

Multi-stakeholder informed guidelines to support direct
admission for hospitalized children

A thesis submitted by

JoAnna K. Leyenaar

in partial fulfillment of the requirements for the degree of

PhD

in

Clinical and Translational Science

Tufts University

Sackler School of Graduate Biomedical Sciences

2017

Advisor: Dr. Peter K. Lindenauer, MD, MSc

ABSTRACT

Introduction: One-quarter of all unplanned pediatric hospitalizations in the United States begin as direct admissions, defined as hospital admission without first receiving care in the hospital's emergency department. For some children, direct admission may have several advantages over admission beginning in the emergency department, including improved continuity of care, decreased risk of nosocomial infection, and reduced resource utilization. However, studies in adults have raised concerns about the safety of this admission approach. Previous research has shown that direct admission rates for children are highly variable across hospitals, yet we know little about why this variation exists, or how to optimize direct admission quality and safety. The work summarized in this thesis aimed to address these gaps through three complementary studies: (i) a qualitative analysis characterizing patterns of pre-admission acute care for children and parents' priorities regarding their child's hospital admission processes and outcomes; (ii) a retrospective cohort study examining hospital and community characteristics associated with pediatric direct admission to hospital; and (iii) deliberative methods and a modified Delphi process to develop direct admission guidelines for hospitalized children.

Methods: The work summarized in this thesis applied mixed methods, including: (i) semi-structured interviews with parents of hospitalized children, (ii) hierarchical regression modeling to determine the proportion of variation in hospitals' risk-adjusted direct admission rates that may be attributed to observed hospital and community characteristics, and (iii) pairing of deliberative methods and a modified Delphi process to

engage multiple stakeholders in the direct admission process to develop pediatric direct admission guidelines.

Results: We conducted 48 interviews with parents of hospitalized children at four hospitals. Children had a median of 2 [interquartile range 1-3] healthcare encounters in the week preceding hospital admission, with 44% seeking care in multiple settings. Participants' hospital admission priorities included: (i) effective clinical care; (ii) efficient admission processes; (iii) safety and security; (iv) timeliness; and (v) patient- and family-centered processes of care. In our retrospective cohort study of 211,458 pediatric discharges from 933 hospitals and 26 states, 20.2% were admitted directly. One-fifth of the variance in risk-adjusted direct admission rates was attributed to observed hospital and community factors. The greatest proportion of this explained variance was related to ED volume (37%), volume of pediatric hospitalizations (27%), and size of the pediatrician workforce (12%). Using a modified Delphi process, panelists endorsed 71 direct admission best practices and 13 outcomes to evaluate hospital admission processes.

Conclusions: These three papers expand our knowledge about factors associated with direct admission to hospital, and characterize diverse perspectives of key stakeholders in this admission approach. The direct admission guidelines resulting from this work can be adapted by hospitals and health systems to inform hospital admission policies and protocols, providing best practices to standardize approaches to hospital admission for children.

ACKNOWLEDGEMENTS

I would like to thank my Thesis Advisory Committee (Drs. Peter Lindenauer, Laurel Leslie, David Kent, Penny Pekow, and Rita Mangione-Smith) for their rock solid support throughout this PhD. Thank you for always being willing to share your time, knowledge and tremendous expertise with me, and for spending evenings and weekends reading many manuscript drafts. I have learned very much from all of you. I would also like to acknowledge the support of the Division of Pediatric Hospital Medicine at Tufts Medical Center and my wonderful research assistants (Paul Rizzo, Megan Shevenell and Emily O'Brien); this work would have been much more difficult and much less fun without you. Thank you to Drs. Tara Lagu and Meng-Shiou Shieh, who have supported and collaborated with me for many years now. I'd also like to Dr. Vanessa Hill who collaborated with me on the Delphi guideline development process and continues to work with me to translate this work into an American Academy of Pediatrics policy statement. I would like to acknowledge my collaborators at our partnering hospitals: Dr. Alisa Khan, Instructor in Pediatrics at Harvard Medical School, Stephannie Furtak, Research Assistant at Boston Children's Hospital, and the pediatric hospitalists at Brockton General Hospital and Lowell General Hospital for their assistance in identifying parents eligible for participation in Manuscript 1. Finally, I am tremendously thankful to the nine members of my Delphi panel, who gave so generously of their time and expertise to develop these direct admission guidelines.

Financial Disclosure: The authors have no financial relationships relevant to these articles to disclose.

Funding Source: Dr. Leyenaar was supported by grant number K08HS024133 from the Agency for Healthcare Research and Quality. Dr. Lindenauer was supported by grant K24HL132008 from the National Heart, Lung, and Blood Institute. The project was also supported by the National Center for Advancing Translational Sciences, National Institutes of Health, through Grant Number UL1 TR001064. The content is solely the responsibility of the authors and does not necessarily represent the official views of AHRQ or the NIH.

Potential Conflicts of Interest: The authors have no conflicts of interest relevant to these articles to disclose.

Table of Contents

| | |
|---|------|
| Title Page..... | i |
| Abstract..... | ii |
| Acknowledgements..... | iv |
| Table of Contents..... | vi |
| List of Tables..... | vii |
| List of Figures..... | viii |
| List of Abbreviations..... | ix |
| Chapter 1: Introduction..... | 1 |
| Chapter 2: Pediatric hospital admission processes and outcomes: a qualitative study of parents' experiences and priorities..... | 7 |
| Chapter 3: Hospital and community characteristics associated with pediatric direct admission to hospital | 27 |
| Chapter 4: Multi-stakeholder informed guidelines for pediatric direct admission to hospital | 49 |
| Chapter 5: Discussion..... | 70 |
| Chapter 6: Appendix..... | 75 |
| 6.1. Supplementary Results (Chapter 2): Representative quotes describing processes and outcomes related to hospital admission valued by parents of children admitted through emergency departments and via direct admission.. | 76 |
| 6.2. Supplementary Results (Chapter 3). Hierarchical generalized linear model of patient-level characteristics on direct admission rate..... | 80 |
| 6.3. Supplementary Methods (Chapter 4): Areas of Inquiry for Deliberative Discussions and Facilitation Guide..... | 81 |
| 6.4. Supplementary Methods (Chapter 4): Statistical analysis of Delphi survey data and categorization of survey items..... | 88 |
| 6.5. Supplementary Results (Chapter 4). Direct admission guideline components rated as appropriate and necessary at both children's hospitals and community hospitals by Delphi panelists..... | 90 |
| 6.6. Supplementary Results (Chapter 4). Guideline components not endorsed as appropriate and necessary for inclusion in direct admission guidelines..... | 95 |
| Chapter 7: Bibliography..... | 97 |

List of Tables

| | |
|--|----|
| Table 2.1. Sociodemographic characteristics of participants..... | 13 |
| Table 2.2. Variation in perspective regarding primary care and emergency department providers as gatekeepers to hospital admission..... | 17 |
| Table 2.3. Processes and outcomes related to hospital admission valued by parents of children admitted through emergency departments and via direct admission..... | 18 |
| Table 3.1. Sociodemographic and clinical characteristics of children and adolescents..... | 37 |
| Table 3.2. Hospital and community characteristics and associated unadjusted direct admission rates..... | 38 |
| Table 3.3. Generalized linear model of hospital and community factors on risk-adjusted direct admission rates..... | 42 |
| Table 4.1. Demographic characteristics of participants in deliberative Discussions..... | 57 |
| Table 4.2. Domains and themes emerging in deliberative discussions regarding systems and processes required for high quality direct admissions..... | 57 |
| Table 4.3. Outcomes to evaluate direct admission systems of care as prioritized by participants in deliberative discussions..... | 62 |
| Table 4.4. Outcomes prioritized by Delphi panelists to evaluate the quality of direct admission..... | 66 |

List of Figures

| | |
|---|----|
| Figure 2.1. Healthcare encounters in the 7-days preceding hospital admission among children admitted directly and through emergency departments..... | 14 |
| Figure 3.1. Study sample following application of eligibility criteria..... | 35 |
| Figure 3.2. Distribution of unadjusted and risk-adjusted direct admission rates across hospitals..... | 41 |
| Figure 3.3. A: Proportion of variation in risk-adjusted direct admission rates attributed to hospital and community characteristics; B: Proportion of explained variation in risk-adjusted direct admission rates attributed to hospital and community characteristics..... | 43 |

LIST OF ABBREVIATIONS

ACSC - ambulatory care sensitive conditions

AHA – American Hospital Association

AHRF – Area Health Resource File

AHRQ – Agency for Healthcare Research and Quality

APR DRG – All Payer Refined Diagnosis Related Group

ED – emergency department

HCUP –Healthcare Cost and Utilization Project

HGLM - hierarchical generalized linear model

ICD-9-CM - International Classification of Diseases, 9th Revision, Clinical Modification

IQR – interquartile range

KID – Kids Inpatient Database

PCP – primary care provider

PMCA – Pediatric Medical Complexity Algorithm

RADAR – risk-adjusted direct admission rate

RAM – RAND Appropriateness Methods

US – United States

Chapter 1

Introduction

As healthcare costs continue to increase, appropriate use of emergency departments (EDs) is a focus of national attention.¹⁻³ In a landmark report, the Institute of Medicine describes the emergency medical system as *overburdened, fragmented, and at the breaking point*.¹ Despite this, EDs are increasingly serving as portals for hospital admission,⁴ with more than one million children admitted to hospitals through EDs annually.³

While ED utilization patterns have been well studied, there is a paucity of research examining alternative pathways to pediatric hospital admission.⁴⁻⁸ Direct admission is one such alternative whereby patients are referred to the hospital and admitted without receiving care in the hospital's ED. Direct admission may offer benefits for both patients and healthcare systems, including reduced ED volumes and subsequent costs, and improved coordination between outpatient and hospital-based healthcare providers. However, risks associated with direct admission can include delays in initial evaluation and management, which could adversely impact patient safety and quality of care.^{9,10}

Our analysis of the Healthcare Cost and Utilization Project (HCUP) Kids' Inpatient Database (KID), a nationally representative dataset of pediatric hospitalizations, revealed that approximately 40% of all pediatric non-neonatal, non-maternal hospitalizations occur via direct admission.¹¹ Rates of direct admission vary substantially across conditions, ranging from 4% percent for significant trauma to 98% for chemotherapy hospitalizations. Among *unscheduled* hospitalizations, direct admissions account for one in four pediatric hospitalizations.¹² Direct admissions are not accessible to or appropriate

for all children, as they require patients to have timely access to outpatient healthcare providers for acute care as well as hospital systems that can facilitate admissions without ED management. However, given their relative frequency, understanding the safety and effectiveness of direct admissions has important implications for pediatric health policy, access to care, and ultimately the health of all children requiring hospitalization.

Hospitals' discharge processes have been the focus of considerable research over the last decade, motivated by studies illustrating how inconsistent policies and processes can result in adverse clinical outcomes, increased rates of hospital readmission and substantially increased costs. National programs have dedicated significant resources to improving hospital-to-home transitions: the Agency for Healthcare Research and Quality (AHRQ) supported a major initiative to re-engineer discharge processes, the Centers for Medicaid and Medicare transformed payment structures with a focus on hospital readmissions, and national physicians organizations developed a Transitions of Care Consensus Policy Statement.¹³⁻¹⁵ Hospital admission, like hospital discharge, is another key element of patients' and families' transitions of care continuum. Despite this, studies examining methods to optimize transitions *into* the hospital are largely absent from the research literature.

Direct admissions to hospital may originate from patients' homes, primary care provider (PCP) or specialist clinics, or urgent care clinics, typically facilitated by direct conversations between referring and accepting healthcare providers. Although direct admissions may offer benefits to patients and healthcare systems, their safety and

effectiveness is largely unknown. One study of adults with sepsis found that direct admission was associated with increased mortality compared to ED admission, which authors speculated to be related to less timely care.¹⁰ Similarly, a study of unscheduled adult hospitalizations found that patients admitted directly had higher mortality for time-sensitive conditions such as acute myocardial infarction and sepsis than patients admitted through EDs, differences not observed among adults admitted with pneumonia, asthma or cellulitis.⁹ Numerous differences between pediatric and adult healthcare delivery systems limit our ability to extrapolate these results to pediatric patients, yet pediatric studies are limited. In a national retrospective cohort analysis of children hospitalized with pneumonia, we documented significant variation across hospitals in rates of direct admission, and found that children admitted directly received substantially fewer diagnostic tests and had total hospital costs that were 12% less than children admitted through EDs, with no significant differences in hospital readmission or transfer to the intensive care unit (ICU).¹⁶ However, further studies are clearly needed to more fully characterize the pediatric populations, conditions, and settings appropriate for direct admissions.

Systematic evaluation of direct admission outcomes is particularly relevant given the tremendous growth of hospital medicine in the United States. Historically, many pediatric patients were admitted to hospitals by their PCPs or specialists, who continued to provide their medical care during hospitalization. Hospital medicine is the fastest growing specialty in pediatrics, with an increasing number of hospitals having hospitalists present up to 24 hours a day.^{17,18} This staffing model creates opportunities as well as challenges

for direct admission systems of care; the discontinuity of care between outpatient and inpatient providers inherent to hospital medicine calls for contemporary research about direct admission procedures and outcomes. The research summarized in this thesis addresses several gaps in our understanding of hospital admission processes, engaging diverse stakeholders to identify the populations, settings and procedures appropriate for direct admissions.

The overall goal of this PhD thesis is to generate knowledge to identify the pediatric populations, healthcare settings, and procedures best suited for pediatric direct admissions. To achieve this goal, this thesis addresses three Specific Aims:

Aim 1. Characterize families' experiences as they transition from outpatient to inpatient care and identify hospital admission processes and outcomes most important to them.

Aim 2. Ascertain the relationships between hospital and community factors and direct admission rates for common pediatric diagnoses, and identify factors contributing to variation in direct admission rates across hospitals in the United States.

Aim 3a. Characterize the perspectives and experiences of key stakeholders in the direct admission process, and identify the outcomes of most value to them.

Aim 3b. Develop pediatric direct admission guidelines and identify quality indicators to evaluate their safety and effectiveness.

Each of these Aims is addressed in the chapters that follow. Aim 1 is addressed in our paper, *Pediatric hospital admission processes and outcomes: a qualitative study of parents' experiences and priorities*, which involved interviews with 48 parents of

children hospitalized at 4 hospitals in the greater Boston area. Aim 2 is addressed in our paper, *Hospital and community characteristics associated with pediatric direct admission to hospital*. This is a retrospective cohort analysis of the HCUP KID, the Area Health Resource File, and the American Hospital Association database. Finally, Aim 3 is addressed in our paper, *Multi-stakeholder informed guidelines for pediatric direct admission to hospital*, which pairs deliberative methods conducted across three hospitals in the greater Boston area with a guideline prioritization process conducted using RAND/UCLA Delphi Methods and representing stakeholders nationally. Together, these papers elicit and systematically synthesize the perspectives and priorities of the many stakeholders in the pediatric direct admission process, and identify best practice recommendations to implement and evaluate direct admission systems of care.

Chapter 2

Pediatric hospital admission processes and outcomes:
a qualitative study of parents' experiences and priorities

Leyenaar JK, Rizzo PA, O'Brien ER & Lindenauer PK. Under review at *BMJ Quality and Safety*, Submitted 09/28/2017

INTRODUCTION

Each year approximately 2 million children are admitted to hospitals in the United States (US), incurring costs that represent 40% of pediatric healthcare expenditures nationally.^{19,20} While numerous studies have characterized variation in physicians' thresholds to admit children to hospital and called for more standardized approaches to hospital admission decisions, we know correspondingly very little about patients' and families' experiences and preferences as they move from outpatient to inpatient care.^{8,21-}

23

Hospital admission, like hospital discharge, reflects a transition of care associated with changes in care setting, healthcare providers and clinical management. While hospital discharge processes and hospital-to-home transitions have been the focus of considerable efforts to improve their quality and safety,^{13,24,25} there is a paucity of research about hospital admission processes and healthcare utilization preceding hospitalization. A small number of studies have compared the effectiveness of hospital admissions beginning in emergency departments (EDs) with direct admission to hospital, defined as hospital admission without receiving care in the hospital's ED.^{12,16,26} For example, among children hospitalized with pneumonia, children admitted directly incurred lower healthcare costs and resource utilization with no differences in adverse outcomes.¹⁶ Another study found no differences in rates of unplanned transfer for intensive care among children admitted directly and through EDs.²⁶ However, we know very little about parents' perspectives about hospital admission approaches and outcomes. Understanding families' perspectives in this arena may provide valuable guidance as we endeavor to

improve the value of healthcare delivery and patients' and families' experiences across the care continuum. To this end, we aimed to: (i) characterize families' experiences with the healthcare system as they transitioned from outpatient to inpatient care, (ii) identify hospital admission processes and outcomes most important to families, and (iii) identify how parental perspectives differed between children admitted directly and those admitted through EDs. We limited this work to children hospitalized with ambulatory care sensitive conditions (ACSC), defined as acute conditions for which ambulatory care may prevent disease progression, in order to represent common reasons for pediatric hospitalization at both community hospitals and children's hospitals for which families might reasonably have contacted their primary care provider (PCP) prior to hospital admission, and thus for whom direct admission could be considered.^{27,28}

METHODS

Study design & setting

We employed qualitative methods to provide rich descriptions of parents' perspectives and develop a nuanced understanding of parents' perspectives to inform subsequent research and quality improvement initiatives.²⁹ We conducted semi-structured interviews with parents of hospitalized children at four structurally diverse hospitals in Massachusetts, US, in 2015-2016. Hospitals included one freestanding children's hospital (with a dedicated pediatric ED), one children's hospital nested within an adult hospital (with a dedicated pediatric ED from 12pm-12am), and two community hospitals with general pediatric wards (with general EDs). All of these hospitals accept hospital admissions both from their ED and via direct admission, and all have Hospital Medicine services where pediatric hospitalists provide inpatient care. However, the processes to

accept direct admissions, and rates of direct admission, varied across these hospitals.

