advanced practice nurses (APNs), and 4 to 5 full- and part-time pediatric emergency medicine (PEM) physicians—providing services for 12 to 16 hours a day, caring for more than 15 000 patients annually. Throughout the program's infancy, the focus was on maintaining appropriate staffing during hours of operation and integrating a few select quality improvement initiatives to align delivery of care with our affiliated academic center. QI conducted at CDH during these first 6 years was therefore limited in size and scope. As the PED program expanded, and the patient population evolved in volume and complexity, it became clear that a locally formulated QI program was necessary to improve patient care delivery unique to our setting.

The challenges faced at that stage in our PED's development, one which remains a relevant barrier for many community programs, was how to build and sustain a meaningful QI processes, in a non-academic center, without the benefit of a strong QI or research culture, limited local resources, and limited or no dedicated time to conduct QI initiatives. Four basic principles have aided our program in producing what we believe is a sustainable (and likely reproducible) model within a community hospital based PED:

- Developing a QI workgroup infrastructure and clearly defining directives
- Stressing multidisciplinary efforts
- Shifting the community ED practitioner paradigm away from apure clinical focus to enhance both physician and nursing participation in the QI process
- Recognizing the importance of external groups and collaborators

Figure. 1 offers a SWOT analysis highlighting the strengths, weaknesses, opportunities and threats related to the implementation, integration and growth of QI in our community PED and lays the foundation upon which this article's discussions are anchored.

QI WORKGROUPS: CREATION AND DIRECTIVES

In our institution's experience, the key driver to facilitate QI discussion and project implementation was the formation of our QI workgroup. Above all else, having well-defined processes and an infrastructure in place not only facilitated the conceptualization of QI projects, but formalized a course of action which, by design, was creative, collaborative and self-regenerative in nature.[1] The core structure and timeline for our workgroup is described below:

- Team development: the PED QI workgroup is multidisciplinary, composed of nurses, administrators, APNs, and physicians.
- Schedule: the group meets on a quarterly basis. Each quarterly meeting within the fiscal year has a specifically defined goal:
  - o Quarter 1: Brainstorming session
  - o Quarter 2: Project write-up and group solidification
  - o Quarter 3: Project update
  - o Quarter 4: Project close-out or update with timeline projections discussed
- Team structure: QI projects require a primary investigator (PI) or co-PIs, to be selected by Quarter 2.
  - o All PED attending physicians are expected to function as a PI for at least one project per fiscal year.
  - o Investigative groups can vary in size based on project breadth and member interest.

The outlined workgroup infrastructure and timeline has allowed for a process that is structured yet also flexible. There is no better representation of this dichotomy then Quarter 1's "brainstorming" meeting; often the most interesting and animated session in the timeline. During this meeting, all participants are encouraged to bring potential ideas, or raw pitches, to the table for expanded discussion by the larger group. Importantly, these ideas do not have to be polished, completely researched, or fully vetted from a feasibility standpoint to be brought forward for consideration. While it is often the case