With respect to referring healthcare providers, the majority of primary care in Massachusetts is provided by community and hospital-based general pediatricians whose practices include primary care for children with and without chronic conditions. Additional sources of ambulatory care include specialty clinics, urgent care (walk-in) clinics, and EDs.

In addition to interviews, participants completed a questionnaire to document sociodemographic characteristics. To understand patterns of pre-hospital admission clinical care we asked participants' about their clinical encounters for their child's illness in the 7 days preceding hospital admission (including primary care, specialty care, urgent care, emergency department care and hospitalizations). Institutional review board approval was received at Tufts Medical Center, Lowell General Hospital, Brockton General Hospital, and Boston Children's Hospital.

Study population & sampling plan

Study participants were parents of hospitalized children and adolescents who had been admitted for unplanned hospital stays for common ACSCs (pneumonia, asthma, cellulitis, gastroenteritis/dehydration, urinary tract infections, and ear-nose-throat infections).

Eligibility criteria included parent age > 18 years, ability to communicate in English with the interviewer, and hospital admission to a general medical-surgical bed within the preceding 48 hours. Recognizing that approximately three-quarters of hospital admissions begin in EDs while one-quarter of children experience direct admissions,¹² participants were purposefully sampled to represent both ED and direct admissions. Additionally, we

purposefully sampled to represent children with and without co-existing chronic conditions.

Procedures

Interviews at all four hospitals were conducted by one member of the research team trained to conduct semi-structured interviews using a structured guide and associated question probes (PR). Potential participants were purposefully sampled based on the criteria described above to include both direct and ED admissions and children with and without comorbid chronic illnesses at each hospital. Following confirmation from the bedside nurse that the parent was present and that the child was clinically stable, the interviewer approached potential participants during day time hours to explain the study, request participation, and receive verbal consent from parents and assent from adolescents (when applicable). Children/adolescents were encouraged to share their perspectives as age and cognitive development allowed. Interviews were conducted in a private location within the hospital and audio-recorded with permission. To minimize recall bias, all interviews were conducted within 48 hours of hospital admission. Participants received a \$10 gift card to recognize their participation. Audiofiles were professionally transcribed and verified for accuracy.

Interview guides were developed by the research team and pilot-tested with parents (not included in the final sample) to ensure that the questions were clear and elucidated nuanced, comprehensive responses. For the purpose of this study, hospital admission was defined as the period beginning upon arrival at the hospital and ending when the child had care initiated and was physically located in his/her hospital room. Interview questions

focused on: (i) health care received in the 7 days preceding hospital admission; (ii) how the need for admission was identified; (iii) how the admission was facilitated; (iv) satisfaction with the admission process; (v) perceptions of differences between direct admissions and ED admissions; (vi) challenges associated with the admission process and areas requiring improvement; and (vii) outcomes thought to be most relevant to quality improvement. Interviews were conducted sequentially, one hospital at a time, and stopped at each hospital when the study team agreed that data saturation was achieved.

Analysis

Using open-coding, an approach rooted in grounded theory, transcripts were reviewed by the research team to identify emergent concepts related to families' admission experiences and preferences. These concepts and associated definitions were summarized in a jointly-developed coding framework.^{30,31} Two members of the research team then independently applied codes to a subset of transcripts; areas of coding disagreement were resolved through in-depth discussions of the concepts, corresponding codes, and definitions. Following assurance of coding agreement, transcripts were uploaded to Dedoose, a mixed-methods data management and analysis program, and one member of the research team coded the transcripts, with coding audits performed by the principal investigator.³² Analysis was performed during the interview period, and interviews were continued at each hospital until the research team agreed that no new relevant concepts or insights were emerging from the data (data saturation).³³⁻³⁵ Following open-coding of all interviews, all codes and associated transcript excerpts were reviewed by the research team to group similar concepts into themes. Similar themes were then grouped into domains, which were conceptualized within the context of the quality improvement

literature to develop a framework for improving families' hospital admission experiences. Descriptive statistics were employed to summarize quantitative data.

Participants

We conducted 48 interviews including 26 at community hospitals (n=14 at hospital 1 and n=12 at hospital 2) and 22 at children's hospitals (n=12 at hospital 3 and n=10 at hospital 4). Each interview focused on the child's current hospitalization; no parents were interviewed more than once. A total of 25 interviews represented children admitted directly and 23 represented children admitted through EDs. Based on analysis performed during the interview period, the research team agreed that data saturation was achieved at each hospital, with sample sizes falling with the range suggested by qualitative methods guidelines.³⁴⁻³⁶ Participants were predominantly mothers (75%); 70% were native English speakers and 70% had some college education. Approximately half of children were privately insured; 45% had chronic illnesses and 100% had primary care providers (Table 1).

RESULTS

Healthcare encounters preceding hospital admission

Figure 1 illustrates the ambulatory and ED care received by children in the 7 days preceding hospitalization. During this period, hospitalized children had a median of 2 clinical encounters with PCPs, specialists, urgent care clinics and EDs, with a range from 1 to 5 visits. Approximately half (n=27, 56%) of parents reported that all of their pre-hospitalization visits occurred in one care setting, while 44% (n=21) received care in 2 or

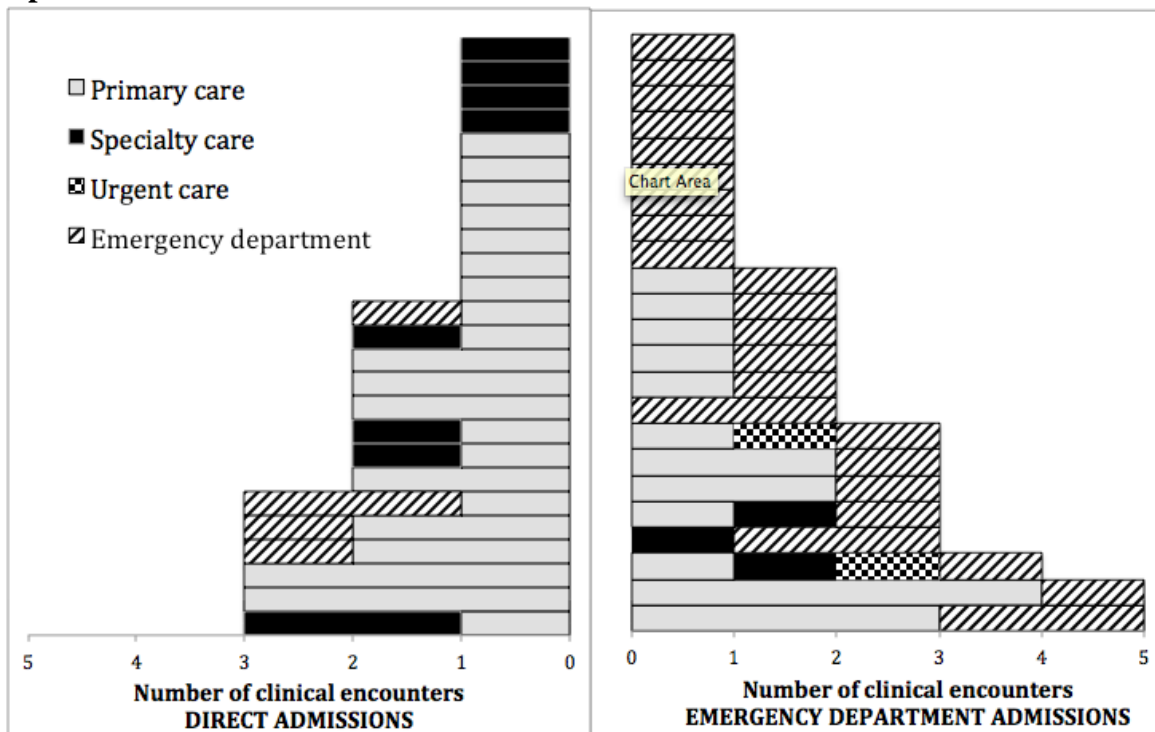
more settings. Although children admitted directly reported fewer ED visits and more PCP visits, there were not differences between the groups regarding the number of clinical encounters in the week prior to hospitalization (p=0.45).

Table 2.1. Sociodemographic characteristics of participants (n=48)

| <i>Parent characteristics*</i> | n (%) | |
|---|-----------------|--------|
| Parent age, years (median, IQR) | 33 [28.5, 42.5] | |
| Relationship to child: | | |
| Mother | 35 | (74%) |
| Father | 11 | (23%) |
| Other relative/guardian | 1 | (2%) |
| Parent race/ethnicity: | | |
| Non-hispanic white | 26 | (57%) |
| Non-hispanic Black | 7 | (15%) |
| Hispanic | 8 | (17%) |
| Asian | 3 | (7%) |
| Other | 2 | (4%) |
| Native English speaker (% yes) | 33 | (70%) |
| Educational attainment: | | |
| ≤ high-school | 14 | (30%) |
| Some college or 2-year degree | 13 | (28%) |
| ≥ 4-year college graduate | 20 | (43%) |
| <i>Child characteristics</i> | | |
| Child age, years (median, IQR) | 2.5 [0.7-7.8] | |
| Child gender (female) | 17 | (36%) |
| Primary payor: | | |
| Private health insurance | 24 | (52%) |
| Public | 22 | (48%) |
| Principal reason for hospitalization: | | |
| Gastroenteritis/dehydration | 17 | (36%) |
| Respiratory illness (asthma, pneumonia) | 14 | (30%) |
| Urinary tract infection | 8 | (17%) |
| Skin/soft tissue infection | 5 | (11%) |
| Other | 3 | (6%) |
| Concurrent chronic illness | 21 | (45%) |
| Has primary care provider | 47 | (100%) |

**missing for one participant*

Figure 2.1. Healthcare encounters in the 7-days preceding hospital admission among children admitted directly and through emergency departments; each row represents one child.



When asked about factors that influenced where they sought care, parents’ responses aligned with three domains: (i) illness acuity and healthcare accessibility; (ii) past experiences with the health care system; and (iii) primary care and ED roles as gatekeepers to hospitalization.

Illness Acuity & Healthcare Accessibility

Parents’ reported that the relative acuity of their child’s illness was a major factor influencing where they sought health care. For example, one parent stated, “*We’ve been going to the pediatrician all along. As the symptoms really got significantly worse we decided to take him to the emergency room. It was more acute.*” (Participant A3,

community hospital). Among children directly admitted to hospital, several parents reported multiple visits to their PCP prior to hospitalization for intensive outpatient management and follow-up, with one parent reporting 3 visits to her child's PCP in 24 hours for close observation. In contrast, other parents reported that their PCPs directed them to the ED for acute care management, due to both resource limitations for acute care provision within primary care practices as well as the time of day or week. For example, one parent of a child admitted through the ED reported, *"The clinic is closed at night, that's why I go to the Emergency Room. If the clinic is open, I'm going to the clinic."* (Participant A5, community hospital). Another stated, *"No one ever gets sick Monday through Friday during business hours. It is on the weekend or overnight..."* (Participant D7, children's hospital). In our sample, limited primary care office hours appeared to be the largest barrier to PCP accessibility; relatively few parents reported difficulties scheduling same-day appointments for acute care visits.

Past experiences with the healthcare system

Parents also reported that their past experiences with the healthcare system, either related to their currently hospitalized child or for other family members, influenced where they sought care in advance of their child's hospitalization. One parent reported, *"For my older daughter, when she had a fever of 100.7 and I took her to the clinic first they told me, actually, just go to the ER... So instead of wasting my time there [clinic], I came straight here [ED]."* (Participant D6, children's hospital). A subset of parents of children with chronic conditions described that they had a written protocol that influenced their choice of healthcare setting, stating, *"There's a protocol of when you go to the*

pediatrician and when you come to the hospital [ED].” (Participant B1, community hospital).

PCP and ED roles as hospital gatekeepers

The most notable difference between parents of children admitted through EDs compared with direct admission related to their perspectives about the roles of PCPs and ED providers as hospital gatekeepers. Parents of children who were directly admitted described that they trusted their PCP and felt that s/he was in the best position to advise them about the most appropriate care. They also described how their PCP’s ability to arrange a direct admission facilitated continuity of care. Representative quotations from parents illustrating this domain are provided in Table 2.2. These quotes demonstrate that parent of children who were admitted directly had well-established relationships with their PCP and highly valued PCP involvement in all aspects of their child’s healthcare.

In contrast, parents of children admitted through EDs were less likely to describe their PCP as a key stakeholder in the hospital admission process, reporting that they didn’t want to have their PCP “*in the middle*” when their child required hospitalization. They described the ED as “*the filter for [access to] the rest of the hospital,*” and reported how the ED provided opportunities for a “*second opinion,*” rapid diagnostic testing, and the opportunity to avoid unnecessary hospital admission. For example, one parent stated, “*The pediatrician [primary care provider] might have his worry meter up, saying this person needs to be admitted. What if we get here [ED] and get admitted and then the specialist says you didn't really have to be in here? ... And so they were sort of that middleman. And I think that the ER does that a lot.*” (Participant D9, children’s hospital).

Table 2.2. Variation in perspective regarding primary care and emergency department providers as gatekeepers to hospital admission.

| Primary care provider as hospital gatekeeper | Emergency department as hospital gatekeeper |
|--|---|
| <p><i>“We rely on the doctors to tell us what’s causing the sickness...Any time we fell that she needs to go to the hospital, or she’s sick, we go to the pediatrician first...so they tell us what to do”</i> (Participant B4, community hospital)</p> <p><i>“I trust the doctor’s expertise.”</i> .” (Participant B5, community hospital)</p> <p><i>“They are in charge of her complete care for the rest of her life, pretty much.”</i> . (Participant C7, children’s hospital)</p> <p><i>“He’s been his pediatrician since birth, excellent. We trust him one hundred percent.”</i> (Participant A12, community hospital)</p> <p><i>“We work with the pediatrician. If we were coming to the emergency room every time, we don’t know who we’re going to get. It’s basically going through the same thing over and over from the beginning.”</i> (Participant A8, community hospital)</p> <p><i>We had a feeling that he probably was going to get admitted but we wanted to go through the process of bringing him to the pediatrician and have him do the tests cause... I don’t want to come here and have him admitted if there’s nothing going on, just to do all those tests here if they could do it at the pediatrician. I’d rather have them do the tests and we’re coming in with some knowledge of what’s going on.</i> (Participant C8, children’s hospital)</p> | <p><i>“I knew that he was going to come in [for admission] before we got to the ER. The point of going to the ER was to get him in...”</i> Participant B1, community hospital)</p> <p><i>“I was going to take her to the doctor’s office, but, like, what is the point of going to the doctor’s office. They are not doing nothing for her...So let her go to the hospital. They probably will know what to do better in this situation.”</i> Participant B9, community hospital)</p> <p><i>Personally, I would rather go to the Emergency vs. having your doctor in the middle.</i> (Participant D4, children’s hospital)</p> <p><i>...We went to the ER because we weren't already established here... We were brand new here.</i> (Participant D11, children’s hospital)</p> <p><i>Because at least they have x-rays or something they can use to at least see what I can't see to help pinpoint the problem. So yeah. I'm always quick to say let's go the ER or to the hospital to see what's wrong.</i> (Participant C3, children’s hospital)</p> <p><i>“He had been sick with diarrhea and vomiting for 2 weeks so I took him to the doctor, and his doctor referred him to the ER just to check and see if there was anything worse.”</i> . (Participant D9, children’s hospital)</p> |

These quotations suggest that among children admitted through EDs, several parents were wary that their PCP would be able assist with acute care while in other cases and therefore bypassed PCP involvement. However, for other children admitted through EDs, the PCPs themselves suggested that the ED was the most appropriate venue for acute care management. Among children admitted through EDs, 43% (n=10) reported that they had been directed there by their PCPs.

Processes and outcomes prioritized by families

When asked to describe hospital admission processes and outcomes that were most important to them, parents' responses encompassed five domains: (i) effective clinical care; (ii) efficiency; (iii) safety and security; (iv) timeliness; and (v) patient- and family-centered care. Minor themes within each of these domains, as well as key concepts discussed by participants, are shown in Table 2.3.

Although all five domains were described by parents of children who were admitted directly and through EDs, we observed variation between the groups with respect to the minor themes emphasized. Representative quotations, categorized according to admission source, are provided in the Supplement to demonstrate how the hospital admission processes and outcomes most valued by parents varied according to hospital admission source. Within the efficiency domain, parents described how, unlike direct admissions, initiating care in the ED might avoid hospitalization. For example, one parent of a child with a chronic condition stated, “...*There’s a chance you’re going home when you get admitted into the ER... there’s a 50-50 split whether she bounces back and we can go home...that’s really the most ideal.*” (Participant A9, community hospital). In contrast, parents of children admitted directly described efficiency associated with fewer clinical encounters, with one parent describing ED care as “*an unnecessary step.*”

Parents of children admitted directly and through EDs both prioritized a safe physical environment, with parents of children admitted through EDs valuing the relatively large healthcare staff in the ED and rapid access to medical equipment, and parents of directly admitted children describing the value of security and privacy in their hospital rooms,

Table 2.3. Domains and associated themes summarizing hospital admission processes and outcomes most valued by parents of hospitalized children.

| Domain | Themes | Key concepts expressed by participants |
|-----------------------------------|---|---|
| Effective clinical care | A. Clinical improvement B. Healthcare team expertise | <ul style="list-style-type: none"> • Improvement in symptoms and return to baseline health status • Avoidance of medical errors • Healthcare team that is knowledgeable about pediatric problems and disease management |
| Efficiency | A. Avoid unnecessary hospitalizations B. Avoid unnecessary clinical encounters C. Avoid unnecessary diagnostic testing | <ul style="list-style-type: none"> • Referral to the ED provides an opportunity for a second opinion and the potential to avoid hospital admission • Direct admission can decrease the number of healthcare providers involved in care (by bypassing the ED) • Desire to avoid diagnostic testing that is not needed, or that has already been performed in another setting |
| Safety and security | A. Safe physical environment B. Low nosocomial infection risk | <ul style="list-style-type: none"> • Ready availability of medications and equipment to address acute health problems • Avoidance of exposure to noise, trauma, ill adults, stressful environment • Avoidance of exposure to other infectious disease risks |
| Timeliness | A. Rapid diagnosis and treatment B. Rapid bed placement | <ul style="list-style-type: none"> • Desire to receive diagnostic testing and treatment initiation as quickly as possible • Minimize waiting times to be placed in a hospital room / bed |
| Patient- and family-centered care | A. Respect for parents' perspectives B. Effective communication & transitions C. Privacy/atmosphere E. Convenience F. Low out-of-pocket costs | <ul style="list-style-type: none"> • Parents' desire to have their concerns taken seriously, and to be respected for their knowledge about how their child's condition has changed from baseline and what disease management has already occurred • <i>Effective communication with families:</i> healthcare team demonstrates empathy towards parent(s) and child; keep the family updated re. timelines, next steps, and results of diagnostic testing • <i>Effective communication within the healthcare team:</i> effective handoffs between physicians in different departments, including between referring and accepting providers, and over time • Pediatric-friendly waiting room and/or treatment spaces • Quiet and private spaces for child to rest and recover • Receipt of healthcare that is easy and convenient to access; healthcare processes that minimize demands on parent(s) and child • Receipt of healthcare in settings that minimize direct and indirect costs to families |

perceived decreased risk of nosocomial infection and exposure to “*other people’s issues,*” such as trauma and drug overdoses/toxic ingestions. Parents in both groups valued rapid diagnosis and treatment and rapid bed placement, but had differing perspectives about how these outcomes could be achieved via the different portals of hospitalization. For example, some parents reported that they were able to receive “*a lot of the tests a lot faster...in the ED*” while other parents reported that diagnostic testing and treatment initiation occurred more quickly via direct admission. These varied responses occurred within the same hospital and across hospitals, and didn’t appear to be related to the chronicity of the child’s medical concerns.

Patient-centered care was also valued by parents in both groups. Direct admission was described as providing more personalized care in a more comfortable environment, with one parent described direct admission as “*more 1 to 1 service.*” Parents among children admitted directly as well as through EDs both expressed concerns that communication between healthcare providers was often poor, particularly related to “*debrief[ing] each other*” and consistency in clinical management approaches across healthcare providers, and that updates regarding timelines and next steps were frequently not communicated to them.

DISCUSSION

To our knowledge, this is the first study to examine patterns of and reasons for pediatric pre-admission acute care among hospitalized children and to characterize parents’ perspectives and preferences regarding hospital admission processes. We identified quality domains prioritized by parents regarding their child’s hospital admission,

generating valuable data to inform initiatives to improve transitions from outpatient to inpatient settings, and to guide efforts to improve health system integration while reducing healthcare utilization.

We found that, among this group of children hospitalized with ACSC, the week preceding hospitalization was a period of substantial healthcare utilization, with the majority of children having more than one clinical encounter during this time, often in multiple settings. Parents reported that recurrent healthcare visits were influenced by both PCPs or specialists requesting close clinical follow-up and by their own ongoing concerns about their child. Our findings highlight that, similar to post-discharge care, pre-admission healthcare utilization is substantial and associated with varied degrees of continuity. While a small number of studies have illustrated associations between continuity of care for well child visits and decreased risk of hospitalization for ACSC, further research is needed to determine if improved continuity of care for acute illnesses is associated with decreased risk of hospitalization and resource utilization during hospital stays.^{37,38} In addition, our findings raise questions about whether expanding bundled payments for “episodes of care” to include healthcare during the pre-admission period would incentivize high value care across the care continuum.³⁹

The results of this study also expand on the literature about why patients seek acute care in EDs. Although several parents in our sample described their PCP as the first and most appropriate point of contact to access all healthcare services, others viewed the ED as the most appropriate avenue for acute care and did not conceptualize PCPs in this role. Past studies have described how insurance coverage, disease acuity, and PCP access,

availability, and affordability are associated with where patients seek care for acute illnesses.⁴⁰⁻⁴³ Our results suggest that parental perspectives about PCPs' roles in acute care management and hospitalization decisions also strongly influence where they seek care. First contact, coordinated care are key principles of the patient-centered medical home;⁴⁴ increasing parental knowledge about these principles may reduce ED utilization and improve care coordination.

Among children admitted through EDs, PCPs were the first point of contact for approximately 50%; this number is similar to national survey data that found that, among a predominantly adult population, only 42% saw their PCP for "first contact" care for acute conditions.⁶ In contrast, more than 90% of children admitted directly saw their PCP for initial disease management. These findings speak to the enhanced opportunity for care coordination among directly admitted children. Effective hand-offs from outpatient to inpatient providers, as described by parents in our study, may contribute to lower rates of diagnostic testing and healthcare costs observed in previous studies comparing direct and ED admissions.^{12,16} Given variation in outpatient clinic hours and accessibility, as well as variation in the resources available in primary care offices to provide acute care, the ED plays an important role in acute care provision. Enhanced handoff between PCPs and EDs, as well as shared electronic health records, may similarly improve care coordination and reduce duplicative diagnostic testing as described in this study.

While considerable research and health policy efforts have been dedicated to develop validated quality measures to evaluate transitional care, transitions into the hospital have received little attention.⁴⁵⁻⁴⁸ Our identification of quality domains prioritized by families

lays important groundwork for future quality improvement work in this area. Parents of children admitted through EDs and via direct admission valued effective, efficient, timely, safe and patient-centered care, with several themes within these domains specific to their hospital admission experiences. While some of these domains can be evaluated using existing survey instruments, future work is needed to operationalize the evaluation of other domains emerging in this research. For example, the Child Hospital Consumer Assessment of Healthcare Providers and Systems survey evaluates patient and family experience of care during their hospital stay and includes assessment of communication with parents as well as attention to safety and comfort.⁴⁹ However, to our knowledge there are not validated quality measures to evaluate parents' perceptions about the timeliness of diagnosis and treatment, avoidance of duplicative diagnostic testing, or the effectiveness of hand-offs between outpatient, ED and inpatient providers. In addition, we are not aware of any quality measures that are specific to hospital admission procedures that could be applied for both ED and direct admissions. Development of quality measures in these areas are important next steps to evaluate families' experiences as they transition from outpatient to inpatient care.

Our results should be interpreted in light of its strengths and limitations. Strengths of this study include its multi-center design, incorporating the perspectives of parents admitted to structurally diverse hospitals. The validity and transferability of our work is supported by the consistency of our results across these settings, and among parents of children with and without chronic conditions. By excluding parents who did not speak English we may have missed themes of particular importance to non-English-speaking families.

Massachusetts has a very high rate of health insurance coverage for children, and all children represented in this study were insured. Correspondingly, these findings may not be applicable to children without health insurance. Relatedly, 98% of children in the Northeastern United States have a usual source of healthcare; this percentage is somewhat higher than the rest of the country. A referral from an outpatient-based physician to the hospital is required for all direct admissions; as a result our findings may not apply to children without primary care access. In addition, primary care practices vary considerably in their resources available to provide acute care in outpatient settings; this study did not examine how resources available in outpatient settings are related to hospital admission approach. We conducted interviews with parents during their child's hospitalization, thereby excluding children who were referred to the ED for hospitalization but discharged home. As a result, determining the potential preventability of these pediatric hospitalizations is beyond the scope of this work. Lastly, it is important to note that qualitative research is, by design, hypothesis generating; further studies of representative populations are needed to determine how to optimize hospital admission experiences and pre-admission coordination of care.

The majority of hospitalized children had at least two encounters with healthcare providers in the week preceding hospitalization, often in multiple settings. Parents prioritized efficient, timely and family-centered hospital admission processes, which were variably achieved. This research may guide improvements in hospitals' admission systems and inform quality assessment of both ED and direct admissions. Given the

national focus on health system integration and continuity of care, these findings are particularly relevant.

Chapter 3

Hospital and community characteristics associated with pediatric direct admission to hospital

Leyenaar JK, Shieh MS, Lagu T, Pekow PS, Lindenauer PK. In press accepted manuscript, *Academic Pediatrics*, Published online: October 27, 2017.

INTRODUCTION

Emergency department (ED) crowding has been described by the Institute of Medicine as a “national epidemic,” with numerous studies illustrating associations between ED crowding and patient mortality, treatment delays and patient dissatisfaction.^{1,50,51} One factor contributing to ED crowding is the substantial proportion of hospitalizations that begin in EDs, which has increased considerably since the 1990s.^{5,52} In contrast, the proportion of direct admissions - defined as hospital admission without first receiving care in the hospital’s ED – has decreased.⁵

One-in-four unplanned pediatric hospitalizations originate as direct admissions. A national survey of inpatient pediatric medical directors suggests several benefits of this admission approach, including improved patient satisfaction, reduced risk of nosocomial infection, earlier patient access to pediatric-specific care in general hospitals that lack pediatric EDs, and decreased healthcare costs.^{12,53} Comparative effectiveness research has shown that pediatric direct admission is associated with substantially lower costs and no appreciable differences in adverse outcomes relative to admission through EDs.^{12,16,26}

Despite potential benefits for patients and health systems, pediatric direct admission rates are highly variable across hospitals and patient characteristics. Past work has shown that children who are privately insured and who report white race are more likely to be directly admitted than racial/ethnic minorities and children who are publically insured, which may reflect differences in access to ambulatory care.^{12,16} However, these differences may also be related to the characteristics of hospitals, health systems and their

communities, such as the local physician workforce, the presence of hospitalists to provide inpatient care, and ED volumes. To our knowledge, no previous studies have examined these factors. Healthcare administrative structures, such as joint ventures between hospitals and physicians may also increase direct admission rates through physician-hospital integration. Finally, variation in direct admission rates may be influenced by physician and hospital preferences, with some hospitals formalizing direct admission programs and implementing communication systems to optimize handoffs between referring (outpatient) and accepting (inpatient) healthcare providers.⁵³

We hypothesized that community and health system factors would contribute to the variation in pediatric direct admission rates across hospitals. More specifically, we hypothesized that factors associated with limited access to ambulatory care (i.e. child poverty, residence in a health professional shortage area), and factors that may limit relationships and communication between referring and accepting healthcare providers (i.e. large pediatric workforce, hospitalists providing inpatient care) would be negatively associated with hospitals' direct admission rates. In contrast, we hypothesized that factors facilitating relationships between referring and accepting physicians (i.e. physician-hospital integration) would be associated with higher direct admission rates. To evaluate these hypotheses, our objectives were twofold: (i) to determine the relationships between hospital and community factors and direct admission rates for common pediatric reasons for hospitalization, and (ii) to evaluate the degree to which these characteristics explain variation in risk-adjusted pediatric direct admission rates.

METHODS

Study Design and Eligibility

We conducted a retrospective study of non-elective hospitalizations in children and adolescents (hereafter called children) less than 18 years of age, excluding in-hospital births, hospitalizations without documentation of the admission source, hospitalizations originating from court or law enforcement, and inter-facility transfers. Hospitals without EDs were excluded, so as to include only hospitals where both direct and ED admissions were possible. Given our interest in understanding patterns of care at hospitals with general pediatrics services, hospitals that admitted only adolescents greater than twelve years of age or infants less than 6 months of age were excluded. To limit heterogeneity at the patient level, we only included children with a principal diagnosis of one of nine common pediatric medical conditions, identified using the pediatric diagnostic grouper by Keren et al.⁵⁴ This grouper uses International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes to group common and costly principal diagnoses into distinct conditions (for example, pneumonia), excluding children with ICD-9-CM principal procedure codes unlikely related to their principal diagnosis (for example, appendectomy for a child with a principal diagnosis of pneumonia). Finally, to allow for stable estimates of direct admission rates, we included only hospitals with ≥ 25 pediatric hospitalizations during the study year.

The data sources for this analysis included the Healthcare Cost and Utilization Project's (HCUP) 2009 Kids' Inpatient Database (KID), the 2009 US Department of Health and Human Services' Area Health Resource File (AHRF), and the American Hospital

Association (AHA) database (2009). The KID is a publicly available, nationally representative database developed to study pediatric hospitalizations and includes an 80% sample of non-inborn pediatric discharges from all community, non-rehabilitation hospitals from participating states.¹¹ It contains information on all patients, regardless of payer, and includes both hospital-level and patient-level variables, including demographic characteristics, charges, and other clinical and resource use data available from discharge abstracts. The 2009 KID was used because it is the most recent data set that contains hospital identifiers that can be linked to other national data sources. The AHRF aggregates county-level data from several sources and includes data related to health facilities, health status, and socioeconomic and environmental characteristics at the county level. The AHA database provides a comprehensive census of hospitals in the United States, including detailed characteristics about hospital resources, infrastructure and staffing.⁵⁵ Because the datasets do not contain identifiable information, the Institutional Review Board at Baystate Medical Center determined that our study did not constitute human subjects research.

Descriptor variables

A priori, we identified variables at the patient, hospital and community levels that we hypothesized would be associated with pediatric direct admission rates. At the patient level, we examined age, gender, race/ethnicity, expected primary payer, medical complexity and disease severity. Medical complexity was categorized as (i) non-chronic disease, (ii) complex chronic disease or (iii) non-complex chronic disease, using the previously validated Pediatric Medical Complexity Algorithm (PMCA) based on ICD-9-CM codes.⁵⁶ Disease severity was classified based on all patient refined-diagnosis related

group (APR-DRG) severity of illness coding, which classifies illnesses severity as minor, moderate, major or extreme.⁵⁷

Hospital characteristics derived from the KID included geographic region, defined according to census classifications; teaching status based on membership in the Council of Teaching Hospitals of the Association of American Medical Colleges; urban/rural location; hospital ownership, classified as public, private non-profit and private investor-owned; hospital type, classified as general hospital or children's hospital; and total volume of pediatric hospitalizations, categorized as low (<185 hospitalizations), medium (186-986 hospitalizations) and high volume (>986 hospitalizations) based on national data of pediatric hospitalizations.²⁸ From the AHA database we determine annual total ED volume; presence of hospitalists to provide patient care; presence of a pediatric intensive care unit; hospitals' participation in joint venture arrangements with physicians or physician groups; and level of hospital-physician integration, categorized as low or high according to a previously published algorithm.⁵⁸ These variables were pediatric-specific for freestanding children's hospitals only.

Community characteristics, reported in the AHRF at the county-level included sociodemographic variables (percent of children living in poverty, percent of adults >25 years of age with four or more years of college education), and healthcare resource variables (number of short-term general hospital beds per 100,000 population [bed supply], pediatrician and emergency medicine workforce per 100,000 population, and designation as a health professional shortage area).

Statistical analysis:

We categorized each hospitalization as a direct admission or ED admission and calculated patient-level summary statistics, assessing differences between direct and ED admissions using chi-square tests for categorical variables and Wilcoxon rank sum tests for continuous variables. We then calculated median direct admission rates associated with each hospital and community characteristic.

Because our primary aim was to evaluate community and health system factors associated with direct admission rates, we developed hospital-specific risk-adjusted direct admission rates (RADARs). A hospital's RADAR reflects the proportion of children directly admitted to a hospital, adjusting for the case-mix admitted to that hospital, where the case-mix is defined by patient age, gender, race/ethnicity, primary payer, disease severity, medical complexity and reason for hospitalization (Table 3.1). We then used the RADAR as the primary outcome in multivariable models, allowing us to evaluate how community and health system factors were associated with direct admission rates that had been adjusted for patient characteristics. To calculate RADARs, we used a hierarchical generalized linear model (HGLM) that included the above-described patient characteristics as well as a random intercept for hospital, applying methods analogous to those used by the Centers for Medicare and Medicaid Services to calculate risk-standardized outcomes.^{59,60} For each hospital, we estimated a *predicted direct admission rate* as the direct admission rate for that hospital's case-mix while incorporating the hospital-specific random intercept. We then calculated an *expected direct admission rate* for each hospital as the direct admission rate for the same case-mix, but incorporating the

average hospital intercept. The ratio of predicted to expected rates for each hospital provides a measure of whether the hospital has a higher (ratio > 1) or lower (ratio <1) direct admission rate than average, while accounting for the hospital's particular case mix. Finally, RADARs for each hospital were calculated as the product of the unadjusted overall mean direct admission rate and the ratio of the predicted to expected direct admission rate. Variation across RADARs should reflect factors beyond the case-mix of patients admitted to the hospital.