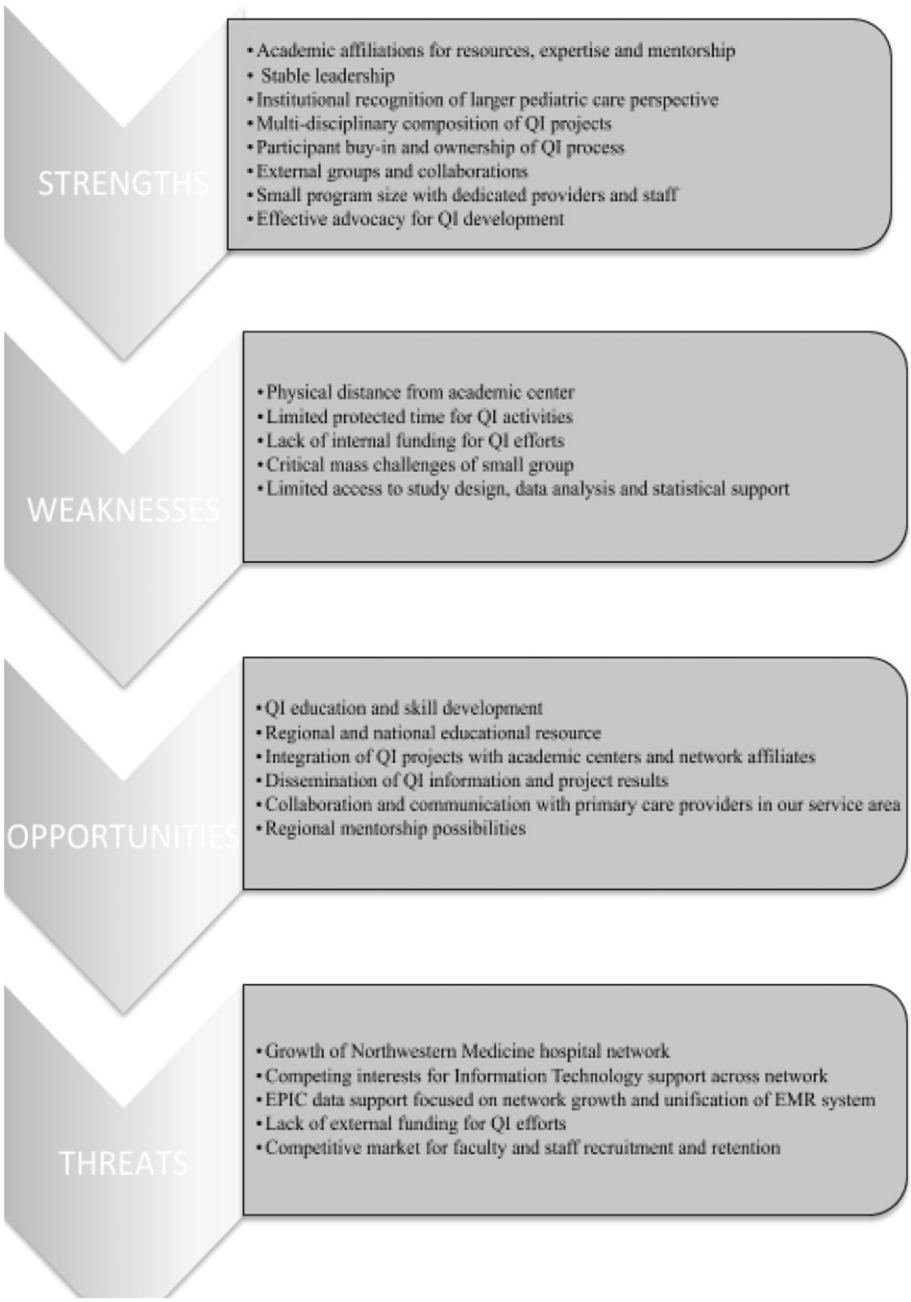

Figure. 1 Developing QI in community emergency department SWOT analysis.

that an individual provider or nurse may subsequently become the PI for a project idea that they pitched, this is not a forgone conclusion, as formalizing investigative sub-groups and PIs is a separate process. The concept of the "raw pitch" being not only acceptable, but encouraged, by any of the participants within the group is at the core of allowing creative brainstorming and developmental discussions to prevail. This transforms a meeting—potentially limited by the pressure to only share ideas reaching a perceived threshold of worthiness—into a freely flowing open forum. During this brainstorming process, QI workgroup member input often assists in further refining preliminary ideas into a more fully developed project conceptualization.

The second quarter meeting is clearly delineated for the structured presentation of project write-ups, determination of the project PI, and project charter and team formation. QI project write-ups, similar to

research abstracts, are expected to cover background, goals, outcome metrics, and projected timeline elements. This meeting serves as a final opportunity for group input and project refinement before the PI develops the final charter and launches the project officially. The remaining quarters allow for mid-study updates and the PI's final project presentation, respectively. All PIs of multi-year or tiered projects, of which we've had many, are requested to give project updates and recalibrated project timelines during the 4th quarter meeting.

This QI project development and management process has been a gratifyingly successful working template for the implementation of quality and process improvement, with over 40 projects to date completed since the workgroup's formation. Within a group of less than five full-time providers, an average of 8 to 10 ongoing projects will be active each fiscal year, led by team members of all provider types (physicians, nurses, and APNs). Project breadth is quite variable. Many QI initiatives are multi-year, some have been presented at local or national conferences, and a few have been submitted and/or accepted for publication. Most importantly, this process has provided our group with an empowered and effective mechanism for the continual assessment and improvement of care provided within our PED.

MULTIDISCIPLINARY EFFORTS

By design, the PED QI workgroup is multidisciplinary in nature. Essential stakeholders include members of our nursing staff, nursing and hospital administrative leaders for the PED and the main ED, advanced practice providers and PED physicians. Individual QI project groups often mirror the overall QI workgroup composition and include a mix of provider types. We believe the presence of a multidisciplinary team is one of the fundamental strengths of our process, increasing collaboration, buy-in, and broadening the perspective and scope of discussions in all phases of the QI project.