Following calculation of our RADARs, we developed generalized linear models (GLMs) at the hospital level to assess the association of hospital and community characteristics with these rates. We used backward stepwise regression modeling, keeping factors with $p < 0.10$, and forcing 'hospitalist care' into the model. Regression diagnostics did not indicate problems with multicollinearity among community and hospital factors in the final model.

We also evaluated the proportion of variance of the RADAR attributed to these factors via partitioning of Type III sums of squares. County-level characteristics were attributed to all hospitals in that county; because the majority of counties in our sample (70%) included only one hospital, it was not feasible to develop hierarchical models with hospitals nested within counties. The initial hospital-level model included all characteristics shown in Table 3.2 as well as three variables to describe the pediatric case mix: percent non-white race, percent publicly insured, and percent with complex chronic medical conditions. These pediatric case-mix variables reflect the full pediatric

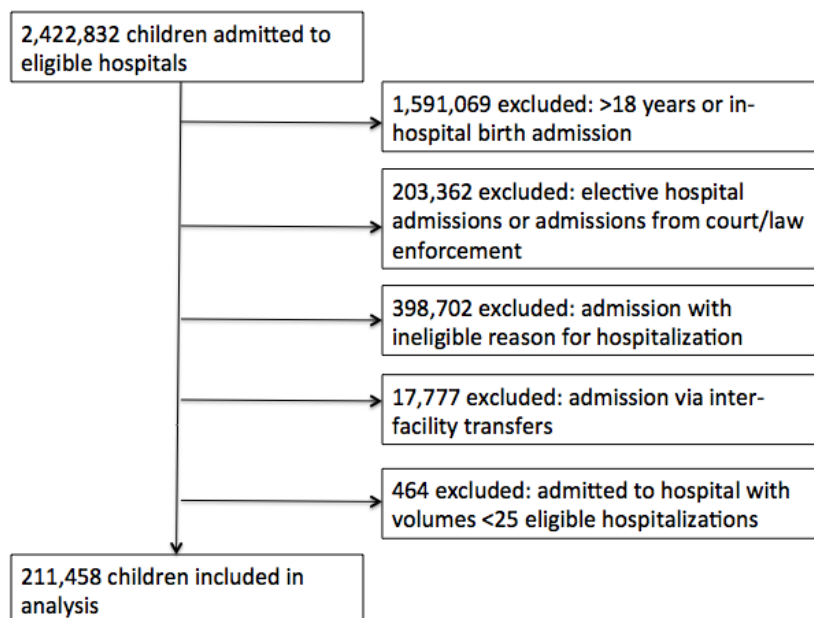
population at each hospital during the study period, and are not limited to the children meeting our eligibility criteria. A reduced model included only those variables in the full model with p-values <0.1.

Three states did not report race/ethnicity data in the KID, which resulted in a substantial proportion of missing race/ethnicity data; for these cases a missing category was included for race/ethnicity.¹¹ As a sensitivity analysis, we repeated the above-described models including only hospitals for which race/ethnicity data was available (182,522 admissions across 807 hospitals).

RESULTS

211,438 children discharged from 933 hospitals and 26 states were included in primary analyses (Figure 3.1).

Figure 3.1. Study sample following application of eligibility criteria



One-fifth of children (20.2%) were admitted directly, while the remainder were admitted through EDs. Children admitted directly were more likely to identify as white and less likely to identify as black or Hispanic, were less likely to be publically insured or uninsured than children admitted through EDs (Table 3.1). There were small but statistically significant differences between the admission groups in gender, reasons for hospitalization, medical complexity and disease severity. In our multivariable analyses the majority of these differences remained (Appendix 5.1, Supplementary results); gender ($p=0.73$) and age ($p=0.09$) were the only patient-level characteristics not significantly associated with direct admission rates.

Table 3.2 illustrates characteristics of hospitals and communities included in this analysis and their associated direct admission rates. Hospitals in the Northeast had the lowest direct admission rates (12.5%), while those in the Midwest had a median direct admission rate of 27.4%. Direct admission rates were considerably higher at non-teaching hospitals, rural hospitals, and general hospitals than teaching, urban and children's hospitals respectively. Hospitals where hospitalists provided inpatient care had significantly lower direct admission rates than those without hospitalists. Direct admission rates also varied across hospitals with low, intermediate and high pediatric patient volumes, with the lowest direct admission rates observed at hospitals with the highest pediatric volumes. With respect to total ED volumes, hospitals with the lowest ED volumes had the highest pediatric direct admission rates; as ED volumes increased, we observed that pediatric direct admission rates decreased. There were no significant differences in direct

Table 3.1. Sociodemographic and clinical characteristics of children and adolescents

| Characteristic | Direct admission 42645 (20.2%) n (%) | Emergency department admission 168813 (79.8) n (%) | p-value |
|--|--|--|----------------|
| Age ¹ (median [IQR]) | 2 [0-6] | 2 [0-6] | <0.01 |
| Gender: ² Female | 18795 (45.5) | 74070 (44.4) | <0.01 |
| Race/ethnicity: ³ White | 19032 (44.6) | 61573 (36.5) | <0.0001 |
| Black | 3358 (7.9) | 31427 (18.6) | |
| Hispanic | 8493 (19.9) | 40926 (24.2) | |
| Other | 2950 (6.9) | 14763 (8.8) | |
| Primary payer: Public | 19619 (46.0) | 90962 (53.9) | <0.0001 |
| Private | 20547 (48.2) | 66023 (39.1) | |
| Uninsured | 991 (2.3) | 6953 (4.1) | |
| No charge or other | 1488 (3.5) | 4875 (2.9) | |
| Medical complexity: Non-chronic disease | 26305 (61.7) | 90099 (53.4) | <0.0001 |
| Non-complex chronic disease | 12100 (28.4) | 62352 (36.9) | |
| Complex chronic disease | 4240 (9.9) | 16362 (9.7) | |
| Disease severity: 1 | 27022 (63.4) | 100419 (59.5) | <0.0001 |
| 2 | 13105 (30.7) | 57537 (34.1) | |
| 3 | 2239 (5.3) | 9595 (5.7) | |
| 4 | 279 (0.7) | 1262 (0.8) | |
| Reason for hospitalization: Pneumonia | 10203 (23.9) | 41404 (24.5) | <0.0001 |
| Asthma | 6274 (14.7) | 38811 (23) | |
| Bronchiolitis | 8121 (19) | 27957 (16.6) | |
| Dehydration | 6142 (14.4) | 16044 (9.5) | |
| Cellulitis | 4189 (9.8) | 14384 (8.5) | |
| Urinary tract infection | 2753 (6.5) | 11931 (7.1) | |
| Fever | 1978 (4.6) | 6582 (3.9) | |
| Influenza | 1673 (3.9) | 6084 (3.6) | |
| Gastroenteritis | 1312 (3.1) | 5616 (3.3) | |

¹ Missing for 576 children; ² Missing for 3370 children; ³ Missing for 28,936 children (8812 in direct admission group and 20,124 in ED admission group)

Table 3.2. Hospital and community characteristics and associated unadjusted direct admission rates

| Hospital characteristics | Number of hospitals (%) <i>(total 933 hospitals)</i> | Median direct admission rate (%) [IQR] <i>(median across hospitals 21.3% [5.1-41.0])</i> | p-values |
|--|--|--|-----------------|
| Region: | | | |
| Northeast | 234 (25.1) | 12.5 (3.0-33.4) | <0.0001 |
| South | 267 (28.6) | 25.6 (4.6-45.5) | |
| Midwest | 181 (19.4) | 27.4 (10.6-44.1) | |
| West | 251 (26.9) | 24.1 (9.8-40.3) | |
| Teaching hospital: | | | |
| Yes | 137 (14.7) | 8.3 (2.7-23.8) | <0.0001 |
| No | 796 (85.3) | 24.7 (7.1-43.4) | |
| Hospital ownership/control: | | | |
| Government, non federal | 124 (13.3) | 24.5 (4.9-48.2) | 0.71 |
| Nongovernment not-for-profit | 733 (78.6) | 21.0 (5.4-40.3) | |
| Investor-owned (for-profit) | 76 (8.2) | 24.0 (4.0-40.8) | |
| Hospital setting: | | | |
| Rural | 247 (26.5) | 33.5 (14.8-50.9) | <0.0001 |
| Urban | 686 (73.5) | 17.5 (4.4-36.7) | |
| Hospital structure: | | | |
| Children's hospital | 103 (11.0) | 9.7 (2.6-20.6) | <0.0001 |
| General hospital | 830 (89.0) | 24.5 (6.3-43.3) | |
| Hospitalists provide care: ¹ | | | |
| Yes | 690 (74.0) | 18.6 (4.7-37) | <0.0001 |
| No | 164 (17.6) | 29.5 (5.8-45.8) | |
| Pediatric intensive care unit: | | | |
| Yes | 187 (20.0) | 11 (2.7-30.4) | <0.0001 |
| No | 746 (80.0) | 25.1 (7.4-43.5) | |
| Pediatric hospitalization volume: | | | |
| Low (<185 hospitalizations/year) | 269 (28.8) | 21.4 (3.7-41.2) | <0.0001 |
| Intermediate (186-986 hospitalizations/year) | 444 (47.6) | 26.2 (9.5-43.5) | |
| High (>986 hospitalizations/year) | 220 (23.6) | 14.1 (3.1-34.6) | |
| ED volume (quartiles): | | | |
| Q1: <24585/year | 233 (25.0) | 36.5 (15.9-51.9) | <0.0001 |
| Q2: 24678-41246/year | 233 (25.0) | 26.5 (8.2-42.3) | |

| | | | |
|---|------------|------------------|---------|
| Q3: 41301-62121/year | 234 (25.1) | 18.3 (6.2-34.9) | |
| Q4: >62137/year | 233 (25.0) | 10.2 (2.8-26.4) | |
| Physician-hospital integration: | | | |
| Low | 471 (50.5) | 24.6 (6.0-44.1) | 0.03 |
| High | 462 (49.5) | 19.8 (4.7-38.5) | |
| Joint venture: ² | | | |
| Yes | 370 (39.7) | 19.9 (4.7-40.3) | 0.24 |
| No | 506 (54.2) | 22.5 (5.4-41.2) | |
| Community characteristics | | | |
| Children living in poverty (% , quartiles): | | | |
| Q1: 3.7-14.1 | 233 (24.5) | 16.1 (4.1-34.4) | <0.001 |
| Q2: 14.2-20.4 | 235 (25.2) | 28.3 (9.8-44.2) | |
| Q3: 20.5-23.8 | 230 (24.7) | 24.9 (10.2-42.3) | |
| Q4: 24.0-51.6 | 235 (25.2) | 17.4 (3.3-38.5) | |
| Adults with ≥ 4 yrs college education (% , quartiles): | | | |
| Q1: 7.6%-18.6% | 232 (24.8) | 33 (9.8-50) | <0.0001 |
| Q2: 18.7%-26.3% | 236 (25.2) | 25.1 (12.2-43.2) | |
| Q3: 26.4%-34.2% | 230 (24.6) | 26 (9.3-44.4) | |
| Q4: 34.3%-59.5% | 237 (25.4) | 17.4 (4.5-33.5) | |
| Hospital bed supply/100,000 population (n, quartiles): | | | |
| Q1: 38.6-178.9 | 233 (25.0) | 19.6 (5-38.2) | 0.01 |
| Q2: 180.8-250.3 | 231 (24.8) | 24.8 (10.2-42.3) | |
| Q3: 250.4-351.2 | 235 (25.2) | 17.2 (3.6-37.3) | |
| Q4: 352.6-2737.8 | 234 (25.1) | 25.7 (5.2-44.1) | |
| Designated Health professional shortage area: | | | |
| Yes (full county) | 406 (43.5) | 20.6 (6-38) | 0.69 |
| No/other | 527 (56.5) | 22.1 (4.4-42.6) | |
| Pediatricians/100,000 population (n, quartiles): | | | |
| Q1: 0-8.79 | 232 (24.9) | 28.9 (12.1-45.5) | <0.0001 |
| Q2: 8.83-12.94 | 234 (25.1) | 29 (13.2-44.3) | |
| Q3: 12.96-18.49 | 233 (25.0) | 19 (4.5-41) | |
| Q4: 18.64-82.9 | 234 (25.1) | 9.7 (2.7-26.9) | |
| Emergency medicine physicians /100,000 population (n, quartiles): | | | |
| Q1: 0-4.67 | 232 (24.9) | 30 (9.7-47.9) | <0.001 |
| Q2: 4.68-8.67 | 235 (25.2) | 20 (5-38.5) | |
| Q3: 8.71-12.19 | 232 (24.9) | 16.6 (4.4-36.8) | |
| Q4: 12.21-73.38 | 234 (25.1) | 20.1 (4.4-38.9) | |

¹Missing for 79 hospitals; ²Missing for 57 hospitals

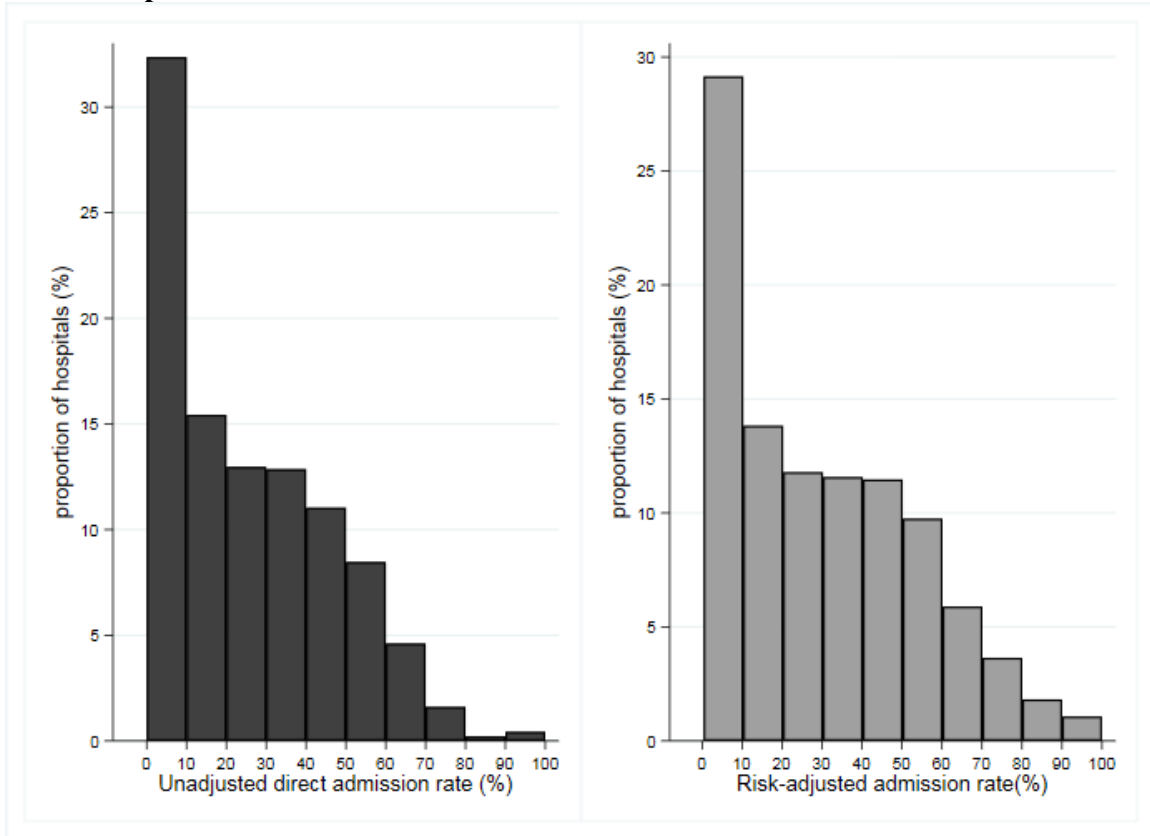
admission rates at hospitals reporting joint ventures with physicians, but hospitals with low rates of physician-hospital integration had higher direct admission rates in our unadjusted analysis.

We also observed variation in hospitals' direct admission rates associated with the characteristics of their communities (Table 3.2). Direct admission rates were relatively low in communities with the lowest and highest rates of childhood poverty, and higher among the middle quartiles. In communities that had the highest number of college-educated adults, the direct admission rates were significantly lower than in communities with lower rates of college-educated adults. Communities with the lowest numbers of pediatricians and ED physicians per capita had the highest direct admission rates.

Figure 3.2 illustrates the variation in direct admission rates across hospitals included in our analysis, showing the distribution of both unadjusted direct admission rates and RADARs.

The results of our GLM models assessing associations between hospital and community characteristics and RADARs are provided in Table 3.3. Variables retained in this model included percent non-white race/ethnicity, medical complexity of the pediatric hospital population, pediatric hospitalization volume, hospital ownership/control, hospitalist presence, hospital type (children's hospital or general hospital), child poverty, size of the pediatrician workforce, size of the emergency medicine physicians workforce, ED volume, and number of short-term hospital beds per 100,000 population. Of these

Figure 3.2. Distribution of unadjusted and risk-adjusted direct admission rates across hospitals.



variables, hospitalist presence, child poverty, and hospital medical complexity case-mix were not significantly associated with RADARs while the remaining variables showed significant associations with this outcome. In this adjusted model, hospitals with the highest annual volume of pediatric hospitalization, the lowest volume of ED visits annually, and the smallest pediatrician workforce per capita had the highest RADARs.

Table 3.3. Generalized linear model of hospital and community factors on risk-adjusted direct admission rates

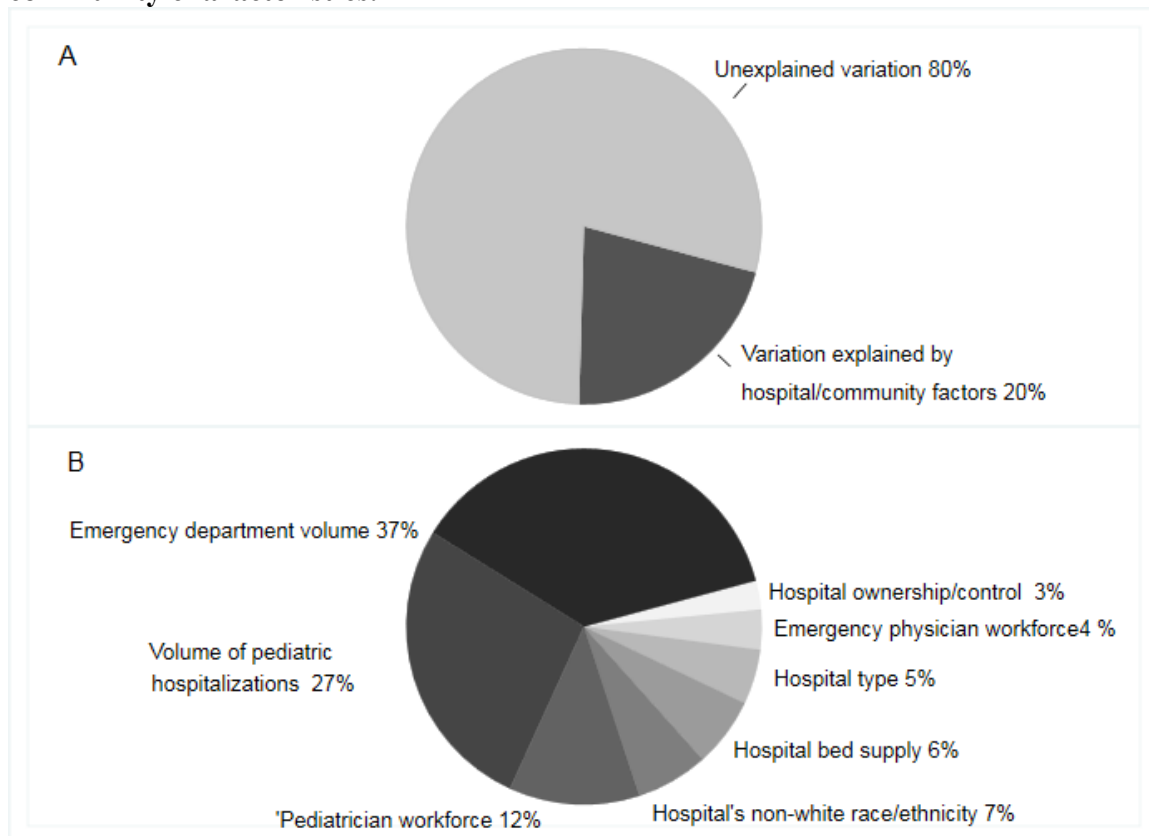
| Parameter* | Estimate | Standard error | t-value | (p-value) | F-value | (p-value) |
|--|------------|----------------|---------|-----------|---------|-----------|
| Intercept | 13.65 | 4.29 | 3.18 | (<0.01) | | |
| Pediatric hospitalization volume: | | | | | 28.53 | <0.0001 |
| Low (<185 hospitalizations/year) | -18.35 | 2.95 | -6.21 | (<0.0001) | | |
| Intermediate (186-986 hospitalizations/year) | -4.20 | 2.41 | -1.74 | (0.08) | | |
| High (>986 hospitalizations/year) | <i>ref</i> | . | . | . | | |
| ED volume (quartiles): | | | | | 24.09 | (<0.0001) |
| Q1: ≤24585/year | 22.60 | 2.73 | 8.27 | (<0.0001) | | |
| Q2: 24678-41246/year | 9.57 | 2.31 | 4.13 | (<0.0001) | | |
| Q3: 41301-62121/year | 5.13 | 2.08 | 2.47 | (0.01) | | |
| Q4: >62137/year | <i>ref</i> | . | . | . | | |
| Pediatric case mix: % non-white race | -0.09 | 0.02 | -3.75 | (<0.0001) | 14.09 | (<0.0001) |
| Hospital type: general hospital* | 11.85 | 3.26 | 3.63 | (<0.0001) | 13.17 | (<0.0001) |
| Pediatricians/100,000 population (n, quartiles): | | | | | 6.53 | (<0.0001) |
| Q1: 0-8.79 | 9.09 | 2.79 | 3.26 | (<0.0001) | | |
| Q2: 8.83-12.94 | 11.27 | 2.56 | 4.4 | (<0.0001) | | |
| Q3: 12.96-18.49 | 6.90 | 2.32 | 2.97 | (<0.0001) | | |
| Q4: 18.64-82.9 | <i>ref</i> | . | . | . | | |
| Hospital bed supply/100,000 | | | | | 4.07 | (<0.0001) |
| Q1: 38.6-178.9 | -4.23 | 2.34 | -1.81 | (0.07) | | |
| Q2: 180.8-250.3 | 0.98 | 2.19 | 0.45 | (0.65) | | |
| Q3: 250.4-351.2 | -4.83 | 2.09 | -2.31 | (0.02) | | |
| Q4: 352.6-2737.8 | <i>ref</i> | . | . | . | | |
| Emergency medicine physicians/100,000 population | | | | | 2.78 | (0.04) |
| Q1: 0-4.67 | 2.42 | 2.42 | 1 | (0.32) | | |
| Q2: 4.68-8.67 | -3.34 | 2.33 | -1.43 | (0.15) | | |
| Q3: 8.71-12.19 | -2.12 | 2.18 | -0.97 | (0.33) | | |
| Q4: 12.21-73.38 | <i>ref</i> | . | . | . | | |
| Hospital ownership/control: | | | | | 2.64 | (0.07) |
| Government, non-federal | 4.44 | 2.19 | 2.03 | (0.04) | | |
| Investor-owned (for-profit) | -2.14 | 2.66 | -0.81 | (0.42) | | |
| Nongovernment not-for-profit | <i>ref</i> | . | . | . | | |
| Hospitalists provide care: ¹ | | | | | 2.11 | (0.12) |

| | | | | | |
|--|------------|------|------|--------|-------------|
| Yes | <i>ref</i> | . | . | . | . |
| No | 1.23 | 2.04 | 0.61 | (0.54) | |
| Missing | 5.43 | 2.66 | 2.04 | (0.04) | |
| Pediatric case mix: % children with medical complexity | 0.20 | 0.14 | 1.41 | (0.16) | 1.99 (0.16) |
| Children living in poverty (% quartiles): | | | | | 1.32 (0.27) |
| Q1: 3.7-14.1 | 1.15 | 2.40 | 0.48 | (0.63) | |
| Q2: 14.2-20.4 | 3.60 | 2.11 | 1.71 | (0.09) | |
| Q3: 20.5-23.8 | 3.13 | 2.14 | 1.46 | (0.14) | |
| Q4: 24.0-51.6 | <i>ref</i> | . | . | . | |

* Presented from largest to smallest F-value; ** children's hospitals is referent group

Figure 3.3a illustrates the proportion of variance in the RADAR that could be attributed to hospital and community level variables; 20% of the variance was attributed to hospital

Figure 3.3. A: Proportion of variation in risk-adjusted direct admission rates attributed to hospital and community characteristics; B: Proportion of explained variation in risk-adjusted direct admission rates attributed to hospital and community characteristics.



and community factors while 80% was unexplained by these factors. The greatest proportion of explained variance was related to hospitals' volume of pediatric hospitalizations, annual ED volume, the size of the pediatrician workforce per 100,000 population, and the racial/ethnic composition of the hospitalized population; together these factors accounted for 83% of the explained variation in RADARs (Figure 3.3b).

In our sensitivity analysis that excluded the 3 states for which race/ethnicity was not included in the KID, results were essentially unchanged (data not shown).

DISCUSSION

Combining three large national datasets we found that the community and health system characteristics included in this analysis accounted for a small proportion of the variation in risk-adjusted direct admission rates across hospitals. Several of the hospital and health system factors that we expected to be associated with RADARs – hospitalists providing inpatient care, physician-hospital integration, and joint ventures between physicians and hospitals – did not explain the variation across hospitals. Instead, the variables that accounted for greatest proportion of explained variation included pediatric hospitalization volume, ED volume, the number of pediatricians per capita working in the community, and the racial/ethnic composition of the patient population. Our findings suggest that additional unmeasured factors, perhaps related to physician and hospital preferences and health system infrastructure, are associated with hospitals' direct admission rates. Identification of such modifiable factors would enable structurally diverse hospitals to develop the infrastructure necessary to support pediatric direct admission processes.

We found that hospitals with the lowest ED volumes had the highest RADAR while the highest volume EDs had the lowest RADAR. Recognizing that high volume EDs experience greater rates of overcrowding, longer wait times and higher rates of left without being seen – all associated with patient dissatisfaction and adverse outcomes - development of direct admission systems for pediatric patients may be particularly beneficial at these hospitals.⁶¹⁻⁶³ However, communication between referring and accepting healthcare professionals, a prerequisite for direct admissions, may be particularly challenging in high volume hospitals where referring providers may not have personal relationships with inpatient healthcare professionals. Linking communication systems for direct admissions to existing ED referral systems is one potential mechanism to facilitate direct admission referrals while enabling the identification of pediatric patients appropriate for this admission approach.

Our finding that hospitals with the highest pediatric volumes had the highest risk-adjusted direct admission rates was contrary to our hypothesis that direct admission rates would be higher at hospitals with small pediatric volumes. The relatively large number of children admitted to specialty services at higher volume pediatric centers may explain this result. It is plausible that hospital admissions facilitated by specialists who provide patient care across both ambulatory and inpatient settings may lead to higher direct admission rates at high-volume pediatric centers. We also observed that communities with smaller pediatrician workforces per capita had higher direct admission rates than those with larger pediatrician workforces. Direct admissions in these settings may be enabled by

closer relationships between referring and accepting pediatricians, which may facilitate handoffs at the time of hospital admission.

Risk-adjusted direct admission rates were considerably lower in hospitals that provided care to larger black and Hispanic populations. Past studies have shown that direct admission rates are associated with access to primary care, and caregivers of both black and Hispanic children are less likely to report having a usual source of care or a medical home.⁶⁴⁻⁶⁷ We postulate that hospitals caring for a larger proportion of non-white patients are more likely to represent safety-net hospitals, where lower operating margins and disparities in access to outpatient care may limit investment in direct admission systems.^{68,69} A previous qualitative study identified lack of financial incentives for collaboration, competing priorities, and mismatched expectations between hospitals and primary care providers as barriers to effective transitions in a safety-net system; addressing these barriers may support the development of effective direct admission systems.^{70,71}

We had hypothesized that joint ventures between physicians and hospitals and high levels of physician-hospital integration would be positively associated with RADAR and have implications for contemporary accountable care organizations, which align physicians and hospitals to promote care coordination across sites of care.⁷² However, we did not find significant associations between these characteristics and RADAR; the majority of variation in RADAR was unexplained by our models. Additional factors that may account for variation in hospitals' RADAR that we could not evaluate using these

datasets include: hospital-based resources to support direct admission processes, including nurse-patient ratios, physician staffing patterns, and patient referral communication systems; the availability of shared electronic medical records across ambulatory care clinics and hospitals; and hospitals' culture regarding care coordination between outpatient- and inpatient-based clinicians.⁵³

These results should be interpreted in light of several limitations. First, although the KID includes data from 44 states, several states did not provide hospital-level identifiers allowing the KID to be linked to the AHA and AHRF, which limited this analysis to 26 states. Second, race/ethnicity data was missing for almost 14% of patients included in our sample. This data represented three states included in our analysis that did not provide race/ethnicity data to the KID and was therefore not missing at random; in our sensitivity analysis excluding these states our results were essentially unchanged. Third, our analysis was limited to variables available in these three datasets; we have limited knowledge about several aspects of clinical care such as the admitting service/provider location, and hospital-system variables that were specific to pediatric care. Fourth, our workforce variables were limited to the pediatric and ED workforce, and do not include family doctors who provide a substantial proportion of pediatric care in some communities. Finally, the KID 2012, the most recent national pediatric data available from HCUP, does not provide hospital-level identifiers allowing the KID to be linked to the AHA and AHRF.

RADAR were associated with several hospital and community characteristics, with pediatric hospitalization volume, ED volume, and the number of pediatricians per capita

working in the community accounting for greatest proportion of explained variation.

These findings suggest opportunities for structurally diverse hospitals to develop direct admission systems to improve continuity of care and decrease health care costs among hospitalized children, and for future qualitative work to identify health system factors associated with high pediatric direct admission rates.

Chapter 4

Multi-stakeholder informed guidelines for pediatric direct admission to hospital

Leyenaar JK, Shevenell M, Rizzo PA, Hill VL, Lindenauer PK. Submitted to *Pediatrics*, 09/26/2017

INTRODUCTION

One-quarter of unplanned pediatric hospitalizations in the United States (US) begin as direct admissions, defined as admission to hospital without first receiving care in the hospital's emergency department (ED).¹² Compared to hospital admission originating in the ED, direct admission has been associated with less diagnostic testing and lower hospitalization costs, with no significant differences in rates of adverse outcomes including readmission and transfer for intensive care.^{12,16,26} Additional potential benefits of direct admission include decreased ED crowding, decreased risk of nosocomial infection, and greater care coordination between referring and accepting healthcare providers.^{53,71} A national survey of inpatient pediatric medical directors found that 50% believed more children should be admitted directly, yet less than one-third of hospitals had direct admission policies or guidelines.⁵³

Although increasing rates of direct admission may have benefits for children, healthcare providers and healthcare systems, research conducted in adult populations raises concerns about the safety and quality of this hospital admission approach. Among adults admitted with time-sensitive conditions including acute myocardial infarction and sepsis, direct admission has been associated with higher mortality than admission through EDs (differences not observed in adults with pneumonia, asthma or cellulitis).^{9,10} While not borne out in pediatric studies of direct and ED admissions, pediatricians have also raised concerns about potential delays in disease management and treatment associated with direct admission.^{16,26,53} The development and application of direct admission guidelines,

coupled with institutional evaluations of direct admission processes, may improve the quality and safety of this admission approach.

Our objectives were to engage the multiple stakeholders involved in direct admission processes to develop pediatric direct admission guidelines, and to define and prioritize outcomes that could be used to evaluate the safety and effectiveness of hospital admission processes.

METHODS

Study Overview

Our guideline development and outcome prioritization process involved: (i) application of deliberative methods to identify direct admission processes and outcomes most valued by diverse stakeholders, and (ii) a RAND/UCLA Modified Delphi process to prioritize direct admission guideline components and outcome measures. We applied these methods sequentially, using deliberative methods to generate rich data regarding stakeholders shared and dissenting perspectives, and Delphi methods to engage a national panel of experts to prioritize guideline components. Dartmouth College, Tufts Medical Center, Lawrence General Hospital, and Lowell General Hospital Institutional Review Boards provided study approval.

Deliberative Methods

We conducted deliberative discussions at one children's hospital and two general community hospitals in June 2016, applying methods rooted in deliberative democratic theory to learn about stakeholders' respective experiences with direct admissions and

discuss how to optimize this admission approach, taking into consideration others' perspectives and values.^{73,74} Our discussions were structured similarly to focus groups, but, consistent with deliberative methods, began with an educational component summarizing current direct admission processes and existing literature about the strengths and limitations of this admission approach. This educational component was followed by facilitated discussions in mixed stakeholder groups to encourage debate and identify shared and dissenting perspectives.⁷⁴⁻⁷⁶ Our discussions focused on four areas: (i) diagnoses and pediatric populations that may benefit or be at risk from direct admissions; (ii) hospital and clinic settings and infrastructure that may impact direct admissions; (iii) logistical challenges, safety concerns and methods to address these; and (iv) quality and safety outcomes. Stakeholders included: (i) parents of hospitalized children, (ii) inpatient nurses, (iii) hospitalists, (iv) pediatric primary care providers (PCPs), (v) pediatric specialists, (vi) ED physicians, (vii) outpatient nurses, (viii) resident physicians, and (ix) an insurance company representative. Participants were purposefully sampled to reflect diverse pediatric health conditions, practice types and hospital environments; each deliberative discussion included participants from at least four stakeholder groups.