The development and execution of our hospital's Pediatric Mock Code Initiative (PMCI) between FY16 and FY18 serves as a quintessential example of the merits this approach offers in QI construction and delivery. In the spring of 2016, a sub-group of our QI committee began working on the outline for a simulation pilot. The impetus for this project centered on the recognition of variable skill sets among our PED nursing staff and the lack of consistent training opportunities for pediatric resuscitation. Resuscitations were identified as high-acuity, low-frequency events, as they did not offer good fundamental clinical comfort or sustained knowledge based on clinical repetition alone. Once this concern was identified, a five member QI working group was formed, including: (1) pediatric ED medical director, (2) ED nursing educator, (3) ED nurse specialist, (4) PED and ED outcomes manager, and (5) hospital trauma coordinator.

During the QI committee's first quarter (brainstorming) meeting, the PMCI sub-committee presented the concept for utilizing the simulation lab to develop a PED simulation program to assist in the education, training and practice of high-acuity/low-frequency pediatric emergencies for our PED nursing core (n = 18). Group feedback at that time was useful in further refining the PMCI scope and educational goals; specifically regarding opportunities to build pre-/post-simulation skill set reinforcement to assist in long-term skill and knowledge retention. Both subjective and objective metrics were discussed and further refined based on QI workgroup feedback. The multidisciplinary subgroup took this feedback and refined the project charter between Q1 and Q2 of the fiscal year—with project launch occurring in December 2017.

Final project design would include four high-acuity pediatric simulation scenarios conducted quarterly, 16 total for the 1-year pilot project, for the entire PED nursing core. Each subsequent quarter's simulation skill set was formulated to build upon the former's with regards to medical knowledge and requisite skill set complexity. The program was designed to render immediate post-simulation educational/content expertise during post-code debriefing. Additionally, during the non-simulation months of each quarter, pre- and post-simulation educational reinforcement of key concepts was delivered to the nursing staff as educational modules during clinical shifts (Figure. 2). The PMCI completed its 16th and final simulation for the PED nursing core in May 2018. The pilot program showed statistically significant improvement in outcome metrics measured regarding self-reported gains by the nurses in both acute care knowledge and practice changes (Figure. 3). Additionally, improvements in nursing clinical competency, fund of knowledge and overall acute care acumen were observed by PED attending physicians during shifts. Due to the success of the pilot, plans to expand this program into a more ambitious QI initiative, one which will include all PED and main ED nurses (n = 100) and PED and main ED physicians, are currently in development.

Throughout this process, the nurse-physician collaboration became central to the pilot program's overall successful implementation in 2 key areas:

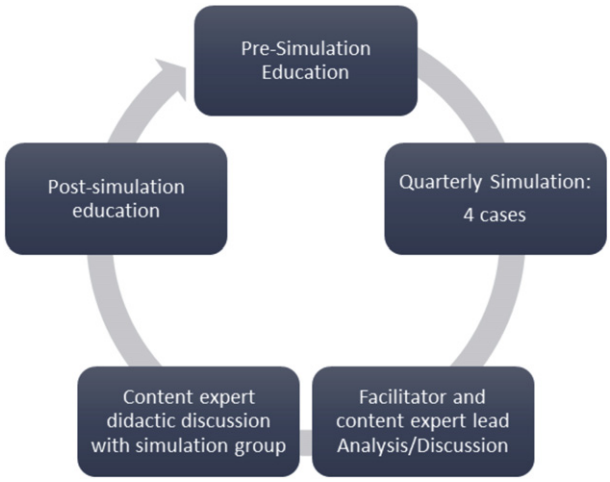

Figure. 2 PMCI quarterly education cycle.

scenario development/deployment and project advocacy. Utilizing a mixed group of providers allowed us to design simulation scenarios that were medically accurate in their presentation, pathophysiology and progression, while aligning with the knowledge base and interventional skill set appropriate for a PED nurse. Striking this important balance in educational focus was unlikely to be attained in the absence of a multidisciplinary approach. The importance of this collaboration was further evident during deployment of the actual simulations, during which the educational team was composed of both a nursing facilitator and a physician content expert working in tandem; allowing post-simulation debriefing and discussions to cover a wide array of nursing specific skills as well as resuscitation pathophysiology.