Six mixed stakeholder groups were convened at three hospitals, with each discussion facilitated by two trained facilitators. Approximately two weeks prior to discussions, all participants were provided with a summary of published studies regarding direct admission quality and safety. A semi-structured discussion guide was developed by the research team and pilot tested with parents and healthcare providers, not included in the final sample, to ensure that questions were clear and prompted discussion. Verbal consent

was received from all participants prior to initiation. Following each facilitated discussion, consistent with established deliberative methods, participants were asked to vote for three outcomes they considered most relevant to evaluating hospital admission processes. These outcomes were selected from a list generated by participants during the deliberative discussions.

All discussions were audio-recorded with permission and professionally transcribed with identifiers removed. Following verification of transcript accuracy, transcripts were uploaded to Dedoose, a mixed-methods data analysis program, and analyzed to identify emergent themes regarding direct admission processes and outcomes using a general inductive approach.²⁹ Transcripts were coded by two members of the research team. Following coding, similar codes were grouped as themes, and similar themes were grouped as domains.

Delphi Methods

We applied the RAND/UCLA modified Delphi approach to prioritize direct admission processes and outcomes for inclusion in a direct admission guideline.⁷⁷ Consistent with RAND/UCLA Appropriateness Methods (RAM), we convened a panel of 9 stakeholders, nominated via national organizations including Family Voices, the Health Care Delivery Committee of the Academic Pediatric Association, the Society of Pediatric Nurses, and the American Academy of Pediatrics Section on Hospital Medicine, Council on Pediatric Subspecialties, and Committee on Child Health Financing.⁷⁷ Participants included a parent of a child with several past hospitalizations, an inpatient pediatric nurse, a PCP working in a community practice, a PCP working in a children's hospital-affiliated

practice, an ED physician, a community pediatric hospitalist, a tertiary care pediatric hospitalist, a pediatric pulmonologist, and a pediatric surgeon, representing 8 health systems nationally.

This process involved two rounds of electronic data collection and two conference calls – the first prior to data collection to discuss the Delphi process and approach to ratings, and the second to discuss the first round results before the second survey. Survey items were developed based on review of the literature and the above-described deliberative methods. Specifically, transcripts from the deliberative discussions were reviewed by two analysts to identify all excerpts that could be operationalized as guideline components or outcomes. A survey instrument was developed and pilot tested with healthcare providers and parents, not included in the final sample, to ensure that the items were clear and comprehensive. Prior to data collection, Delphi panelists were also asked to review the survey for clarity and comprehensiveness. The first-round survey included 103 items related to: (i) pre-admission communication, (ii) written guideline components, (iii) hospital resources, (iv) populations best-suited to and inappropriate for direct admission, (v) communication with families, and (vi) direct admission outcomes. Panelists were asked to focus on unplanned direct admissions that involved a referral of a patient from an outpatient healthcare provider to an inpatient healthcare provider, excluding intensive care.

Panelists were asked to rate the appropriateness and necessity of each item on a 9-point Likert scale, considering each item separately for application at children’s hospitals and

community hospitals. Children's hospitals were defined as hospitals where the majority of services are designed for children (freestanding or "nested" within larger hospitals). Community hospitals were defined as general, non-children's hospitals. Higher ratings indicated greater perceived appropriateness and necessity, and participants were encouraged to use the full range of the scale, considering ratings of 1-3 as inappropriate/unnecessary, ratings of 4-6 as uncertain or equivocal, and ratings of 7-9 as clearly appropriate/necessary.⁷⁷ Consistent with RAM, appropriateness was defined as having an expected benefit that exceeded the expected negative consequences by a sufficiently wide margin that the item/intervention was worth doing, regardless of cost. Necessity was defined by four criteria: (i) benefits exceeded risks and costs by a sufficient margin to make the item worthwhile; (ii) it would be improper to omit the item; (iii) reasonable chance that the item would result in benefits; and (iv) the magnitude of the expected benefit is not small.⁷⁷ In addition to the quantitative ratings, participants were asked to provide free-text comments to justify their responses. Up to three email reminders over a 6-week period were sent to encourage responses. Each item was categorized as appropriate, of uncertain appropriateness, or inappropriate, and necessary, of uncertain necessity, or unnecessary for children's hospitals and community hospitals using RAM statistical methods as detailed in the Supplementary Methods, Appendix 5.3.

Following receipt of all first round data, personalized reports were provided to each panelist illustrating the distribution of responses, a reminder of their own first-round responses, and a summary of free-text responses. Following distribution of these reports, we hosted a conference call for panelists to discuss the items categorized as uncertain

appropriateness or necessity; on this conference each panelist was encouraged to share her/his perspective and suggest modifications to item phrasing. In the second round of data collection, panelists were asked to re-rate the appropriateness and necessity of items rated as uncertain in the first round, as well as newly developed items based on first-round feedback. To incentivize participation, gift cards were provided to panelists for each round of data collection they completed.

RESULTS

Deliberative Methods

A total of 48 participants joined six deliberative discussions in three communities, with each discussion group comprised of 6-10 diverse stakeholders (Table 4.1). These sample sizes are consistent with the recommendations of qualitative methodologists who advise that focus groups be comprised of 5-10 participants, with four to six focus groups conducted to attain maximum response variation and thematic saturation.^{78,79}

Emergent domains and associated themes are summarized in Table 4.2. Participants described the value of: (i) effective multi-stakeholder communication; (ii) resources needed for high quality direct admissions; (iii) written direct admission guidelines, including criteria to identify children appropriate for and inappropriate for direct admission; and (iv) recognizing families' preferences and needs. We observed considerable deliberation between referring and accepting healthcare providers regarding communication and transition procedures at the time of hospital admission request. Outpatient-based healthcare providers emphasized their desire to avoid ED utilization,

Table 4.1. Demographic characteristics of participants in deliberative discussions

| Characteristics of participants (n=48) | n | % |
|--|----|---------|
| Stakeholder group: | | |
| Primary care provider | 15 | (29%) |
| Pediatric hospitalist | 10 | (21%) |
| Inpatient nurse | 9 | (19%) |
| Emergency room physician | 3 | (6%) |
| Parent | 3 | (6%) |
| Outpatient nurse | 2 | (4%) |
| Specialist pediatrician | 2 | (4%) |
| Resident physician | 2 | (4%) |
| Other* | 3 | (6%) |
| Gender (% female) | 31 | (65%) |
| Age (median, IQR) | 49 | [37-57] |
| Race/ethnicity: | | |
| White | 36 | (75%) |
| Hispanic or Latino | 5 | (10%) |
| Asian / Pacific Islander | 4 | (8%) |
| Other | 3 | (6%) |

* including 1 insurance company , 1 case manager, 1 nurse educator

Table 4.2. Domains and themes emerging in deliberative discussions regarding systems and processes required for high quality direct admissions

| Domain & associated themes | Summary of deliberative discussions | Representative quotations |
|---|--|---|
| <i>Effective Multi-stakeholder Communication</i> | | |
| Effective communication within inpatient healthcare teams | Importance of effective communication between inpatient physicians, nurses and residents about patients' clinical and non-clinical needs, including anticipated arrival times, reasons for hospitalization, presence of chronic conditions, pre-admission therapies, acuity, anticipated hospital management, family and social considerations | <p><i>"Any other admission from any other place, PICU, ED, anywhere else, you would get a nurse to nurse report. That would be separate. With direct admissions, the onus is on us to describe adequately and there are always limitations in terms of timing and how busy you are, how busy they are. And it is only like a quick passing in the hallway, where I have to tell you this one liner... "</i></p> <p><i>"We've had a couple of occasions where there is a plan with the daytime doctor, and then the evening doctor has a totally different idea... One saying yes we will take this patient and then the other one saying no, I'm not going to take this patient. I think once the daytime doctor has discussed with the primary care doctor, this is the plan, that we shouldn't be Monday morning quarterbacking them after the fact."</i></p> |
| Effective communication | Effective communication | <i>"[Direct admission] works so much better because I know them [referring provider]. I know them, I trust them. I ask them questions. They feel comfortable to</i> |

| | | |
|--|--|--|
| <p>between inpatient and outpatient healthcare providers</p> | <p>between referring and accepting healthcare providers facilitated by: (i) trust in referring healthcare provider and respect for their longitudinal relationships with families, (ii) respect for accepting healthcare providers' roles in determining inpatient clinical management, and (iii) ongoing reciprocal communication</p> | <p><i>ask me and there is this sort of - if things don't go right, we can go back and talk about it. When you have this large system where people come from all these different places and you don't really have a relationship, then that's when the handoff is really poor. So I think the more integrated the system the better."</i></p> <p><i>"We have tried every possible means to treat the patient as an outpatient and when we get second guessed, that is the most frustrating situation. When you give vital signs...you know, respiratory rate is this, oxygen saturation is this and I have given this treatment...I have kept him in the office with our rehydration protocol for the last 3 hours and he/she is not doing well. And somebody says, 'Well, did you try clear liquids?' What do you think? I was twiddling my thumbs?"</i></p> <p><i>"That handoff between physician and physician and nurse to nurse needs to be clear. And I think we fall short of that a lot. You know, the receiving facility is really dependent on what the hand off is from the admission. That is how you are making your decisions."</i></p> |
| <p>Purposeful communication with families</p> | <p>Communication with the family about plans and expectations for treatment and how those plans may differ when arriving on the floor, instructions regarding when and where to arrive at the hospital</p> | <p><i>"The dangers of direct admission is confusion for the parents sometimes where the doctor in the office says, 'You are going to come over to the hospital, get an x-ray and an IV' and kids change within hours sometimes. Look better and the fever goes away. So I think we have made gains in saying, 'Please don't tell them they are going to get a lumbar puncture...Just say the doctors there are going to evaluate you and they might do this, but they will come up with a plan.' So we've done a lot of communication about trying not to set up a specific plan. Or to make sure we tell the parent the plan will be assessed once you get to the hospital. They will come up with a plan."</i></p> |
| <p><i>Resources needed for high quality direct admissions</i></p> | | |
| <p>Human resources within the hospital</p> | <p>The prompt and ready availability of the medical team including nurses, physicians, respiratory therapists, phlebotomists</p> | <p><i>"Have a little bit of a pop off valve in terms of staffing and in terms of somebody being readily available to see that patient immediately when they get there and do a good assessment of the child when they get there. You know, you are adding a patient to another 4 or 5 patient assignment, sometimes. And the inpatient setting right now, is that our typical day is like 8 to 10 kids go out. 8 to 10 kids come in. So there is a lot of activity and a lot of need for a little pop off valve or something to be another pair of hands, another set of eyes. And that is not always available to us."</i></p> |
| <p>Triage system</p> | <p>Importance of consistent system to triage patients at the receiving hospital upon</p> | <p><i>"It really depends on the capability of whoever that accepting person is or whatever system is in place, to be able to triage, so you can make a decision based on the clinical appearance of the case rather than</i></p> |

| | | |
|---|---|--|
| | arrival; potential opportunity and challenges of triage in the ED without full ED registration | <p><i>diagnoses."</i></p> <p><i>"Either you are being admitted or you are going to the ER. That is a fundamental thing. I don't know anywhere where it exists...well, let's send them there just to make sure they are ok."</i></p> <p><i>"If a patient is seen in the ED, they are registered in the ED and they are an ED patient. And it is because we see the patient, there is liability, there is responsibility and accountability for that patient and therefore, you know, the patient should be registered, we feel, and the ED should get credit for that visit if you will."</i></p> |
| Availability and limitations of non-human resources | The prompt and ready availability of beds, medications, and therapies; limitations of electronic medical records to allow for pre-admission placement of orders | <i>"It is the availability of resources on our end. And it is a system problem of us not being able to access things for that child, if they get directly admitted because we have to go through the admission process...so we get held up on our ability to access resources. There are some system issues that could definitely be fixed and would make us feel better on the inpatient side of it."</i> |
| Resources available to referring providers to initiate patient care | Variation in capabilities and resources of referring healthcare providers to initiate diagnostic testing and therapies | <i>"We can do a lot of stuff in our office, and for the families it is a nicer place to be than going to the ER where they may not know anybody and they do not know them."</i> |
| Systematic approach to pre-admission data collection | Value of using a consistent approach to data collection, including a "one call" system to reach the inpatient team, and a data collection instrument to facilitate pre-admission assessment, including vital signs, pertinent medical history; may inform appropriateness of direct admission and facilitate communication within hospital team | <p><i>"When somebody calls with a potential direct admission, not just calling the attending, but also talking with the charge nurse, having that be a joint phone call so that way, once you are off the phone with the attending, it doesn't have to be ok, well, let me make sure we have a bed. If you have that in one phone call, then that might simplify that process. Or at least take one extra step out of the process."</i></p> <p><i>"As hospitalists we have a written sign out and it has very structured things included on it. I wonder if we could like create something, something structured to make sure we have vitals. 'Cause sometime we will ask, even with 'respiratory kids' and they'll say, 'Oh, he doesn't look good.' But then as an accepting provider, it is harder to know because that is a very subjective thing. So sometimes it is nice to have objective criteria... What is the respiratory rate? What is the oxygen saturation? And if we could have specifics from the referring doctor who knows that they should look through the past medical history. Many times there is no blood pressure. Or maybe there is no oxygen saturation. And knowing what the meds are so we know what to anticipate."</i></p> |
| Quality reviews | Ongoing approach to evaluate direct admission processes | <i>"I've heard all these anecdotal stories of well, 'We got this patient who comes in on a 6 liter non-re-breather.' And why the hell didn't I hear about it? You</i> |

| | | |
|--|---|--|
| | and outcomes | <p><i>know? Why didn't somebody come to me and go, 'Do you realize that so and so from wherever, sent this kid in and... ' We need to talk about that. You know?"</i></p> <p><i>"Every month, we look at every patient who has come to our floor and needed to leave [transfer to higher level of care]...we are doing quality reviews, so it is very rare that someone slips through the cracks"</i></p> |
| Written direct admission guidelines | | |
| Populations appropriate for and inappropriate for direct admission | Diagnoses, clinical conditions, and vital sign parameters to guide the appropriateness of direct admissions, to identify patients that may not require hospital admission as well as patients that may be too unstable for direct admission | <p><i>"I think there are very few diagnoses that are black and white."</i></p> <p><i>"Personally, I don't think we can make a list with specific diagnoses. It would be more if the patient is stable and isn't going to need immediate medical attention. Does the patient need an IV or resuscitation now? Does the patient need labs immediately?"</i></p> <p><i>"There are some conditions that should never go to the ED. Like hyperbilirubinemia should never go to the ED."</i></p> |
| Urgency of initial inpatient management | Need for diagnostic testing or interventions within a particular time window | <i>"They had to be able to be up on the floor for up to 30 minutes before the resident or anyone is going to actually go in and assess them. And so...if they weren't stable enough to be able to do that, then they had to come in through the ER."</i> |
| Pre-admission physician assessment | Time window in which an outpatient provider should have seen the patient to consider them as a direct admission, and locations from where direct admissions accepted | <i>"We do have a specific policy for the hospital when referring from the office that they have to be seen by the physician in the office before they come over. One exception that is written in the policy, is that jaundice - you are home and you hear the lab results. But otherwise all other issues must be seen."</i> |
| Times when direct admissions accepted | Hours for accepting direct admissions might be limited | <i>"I think a lot of times, like as a senior resident at night, with no attending in house, you often get admissions that were billed very differently from what they come in as... complex cases that you are just not sure what to do with them. And so I do think, in a system where we don't have attendings at night, you are running a little bit of a risk sometimes."</i> |
| Strengths and limitations of written guidelines | Application of guidelines should not override reciprocal communication between referring and accepting providers | <i>"But I also, sometimes, develop a great deal of angst around policies and guidelines. And I use the example of my office. We have some policies and guidelines we try to utilize. And that is to keep the office running smoothly. But I also say to my front office staff all the time, 'I don't want the answer to ever just be no.' Like you know, if it seems like a problem, let's figure this out. And my one...one of the big hang-ups with guidelines and policies around this is nothing should ever trump the fact that I can say, 'Well, [hospitalist], here is what I'm actually dealing with. And I've got</i> |

| | | |
|--|---|---|
| | | <i>this and this. You are like, Oh, well, you know. If you have this and this.' There has to be a very clear pathway to say, 'Let's communicate about this and see what the situation is, you know?'"</i> |
| <i>Family preferences and needs</i> | | |
| Preference to avoid the ED | Primary care providers and parents described how and why they preferred to avoid ED utilization | <i>"Like being able to avoid the ER and going straight from the pediatrician to the hospital was fantastic..."</i> <i>"Mostly we have always gone through the ER and she just hates the ER. She just don't like that. Cause I think everything is very hectic in there".</i> |
| Family-centered care | Importance of understanding families' preferences regarding sites of care, emphasizing the importance families' experiences of care | <i>"If your patients have preferences, knowing what they want is helpful."</i> <i>"But we get into the clinical technology of what we need and what we need to do and we forget that this is a person - a mom and a dad and a child - who are now being displaced. "</i> |

both because they were evaluated in third party payer contracting for outcomes including ED utilization, and because they didn't think ED utilization was in their patients' best interests. They also described their desire for inpatient-based physicians and nurses to respect their assessment of patients' need for hospitalization, based on their longitudinal relationships with patients and their efforts to optimize outpatient clinical management. For example, one PCP stated, *"When you are trying to do a direct admission... [and] the accepting person doesn't trust what you are saying - that's very frustrating. Especially when you just spent 4 hours doing a work-up and it's a patient you know really well...I don't want this patient to go to the ER. I do know what I'm doing."* In contrast, inpatient healthcare providers placed a high value on ensuring patient safety, appropriate use of hospital resources, and autonomy to make inpatient-based clinical management decisions.

Participants suggested and discussed 27 outcomes to evaluate pediatric direct admission systems of care, summarized, with representative quotations, in Table 4.3. Of these, the

Table 4.3. Outcomes to evaluate direct admission systems of care as prioritized by participants in deliberative discussions.

| Outcomes suggested by participants | Votes cast (n=135)* | | Representative quotations |
|---|---------------------|-----|--|
| | n | % | |
| Clinical outcomes | | | |
| Unplanned transfer to higher level of care | 26 | 19% | <p><i>"Did the patient present as billed? ...Were they discharged from the floor in a few hours because they were less acute than anticipated? Or were they transferred to the PICU?"</i> (Inpatient nurse)</p> <p><i>"That final outcome is really the patient recovery... How soon, how quick, how complete, is the recovery. And any readmission down the road. Any complications. Like escalated to ICU? All those are of interest in addition to patient and family experience..."</i> (Primary care provider)</p> <p><i>"It's just that we, in our head, are thinking 'Ok, what's the worst this patient could look like?' Because we don't want the patient to come to the floor and then have a Rapid Response..."</i> (Hospitalist)</p> <p><i>"None of us are ever going to be right all the time. And I don't know to what degree we want to manage to the safest level possible. You said you are only thinking worst case scenario. I get that. But if we always truly cover for that, we are going to see our costs go way up and our satisfaction go way down. We are going to see every measureable point except for that unlikely worst case scenario outcome, every other parameter is going to go in the other direction."</i> (Primary care provider)</p> |
| Length of stay in the hospital | 8 | 6% | |
| Number/% of patients redirected to the ED | 4 | 3% | |
| Mortality | 3 | 2% | |
| Hospital readmission | 2 | 1% | |
| Medication errors | 2 | 1% | |
| Disease-specific quality measures | 2 | 1% | |
| Number/% of hospitalizations for non-medical indications | 2 | 1% | |
| Medication reconciliation errors | 1 | 1% | |
| Rapid response calls | 1 | 1% | |
| Number of high-turnover hospitalizations (< 8 hour, <24 hour duration) | 0 | 0% | |
| Number/proportion of patients with significant work of breathing/respiratory distress | 0 | 0% | |
| Number/proportion of patients requiring urgent/emergent procedures | 0 | 0% | |
| Efficiency and healthcare costs | | | |
| Total cost of episode of care | 9 | 7% | <p><i>"Our goal...is to avoid ED utilization. We are in our offices. We have extended hours. We have urgent cares. We have weekend availability. You know, the whole idea is, with all of this availability, every goal is to minimize our most expensive, least efficient form of health care, which is the emergency department."</i> (Primary care provider)</p> <p><i>"So our sort of thinking in the ER is, 'Are we going to add any value to really bringing this patient in through the ER?' If the answer is yes, great. If the answer is no, they should be a direct admit."</i> (Emergency room physician)</p> <p><i>"When people come into the hospital who I don't think should have and then go home the next morning. So to me, I think that is a quality issue when you get admitted, when</i></p> |
| Insurance denials for observation or inpatient level of care | 2 | 1% | |
| Out-of-pocket costs experienced by families | 0 | 0% | |

| | | | |
|---|----|-----|--|
| | | | <i>you don't need to be admitted."</i> (Hospitalist) |
| Timeliness outcomes | | | |
| Time from arrival on hospital floor until initial administration of intervention and/or medications | 15 | 11% | <i>"I think my biggest concern would be a child arriving on the floor and having no one see them for a period of time and having them get very sick before someone - either a nurse or a physician - to go in and see them. I mean I see that as the biggest potential risk. Making sure that if we do accept the direct admission, there is some person - some staff - free to go and assess that patient right away."</i> (Inpatient nurse) |
| Delay in care (unspecified) | 12 | 9% | |
| Time from referring provider call initiation to accepting provider call response | 11 | 8% | |
| Time from acceptance of patient until patient arrival on the floor (timely patient arrival) | 3 | 2% | |
| Time from arrival on hospital floor until initial clinical assessment | 2 | 1% | |
| Time from admission request to bed placement | 1 | 1% | |
| Time from arrival on floor until initial orders placed | 0 | 0% | |
| Multi-stakeholder reported experience of care | | | |
| Families' self-reported experiences of care | 22 | 16% | <i>"I think you also have to decide what is the guiding mission of it. Is it the patient's experience? Or is it cost? And I think those two are really going to hit heads."</i> (Primary care provider) |
| Accepting healthcare team satisfaction with processes | 3 | 2% | |
| Referring provider satisfaction with process | 2 | 1% | |
| Quality of handoff from referring to accepting provider | 2 | 1% | <i>Looking at the family experience perspective, a deductible has a huge impact on a family at times."</i> (Primary care provider) <i>"The referring physician satisfaction. But also the person who is accepting the patient, taking care of the patient and assessing the patient for admission. Did they have the information they needed?"</i> (Primary care provider) |

* each participant cast up to 3 votes to select the outcomes they considered best suited to evaluate direct admission systems

most frequently endorsed outcomes included: (i) unplanned transfer to a higher level of care, (ii) family self-reported experience of care, (iii) delays in care, including time

required from arrival on the hospital floor to initial inpatient clinical management, and time required for referring providers to connect via phone with accepting providers, (iv) healthcare costs, and (v) length of hospital stay. During deliberative discussions, PCPs described the importance of balancing patient safety outcomes with improved efficiency afforded by direct admission, stating, “*From a bigger picture perspective, you know, we can't play it that safe...*” Inpatient-based healthcare providers advocated for clinical outcomes, including avoidance of rapid-response calls and unexpected transfers to higher level of care.

Delphi Methods

All nine panelists completed both rounds of data collection, reflecting a 100% response rate. In the first round of data collection, panelists rated 83 of 103 items as appropriate and necessary at both children’s hospitals and community hospitals. Items rated as having uncertain appropriateness and/or necessity at either hospital type were discussed via conference call; 12 items rated as appropriate and necessary in the first round were also discussed at the request of panelists. Several additions and revisions to items were proposed during the conference call, resulting in a 32 item second-round survey.

In the second round of data collection 8 of 32 items were rated as appropriate and necessary at both children’s hospitals and community hospitals. In aggregate, across both rounds of data collection, 71 guideline components (summarized from 91 survey items) were rated as appropriate and necessary; these are shown in the Supplementary Results, Appendix 5.4. Guideline components include: (i) 10 items related to pre-admission communication, including use of a consistent system to receive direct admission referrals,

allowing referring providers to make one phone call and connect with an accepting provider in an efficient manner, and specific clinical information that referring healthcare providers are recommended to have available at that time; (ii) 11 items recommended for inclusion in written guidelines, including populations appropriate for and inappropriate for direct admission, times that direct admissions are accepted, and circumstances under which patients will be accepted for direct admission from their homes; (iii) hospital resources to optimize direct admission processes, including the availability of a member of the healthcare team to assess the patient's vital signs and clinical status within 15 minutes of the patient's arrival, and the availability of medications and supplies commonly required for directly admitted patients on the admitting unit of the hospital; (iv) 6 special considerations for pediatric populations that may be at particular risk of nosocomial infection and/or stress in EDs, including neonates, children with autism, and children being readmitted to hospital; (v) 8 items regarding communication with families referred for direct admission, including the name of the accepting physician, a phone number at the hospital, and clear instructions regarding when and where to go upon hospital arrival; and (vi) 3 items regarding quality reviews to evaluate admission systems. In addition, 13 outcomes were prioritized to evaluate hospital admission processes and outcomes (Table 4.4). Items rated as appropriate but not necessary for direct admission systems at children's hospitals and/or community hospitals are summarized in the Supplementary Results, Appendix 5.5.

Table 4.4. Outcomes prioritized by Delphi panelists to evaluate the quality of direct admission*

1. Unanticipated transfer to the pediatric intensive care unit or to another hospital for a higher level of care within 6 hours of hospital admission
2. Rapid response calls within 6 hours of hospital admission
3. Total time from the time of arrival on the pediatric ward to initial assessment by the admitting physician or associate provider
4. Time from initial call from the referring provider until the patient is accepted for direct admission or routed elsewhere
5. Total time from the time of arrival on the pediatric ward to initiation of treatment
6. Patient and family satisfaction/experience
7. Number/% of directly admitted patients thought to be unnecessary or inappropriate from the perspective of the accepting physician
8. Rates of medication errors
9. Referring provider satisfaction/experience
10. Inpatient team satisfaction/experience
11. Number/% of directly admitted patients who are discharged home within 8 hours of arrival
12. Number/% of patients admitted to the unit or service that are admitted directly
13. Total costs of the hospitalization

** listed in order from most to least highly recommended by Delphi panelists*

DISCUSSION

We applied two complementary methods to engage diverse stakeholders in pediatric direct admission processes, developing guidelines to improve this admission approach and to evaluate the impact of direct admissions on quality, safety, and patient experience. Pairing of deliberative and Delphi methods allowed us to develop an in-depth understanding of stakeholders' perspectives and to generate recommendations applicable to both children's and community hospitals.

A national survey of pediatric medical directors found that 97% of hospitals accept pediatric direct admissions, yet the majority reported inconsistent approaches to care and low levels of satisfaction with current direct admission processes.⁵³ Our direct admission

guidelines can be adapted for use by hospitals and health systems to standardize admission processes, prioritize populations best suited to this admission approach, and establish necessary infrastructure and resources to provide safe, patient-centered care. Unlike some past outcome prioritization studies that have failed to reach consensus across stakeholder groups, our research process prioritized several quality measures to evaluate direct admission processes and outcomes;⁸⁰ routine evaluation of these measures by multidisciplinary healthcare providers was advocated by all stakeholder groups. As hospitalists increasingly provide hospital-based care for children and primary and inpatient care are increasingly siloed, such multi-stakeholder engagement is particularly important. Analogous to national efforts to evaluate and improve hospital-to-home transitions, efforts to improve transitions *into* the hospital are important to achieve health system integration.⁸¹⁻⁸⁵

This research also provides valuable information about how different stakeholder groups differentially conceptualize high quality pediatric healthcare across the care continuum. PCPs advocated for efficient transitions into the hospital, facilitated by clear and consistent communication systems and respect for their knowledge of their patients' healthcare needs. Correspondingly, they described ED assessment and management prior to hospitalization as duplicative and unnecessary. These perspectives were shared by our parent participants and are consistent with several principles of the patient-centered medical home, including continuous, comprehensive, patient-centered care.⁴⁴ In contrast, hospital-based physicians and nurses advocated for autonomy in their assessment of a patient's need for hospitalization and prioritized patient safety and stewardship of

hospital resources, describing hospital admission processes beginning in the ED as a means to achieve this. Understanding such differences in the perspectives of inpatient- and outpatient-based healthcare providers is important to inform pediatric direct admission processes, as well as the many other healthcare processes that span settings and healthcare teams.

Our results should be interpreted in light of this study's strengths and limitations. Our deliberative discussions were limited to three health systems within the greater Boston region, which may limit the transferability of our results. Moderator bias and response bias are other potential limitations of deliberative methods, which we made efforts to minimize in our facilitator training. With respect to our Delphi process, we acknowledge that the evidence-base upon which our guidelines are based is limited to a small number of retrospective studies and expert opinion.

Our use of Delphi methods following deliberative discussions mitigates several limitations of using one research method alone. For example, to mitigate the geographic limitation of our deliberative discussion, we sought national representativeness in our Delphi panel. Similarly, Delphi methods are designed to reduce response bias because panelists submit their responses anonymously. The outcome of Delphi processes is highly dependent on the data input into the first round, and Delphi processes have been criticized for a lack of transparency regarding this source data.^{86,87} By using the results of our deliberative discussions to inform our Delphi data collection instrument, we addressed this criticism and kept multi-stakeholder engagement central to our approach.

Despite differing perspectives and priorities among stakeholders in hospital admission processes, our Delphi process resulted in a comprehensive set of direct admission guidelines applicable to both children's hospitals and community hospitals. Adaptation of these guidelines for specific hospitals and health systems, and evaluation of outcomes associated with their implementation, are important next steps.

Chapter 5

Discussion

The overall goal of this PhD thesis is to generate knowledge to identify the pediatric populations, healthcare settings, and procedures best-suited for pediatric direct admissions. We addressed this goal by conducting several research studies using different research methods, including a qualitative analysis of families' hospital admission experiences and preferences, a quantitative study of hospital and community factors associated with risk-adjusted direct admission rates, and the pairing of deliberative methods and a Delphi process to develop direct admission guidelines. By completing these three analyses, we have contributed to the knowledge base about this hospital admission approach, providing comprehensive guidance that can be used by hospitals and health systems to improve hospital admission processes.

To our knowledge, our qualitative analysis of parents' experiences and preferences regarding their child's hospital admission (Chapter 2) is the first to examine patterns of and reasons for pediatric pre-admission acute care among hospitalized children and to give a voice to parents regarding their hospital admission preferences. We identified quality domains prioritized by parents regarding their child's hospital admission, generating valuable data to inform initiatives to improve transitions from outpatient to inpatient settings, and to guide efforts to improve health system integration. We found that, among this group of children hospitalized with ACSC, the week preceding hospitalization was a period of substantial healthcare utilization, with the majority of children having multiple clinical encounters during this time, often in multiple settings. Our findings highlight that, similar to post-discharge care, pre-admission healthcare utilization is substantial and associated with varied degrees of continuity.

The results of this study also expand on the literature about why patients seek acute care in EDs. Although several parents in our sample described their PCP as the first and most appropriate point of contact to access all healthcare services, others viewed the ED as the most appropriate avenue for acute care and did not conceptualize PCPs in this role.

Among children admitted through EDs, PCPs were the first point of contact for approximately 50%; this number is similar to national survey data that found that, among a predominantly adult population, only 42% saw their PCP for “first contact” care for acute conditions.⁶ In contrast, more than 90% of children admitted directly saw their PCP for initial disease management. These findings speak to the enhanced opportunity for care continuity among directly admitted children. Effective hand-offs from outpatient to inpatient providers, as described by parents in our study, may contribute to lower rates of diagnostic testing and healthcare costs observed in previous studies comparing direct and ED admissions.^{12,16} In addition, our identification of quality domains prioritized by families’ lays important groundwork for future efforts to improve transitions into hospital.

As summarized in Chapter 3, our quantitative analysis of three large national datasets found that observed community and health system characteristics accounted for a small proportion of the variation in risk-adjusted direct admission rates across hospitals.

Several of the hospital and health system factors that we expected to be associated with risk-adjusted direct admission rates – hospitalists providing inpatient care, physician-hospital integration, and joint ventures between physicians and hospitals – did not explain the variation across hospitals. Instead, the variables that accounted for greatest proportion of explained variation included pediatric hospitalization volume, ED volume, the number

of pediatricians per capita working in the community, and the racial/ethnic composition of the patient population. These findings suggest that additional unmeasured factors, perhaps related to physician and hospital preferences and health system infrastructure, are associated with hospitals' direct admission rates. Identification of such modifiable factors would enable structurally diverse hospitals to develop the infrastructure necessary to support pediatric direct admission processes.

Our third manuscript, Chapter 4, used mixed research methods to suggest several such modifiable factors. We applied two complementary methods to engage diverse stakeholders in pediatric direct admission processes, developing guidelines to improve this admission approach and to evaluate the impact of direct admissions on quality, safety, and patient experience. Pairing of deliberative and Delphi methods allowed us to develop an in-depth understanding of stakeholders' perspectives and to generate recommendations applicable to both children's and community hospitals.

A national survey of pediatric medical directors found that 97% of hospitals accept pediatric direct admissions, yet the majority reported inconsistent approaches to care and low levels of satisfaction with current direct admission processes.⁵³ Our direct admission guidelines can be adapted for use by hospitals and health systems to standardize admission processes, prioritize populations best suited to this admission approach, and establish necessary infrastructure and resources to provide safe, patient-centered care. Unlike some past outcome prioritization studies that have failed to reach consensus across stakeholder groups, our research process prioritized several quality measures to

evaluate direct admission processes and outcomes;⁸⁰ routine evaluation of these measures by multidisciplinary healthcare providers was advocated by all stakeholder groups. As hospitalists increasingly provide hospital-based care for children and primary and inpatient care are increasingly siloed, such multi-stakeholder engagement is particularly important. Analogous to national efforts to evaluate and improve hospital-to-home transitions, efforts to improve transitions *into* the hospital are important to achieve health system integration.⁸¹⁻⁸⁵

Despite differing perspectives and priorities among stakeholders in hospital admission processes, our Delphi process resulted in a comprehensive set of direct admission guidelines applicable to both children's hospitals and community hospitals. Adaptation of these guidelines for specific hospitals and health systems, and evaluation of outcomes associated with their implementation, are important next steps.