The goals for the PMCI required a significant investment in nursing education time, simulation lab resources and PED staffing coverage—all associated with significant costs. Advocacy within both nursing and physician administrative hierarchies were paramount to gaining this financial support and launching the program. The diverse make-up of the PMCI workgroup allowed us to successfully advocate for financial support from several different cost centers simultaneously as we had team members affiliated with different hospital departments. Going forward, this will remain an asset in obtaining support for the next iteration of this project.

CREATING BUY-IN

The development of participant buy-in and creation of a sense of ownership for QI projects is as crucial to the process as having the appropriate mechanisms and infrastructure in place to formulate and conduct QI. Questioning current care practices and patient outcomes, and taking the time to evaluate data utilizing QI tools, requires the commitment of providers and staff. Achieving this commitment can be particularly challenging within the context of a community hospital where 'protected time', more common to academic sites, may not be allotted for PED staff and providers.

Shifting the community provider paradigm from a clinical focus to one centered on quality is an

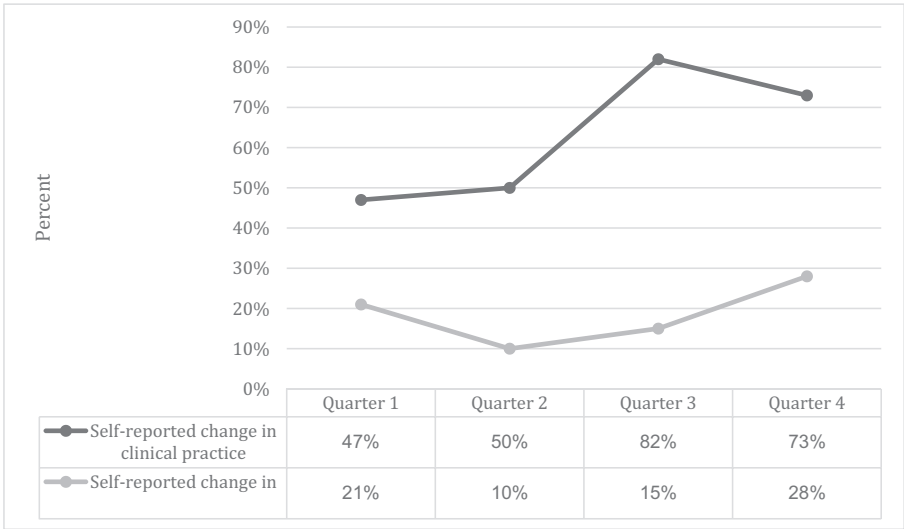

Figure. 3 PED nurses reporting change in either knowledge base or clinical practice.

important early step in formulating a sustainable QI culture. In our experience, buy-in becomes organic when QI becomes an identifiable attribute of the group, one that is shared among all provider disciplines within the PED. To this extent, a well-designed infrastructure and consistent leadership are two pillars that have assisted us in maintaining the pace and growth of our QI program and participant engagement. The multidisciplinary nature of the QI workgroups, allowing for all provider types to participate in the process, further contributes to a culture that continually strives for excellence. It is our observation that typical barriers to participation and/or project implementation tend to break down in this type of environment. In this way, the QI process becomes an ingrained activity within the group, not merely an expectation to be checked off.

Importantly, institutional priorities and local culture regarding quality and process improvement may not always align well with perceived needs in microsystems such as the ED. The absence of an engaged and supportive institutional commitment can limit the success of a QI program. Effective advocacy by PED leadership may be necessary to ensure engagement and support by hospital system (s) leaders. Depending on the scope and resource requirements of a given project, advocacy often approaches equal importance to project development in terms of viability. Throughout our history, advocacy has taken many forms, but fundamentally involves PED leadership engaging senior administrative leaders, communicating the project's scope and rationale. To be a successful advocate, one must be ready to articulate the cost–benefit relationship for the organization and the populations of patients expected to benefit. It is also important to identify key stakeholders, recognizing those groups most likely to be strong partners, co-champions, or opponents, in the process. Finally, one should have a keen appreciation for how the project aligns with the values and mission of the institution. Our program has been fortunate to have consistent leadership within the PED, a strong partner at the children's hospital, and pediatric advocates within the community hospital, all of whom share our desire to improve pediatric care through systematic quality improvement.

Finally, logistic hurdles to creating buy-in may be encountered, depending on the size of the group. Community PED staffs tend to be much smaller compared to those of academic pediatric centers and this may impact the ability of team members to participate in QI initiatives. While recognition of the group's limitations is important, in our experience, the smaller size of our PED team has offered unique advantages towards the maintenance of momentum in project identification, development and implementation. Smaller workgroups often lend themselves to greater local control, enhanced team member communication, better efficiency and fewer barriers to project participation. Further, strategies designed to improve care processes translate more readily into clinical practice when designed and evaluated by front-line providers. As with any quality initiative, key stakeholders are front-line clinicians and staff who do the work, and therefore, best understand the unique situational dynamics affecting care delivery processes, and the potential benefits achieved through change.

IMPORTANCE OF EXTERNAL GROUPS AND COLLABORATORS

External groups and guests from outside the formal QI workgroup can become important allies in developing impactful QI. Within our institution, we colloquially refer to these external relationships as “feeder groups”, those whose expertise, input or partnership, “feed” or contribute to the primary mission of PED QI. Examples of this can include member participation in regional or national QI efforts, affiliated hospital initiatives, intrahospital and subspecialty QI committees, and subspecialty guests involved in direct project input.

Affiliated and subspecialty partnerships are an invaluable component of our QI initiatives and process. During the past 6 years, we have co-developed projects with pediatric surgery, pediatric infectious disease, pediatric urology, social work and child protective services, inpatient pediatrics, neonatology, pediatric endocrinology, pediatric neurology, the department of emergency medicine, the department of radiology, and with our affiliate, Lurie Children's Hospital. Noteworthy examples of co-sponsored projects during this timeframe include: evaluation of utilization of empiric narrow-spectrum therapy for urinary tract infections (pediatric infectious disease, urology); creation of an electronic medical record (EMR) based two-tiered sepsis screening system (pediatric infectious disease, neonatology, pediatrics); development of guidelines for appropriate treatment for children presenting with diabetic ketoacidosis (pediatric endocrinology); and creation of EMR based template for improved capture of critical history and physical examination elements in sexual assault cases (social work, child protective services). Our largest published study to date, development of a staged

ultrasound-first pathway for children being evaluated for appendicitis, evolved from a partnership with pediatric surgery and was successful in reducing utilization of computed tomography (CT) for this patient population by 72%.[2] Each cooperative project has allowed us the opportunity to align best practices with our local experts, simultaneously improving and standardizing the care delivered to our pediatric patients—and lends credence to the maxim that QI not be conducted in a silo. As these partnerships often mirror the reality and needs of subspecialty consultation on a day-to-day basis within the PED, they offer the added benefit of strengthening the functional working relationships and alliances with those colleagues.

Partnering with the Illinois Emergency Medical Services for Children (EMSC) state partnership program has laid the groundwork for several of our initial projects, such as an initiative to decrease the use of CT for minor closed head injury and our work with improving pediatric pain assessment and treatment. Involvement within the state EMSC program provides an excellent platform for all EDs to participate in regional pediatric QI projects. Participation in EMSC endorsed projects can be especially helpful for those institutions with fewer resources and/or experience in QI development, as these projects are designed to be achievable in scope without significant resource investment and are preconstructed. In addition, mentorship in quality methodology and structure may also be available in many regions through EMSC and other funded groups. The EMSC forum also allows community based EDs with greater subject matter expertise in pediatrics, and those with more evolved QI programs, to become recognized as a resource and mentor for other EDs in that region.

RESOURCE BARRIERS AND SOLUTIONS TO COMMUNITY QI IMPLEMENTATION

As discussed early in this article, clinical workload, administrative support and provider/staff buy-in represent challenges that require attention during the implementation of a robust QI program. Additional challenges faced by community programs tend to be resource-based in nature, and if not adequately addressed, may become barriers that limit QI project breadth and completion, and program growth. Resources that are of particular importance to QI include provider education opportunities and data access and analysis.

Evolution and growth of the community PED QI program is dependent on the availability of relevant professional education. Pursuit of QI training should be both encouraged and sought out by healthcare providers, including those working outside of academic centers. Opportunities to acquire training can now be found in a variety of venues and formats, including affiliate academic programs, regional training opportunities, and from a variety of national professional organizations. As an example, several members of our PED QI team have participated in educational programming offered through our academic affiliates at Lurie Children's Hospital and Northwestern Medicine. The Northwestern Medicine Academy for Quality and Safety Improvement (AQSI) is a unique QI mentorship focused collaboration providing clinicians the opportunity to participate in team-based experiential learning, didactic sessions and subsequently QI project development. This past year, after a competitive submission process, a small sub-group of providers from our PED QI committee were chosen to participate in the ASQI program, and are currently conducting a prospective study in partnership with the Department of Radiology with a goal of improving ultrasound services within the ED.[3]

Regional and national educational resources should also be explored, and can assist in augmenting provider QI acumen, when attempting to build a community program. While a full review of these available resources is outside the scope of this article, a few examples bear mentioning. Depending on your location, programs such as Emergency Medical Services for Children (EMSC) are useful in sharing best practices and promoting QI initiatives and learning collaboratives regionally.[4] EMSC State Partnership Programs disseminate information and resources via a variety of mechanisms, including newsletters and webcasts, which allow access to a larger audience.[5] National organizations, such as the Institute for Healthcare Improvement (IHI), provide courses which are free and allow participants to learn at their own pace with the potential to earn certification in a broad scope of quality-related forums.[6] Through our relationship with Lurie Children's, community PED faculty have utilized organizational access to the IHI's Open School and Professional Development Program, subsequently completing online courses centered on quality improvement, patient safety, patient-centered care and leadership development.

The American Academy of Pediatrics (AAP) remains an important resource for clinicians, regardless of academic affiliation, to access important QI based education and QI project concepts. Our institution participated in the Pathways for Improving Pediatric Asthma Care (PIPA) through

the Value in Inpatient Pediatrics (VIP) Network, sponsored and funded by the AAP.[7] In this project, PED and hospitalist physicians were educated on evidence-based best practices and given tools to promote sustainable change aimed at improving the quality of life and reducing morbidity for children with asthma. Through the framework provided by the AAP, data was collected in the PED and pediatric inpatient unit evaluating the following metrics: assessment of asthma severity at triage, timely administration of systemic steroids, decreasing utilization of chest x-rays, early transition to metered dose inhalers, eliminating unnecessary antibiotic prescriptions and increasing referrals to smoking cessation resources. Monthly webinars were held to share institutional results and to offer guidance and feedback. Locally, our study findings will be shared at our hospital's quality improvement forum. Similar to two prior VIP studies focused on bronchiolitis and community-acquired pneumonia, the AAP plans to publish and disseminate PIPA results across numerous national platforms once the study is complete.[8,9]

QI projects of greater complexity may require biostatical analysis that exceeds the ability of the QI team. Accessing support for data analytics may be problematic within community programs. Often, this expertise is available at affiliated academic institutions or potentially through resource sharing with non-related institutions. It is our experience that bridges connecting these resources often must be either requested or built; especially if the program is currently in the early stages of QI workgroup development. As an example, within our QI group, a retrospective study examining empiric treatment of uncomplicated UTI's for PED patients found a large degree of variation in prescribing habits among providers, with broad-spectrum antibiotic coverage frequently prescribed by both general and pediatric ED providers. Based on the results of this retrospective study, and review of our hospital's antimicrobial resistance patterns, a prospective study evaluating utilization of narrow spectrum antibiotics for uncomplicated UTIs was proposed within our QI workgroup. EMR based *ICD-9* and *ICD-10* reports were eventually created to assist in collecting prospective data. However, once data became available, the project stagnated as our group struggled to find the necessary support for data analysis. To our good fortune, with persistent advocacy and discussion, PEM leadership at the children's hospital successfully secured funding to provide division-wide statistics support for research and QI initiatives, with community programs included in this plan. The project was subsequently successful in two regards. First, the final prospective data provided strong confirmation of narrow spectrum antibiotics as being safe and effective first-line agents in the empiric treatment of UTIs. These findings have significantly impacted provider-prescribing practices in our PED, the main ED, and among some community providers as findings were dispersed among all three groups. Secondly, the project has broadly impacted all future local PED QI by establishing the pathway for timely access to statistical support.

Through persistence, advocacy, and some trial and error, our group has identified various layers of QI support leading to the expansion of our community hospital-based PEM faculty members' knowledge base and analytic skills. These resource and experiences have strengthened the group's overall abilities to conduct meaningful QI and will be essential to informing future quality improvement projects within our practice environment. Based upon our experience, we believe identification of similar local, regional and national resources are key towards facilitating the evolution of QI within the community setting.

SUMMARY

Development of a robust community hospital based QI program is possible given time and with diligence. The success of these programs relies on creating a functional multidisciplinary leadership and team structure, fostering the development of a QI culture, and effective advocacy for necessary educational resources and statistical support. Physicians practicing in affiliated programs can develop areas of interest and make meaningful contributions to patient care both within their hospital and beyond. Finally, programs succeeding in developing a reproducible process for community QI should view themselves as mentors in their own right and endeavor to extend their expertise to community programs in their region with less formalized QI infrastructures.

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