Chapter 6

Appendix

6.1. Supplementary Results (Chapter 2): Representative quotes describing processes and outcomes related to hospital admission valued by parents of children admitted through emergency departments and via direct admission.

| Domains and associated themes | Representative quotes | |
|--|--|--|
| | Admission through ED | Direct admission |
| Domain 1. Effective clinical care | | |
| A. Clinical improvement | <i>I would definitely say it is more the quality of the care. 'Cause if I was getting amazing care and I just had to wait all day, I would. It would not matter to me as long as my son was being treated and being take care of. (Participant B6, community hospital)</i> | <i>The admission would go well when we find out what's wrong with her, and she gets treated...I think anybody else would say the same, because if you're sick you want to get well (Participant B4, community hospital)</i> |
| B. Healthcare team expertise | <i>You don't want a moron doing radiology tests, you want someone that actually knows about pediatricians, pediatrics. You want someone that's competent. I think that's the biggest thing, if you have the wrong person reading it or doing it, that's how they make mistakes, the costs go up. (Participant A3, community hospital)</i> | <i>In a hospital, you want it to be the best one and known for the best rankings and all that jazz... I wouldn't want to be in a hospital that is like, "meh"... You want to be in a hospital that is like a really good hospital. Like you feel you are in perfectly good hands. (Participant C10, children's hospital)</i> |
| Domain 2. Efficiency | | |
| A. Avoid unnecessary hospitalizations | <i>The only thing is that there is a chance that you're going home when you get into admitted to the ER. There's a chance. There's a fifty, fifty split whether she bounces back and does well and we can go home...That's really the most ideal because we don't have to stay overnight and we can be home and recuperating at home. (Participant A9, community hospital)</i> | |
| B. Avoid unnecessary clinical encounters | <i>He came by ambulance but he went into the ER first and then got admitted to the floor. But even though we knew he was coming it was like an unnecessary step it seemed like at that point in time to have to come to the ER when the pediatrician was saying "you need to be admitted"...That was a tough admission. (Participant B1, community hospital)</i> | <i>It's better because you'll be seen by just the one doctor as opposed to several different doctors, so at least I know that he's being cared for and that one particular doctor knows what's going on with him. (Participant A2, community hospital)</i> |
| C. Avoid unnecessary testing | <i>I had brought a copy of the x-ray with me, but they wanted their own copy. So then they took another one and then they saw it on the film and went, "Yes. She is going to have to be admitted." So if I had my dream admission, the pediatrician... would have called somebody here and said, "This is what I saw on the x-ray. I'm e-mailing you a copy of it. Pull it up on your screen. He or she would have pulled it up on the screen and said 'Yes, I concur. Have them come to Floor 7</i> | |

| | | |
|---|--|---|
| | <i>and check in at the desk and we will have the room ready.” That would have been my perfect admission. (Participant C9, children’s hospital)</i> | |
| Domain 3. Safety & security | | |
| A. Safe physical environment | <i>Cause you know, they have more equipment to help in case of emergency... I know if I go to the Doctor's Office... they don't have everything... every medication and stuff that can open her airway like the Emergency. They have it all here. (Participant B9, community hospital)</i> | <i>I think it’s important that the little ones be... kind of blocked off from everything ‘cause I remember I was older but coming here to the emergency room to see some people with possible drug overdose and stuff like that. And I don’t want that around my kid all the time. (Participant B2, community hospital)</i> |
| B. Low nosocomial infection risk | <i>You are exposed to other things down there that you know...so you are already coming in compromised because you are ill. And then there are all these other sick people around you. So I think there is an inherent risk of being exposed to other things. (Participant C9, children’s hospital)</i> | <i>Well, also when it is a Direct Admission, you are not waiting in a waiting room with all these other people who have other issues... You are directly taken to your room and all the other children who are there, are properly contained. So I'm not really worried that she is going to get the flu or something else from the others. Where as in the ER, you are always kind of worried. Like are we going to pick something up along the way? (Participant D10, children’s hospital)</i> |
| Domain 4: Timeliness | | |
| A. Rapid diagnosis and treatment | <i>Sometimes the good thing is you get a lot of the tests a lot faster because it is in the ER and they need to get results pretty quickly to determine where they need to go from there. That is kind of a real benefit. That's why my doctor sent him to the ER too. (Participant D9, children’s hospital)</i> | <i>I feel like when they’re directly admitted you get taken care of faster than versus emergency room, where if they’re busy taking care of actual emergencies. She’s not considered a fatal emergency, so it’s a little longer process. But when you’re directly admitted you get, I feel like you get faster attention from the doctor. (Participant D1, children’s hospital)</i> <i>I just feel like she gets better quicker because she doesn’t have to wait for so long...We go to the hospital and I know she will have an IV in her in an hour versus if we go to the emergency room it could be three to four hours before she has that IV. (Participant A9, community hospital)</i> |

| | | |
|---|--|--|
| <p>B. Rapid bed placement</p> | <p><i>I mean there are times when she was admitted like for the stomach virus, there wasn't a bed for her for two days. She was in the ER. And like why would you admit somebody and not have a bed for them? It's just crazy. (Participant C7, children's hospital)</i></p> | <p><i>We don't want to go through the emergency room and wait all that long... We had established a plan with his pediatrician now that we call them up and they expect us. We go right in. (Participant A8, community hospital)</i></p> |
| <p>Domain 5. Patient- and family-centered care</p> | | |
| <p>A. Respect for parents perspectives</p> | <p><i>Parents are pretty credible and I find sometimes they don't really take parents at their word. And I know they have to double check, but sometimes what you are saying doesn't matter. If it didn't come right out of the mouth of the Doctor... they could be a little bit more understanding. A lot of parents are aware of what's happening. (Participant C8, children's hospital)</i></p> | <p><i>If they weren't going to admit her I was going to push for it. She needed to be admitted. We weren't getting any better... and I knew that she was starting to get dehydrated and she was in a lot of pain. And I was glad the pediatrician... agreed to admission because otherwise I would have pushed for it. (Participant A9, community hospital)</i></p> |
| <p>B. Effective communication</p> | <p>With Parents: <i>There was not any communication as far as how long it would be, who's next or anything to the waiting room. There's really no patient liaison for the waiting room that exists. (Participant A3, community hospital)</i></p> <p>Among healthcare team: <i>Well, he called in to the emergency department first, because they had seen us last week. And he spoke with the doctor that saw us that night and he said, "Oh, I remember her. Okay, yeah, send her right over, we'll be waiting." But then when I got here, I'm a little confused because... they were kind of like, "Why are you back?" ... they were completely shocked that I was even there again... That was a little upsetting because... her pediatrician had called here and said, "Yep, they're waiting for you." And then I got here, and they had no idea what the story was. (Participant D1, children's hospital)</i></p> | <p>With Parents: <i>But I guess just more communication... but there hasn't been a ton of that... . (Participant C10, children's hospital)</i></p> <p>Among healthcare team: <i>It's almost like the doctors don't even debrief each other... if I just worked a shift and I know what's going on with this patient I'm going to back-brief you so that when you come in you know what's going on... . (Participant D2, children's hospital)</i></p> |
| <p>C. Privacy/atmosphere</p> | <p><i>The fact that it was just us in the room, that was very nice that there wasn't other patients in the room with her. You know, cause she didn't have to witness other people getting procedures done to them. (Participant D10, children's hospital)</i></p> <p><i>And, one thing about the emergency room is the waiting room</i></p> | <p><i>... I'm making a generalization, but from our experience, when you're in an ER situation people are just more stressed out, which is obvious. Like how could you not be? ...It's not as comfortable as a hospital room on a floor... Because there are just so many people, you know. And you might be on a stretcher with like curtains</i></p> |

| | | |
|----------------------------|--|---|
| | <i>there's really no area in the waiting room that is pediatric-centered. It was really just neutral. That surprised me because we did see a lot of pediatric patients in the emergency room. They need an area, different wallpaper, different TV with kid stuff on it. I didn't see that. . (Participant A3, community hospital)</i> | <i>between each of you... Whereas, this is much more comfortable in terms of knowing like you're coming right from a doctor's office to a hospital room that's ready for you, there's a bed, there's a nurse ready to come help you with needs. She might have other patients but she's not running around like an ER nurse. (Participant B3, community hospital)</i> |
| D. Convenience | <i>They sent the person to me, to register. At the hospital, in the past, you have to register first before you're seen. And it was nice that she just wheeled right in there with her computer. And took care of all of that, while he was getting the care he needed. So...so that was nice. To not have to worry about sitting there with a sick child. . (Participant C2, children's hospital)</i> | <i>Usually what we do is we go to his pediatrician just cause we feel it's more convenient. We don't want to go through the emergency room and wait... (Participant A8, community hospital)</i> |
| E. Low out-of-pocket costs | <i>Unless he is there because of an emergency... I don't see why you would go through an ER to get admitted. Why? That is an expensive way...Or it certainly seems more expensive. (Participant C12, children's hospital)</i> | <i>I mean, luckily, you know, our insurance covers everything, but having been in situations in the past where your insurance doesn't cover everything. And if you're staying overnight admission, that's going to be a different bill coming to you than if you just had like a treatment and you went home. (Participant B3, community hospital)</i> |

6.2 Supplementary Results (Chapter 3). Hierarchical generalized linear model of patient-level characteristics on direct admission rate.

| Parameter | Estimate | Standard Error | t-value | p-value |
|--|-----------------|-----------------------|----------------|----------------|
| Intercept | -1.45 | 0.06 | -24.39 | <0.0001 |
| Race: | | | | |
| White (<i>reference</i>) | - | - | - | - |
| Hispanic | -0.23 | 0.02 | -10.79 | <0.0001 |
| Other | -0.02 | 0.03 | -0.71 | 0.48 |
| Black | -0.42 | 0.03 | -16.09 | <0.0001 |
| Missing | 0.29 | 0.03 | 9.49 | <0.0001 |
| Primary payer: | | | | |
| Private (<i>reference</i>) | - | - | - | - |
| Public | -0.51 | 0.01 | -34.12 | <0.0001 |
| Uninsured | -0.71 | 0.04 | -16.47 | <0.0001 |
| No charge or other | -0.36 | 0.04 | -9.49 | <0.0001 |
| Medical complexity: | | | | |
| Non-chronic disease (<i>reference</i>) | - | - | - | - |
| Non-complex chronic disease | -0.02 | 0.02 | -0.85 | 0.39 |
| Complex chronic disease | 0.39 | 0.03 | 14.15 | <0.0001 |
| Disease severity: | | | | |
| 1 (<i>reference</i>) | - | - | - | - |
| 2 | -0.09 | 0.02 | -5.92 | <0.0001 |
| 3 | -0.03 | 0.03 | -0.82 | 0.41 |
| 4 | 0.03 | 0.08 | 0.33 | 0.74 |
| Reason for hospitalization: | | | | |
| Pneumonia (<i>reference</i>) | - | - | - | - |
| Asthma | -0.18 | 0.02 | -7.56 | <0.0001 |
| Bronchiolitis | 0.34 | 0.02 | 16.54 | <0.0001 |
| Cellulitis | 0.41 | 0.03 | 16.15 | <0.0001 |
| Dehydration | 0.37 | 0.02 | 16.32 | <0.0001 |
| Fever | 0.33 | 0.03 | 9.76 | <0.0001 |
| Gastroenteritis | -0.09 | 0.04 | -2.34 | 0.02 |
| Influenza | 0.19 | 0.04 | 5.43 | <0.0001 |
| Urinary tract infection | -0.01 | 0.03 | -0.5 | 0.61 |

6.3. Supplementary Methods (Chapter 4): Areas of Inquiry for Deliberative Discussions and Facilitation Guide

Set-up: Each room should have:

- a recording device, and spare battery, that should be placed in a central location
- ground rules posted or prominently placed
- index cards to capture ideas that aren't spoken (because of time or participant comfort)
- Dry Erase or Flip chart paper (and markers) for facilitator to record challenges, outcomes.
- Post-it notes for participants to vote on outcomes
- Lunch set up
- Laptop (for note-taker) and electronic templates

Roles:

Note-taker is responsible to:

- Oversee that set-up (provided above) is complete
- Start recording once facilitator lets everyone know it will be used (and double-check it stays on periodically)
- Take time and make sure that focus group is roughly on schedule
- Record notes on laptop into provided template
- Ask probes and assist in ensuring core domains are addressed.

Facilitator is responsible to:

- Make sure that room is set-up in a way conducive to group conversation
- Greet people and develop rapport upon entrance

- Facilitate the guide and ensure core domains are addressed.

STEPS FOR THE 90 MIN MEETING:

- 1) Greet, offer lunch, introduce participants to each other informally until most participants are present
- 2) Encourage participants to sit down with their food and introduce themselves
- 3) Pass around demographic questions and ask each participant to fill one out.
- 4) Introduction of focus group goals/direct admission background
- 5) Focus group discussion
- 6) Voting on outcomes using sticky-notes
- 7) Collect demographic question sheets
- 8) Provide gift cards – important to give these to the right people (pre-specified) and have them sign off that they received them.

Introduction/Ground Rules

A direct admission is defined as an admission to hospital without first receiving care in the hospital's emergency department. One in four children with unexpected hospital admissions are admitted directly. Despite this, few hospitals have policies or guidelines about which children are best suited to direct admissions, or how to keep direct admissions safe. During this discussion, we'd like to hear your thoughts about: (i) how to determine who is best suited for direct admission; (ii) hospital and clinic resources and infrastructure that are needed to support direct admissions; (iii) logistical challenges, safety concerns and methods to address these; and (iv) quality and safety outcomes.

Please focus the conversation on direct admission to hospital from clinics and offices, and not transfers from other hospitals. Please also focus on unplanned admissions – by this we mean admissions that were not pre-arranged (pre-arranged admissions might include surgeries, planned therapies for children with chronic illnesses, or long term monitoring).

We expect you will have different ideas and encourage you to express any differences in opinion that you might have.

We will be recording the session in order to ensure that we capture your comments as accurately as possible. All identifying information will be removed at time of transcription and the audio-recordings themselves will be destroyed once transcription has been completed. If anyone is uncomfortable with the recording or questions posed, you are free to leave or remain silent. Do you have any questions before we begin?

Your Role:

- Speak up! Share your ideas.
- One person at a time
- Talk to one another and do not feel you need to direct comments to me or the research team
- You might have an idea come up after we have moved on from a particular conversation. In this case, please write down your ideas on the index card provided.
- What is said in the room, stays in the room

QUESTION GUIDE

Topic Area 1 – Diagnoses and pediatric populations that may benefit or be at risk from direct admissions

Children can be admitted to hospital for many different reasons. These can include medical conditions, such as pneumonia or skin infections, or surgical reasons, such as trauma or appendicitis. Children can also be admitted for mental health concerns, such as major depression or suicidality.

How do we decide who is safe for a direct admission? (*ie. certain diagnoses or conditions, or should it be based on vital signs*)

Are there conditions or diagnoses that are not appropriate for direct admission? Why? *Does everyone agree that these conditions/diagnoses are not appropriate for direct admission?*

What conditions are best suited for direct admission? Why? (*Does anyone disagree?*)

Topic area 2 - Hospital and clinic settings and infrastructure that may impact direct admissions

What does the hospital need to make direct admissions work well? (*ie. central call center, initial vital signs assessment in the ED before proceeding to ward, admission office able to get to bedside*)

What information or resources do nurses, doctors, or families need when they're in their clinic or office with a child that they'd like to admit directly? *(for example, knowing who to call, map or instructions to give to families, etc)*

What information or resources do nurses, doctors, or others need when they're on the hospital ward to make the direct admission process go smoothly? *(for example, a nurse available to take vital signs as soon as patient arrives, a process to have a room set-up for the patient quickly, etc)*

Does this conversation make you think about other information/resources or systems that we would need to make the direct admission go smoothly?

Topic area 3 – Direct admission logistical challenges, safety concerns and methods to address these

Do you have any concerns about the safety of direct admission? What can we do to prevent these safety concerns from happening?

What things are mostly likely to go wrong with the direct admission process? How can we prevent these things from happening?

What could go wrong for the patient? Their family? The nursing staff? The referring physician? The inpatient physician? The resident team? What could we do to prevent this from happening?

Topic area 4 – Direct admission quality and safety outcomes

What do you think a good admission would look like?

How would you know if the admission went well?

What would a bad admission experience be?

In medicine, we sometimes chose certain outcomes to figure out how good or bad the care is that we're providing. Examples of outcomes include costs, or how satisfied patients and families are.

What outcomes might tell us how safe our admission processes are? In other words, how could we evaluate the safety of our admission process? *Does everyone agree?*

What outcomes might tell us about the quality of our admission processes? In other words, how could we evaluate the quality of our admission process? *Does everyone agree?*

Can anyone suggest other safety or quality outcomes that we should consider with direct admission to hospital?

LIST OUTCOMES ON WHITE BOARD – does everyone agree that these are reasonable safety and quality outcomes? Is there anything that's missing? If you had to vote for the 3 most important outcomes to consider, what 3 outcomes would you choose? Give participants 3 post-it notes and ask them to stick them on the white board next to the outcomes they think are most important.

6.4. Supplementary Methods (Chapter 4): Statistical analysis of Delphi survey data and categorization of survey items

Following receipt of responses from both the first and second rounds of data collection, we calculated the following statistics for each item: (i) median appropriateness and necessity rating, (ii) interpercentile range, a measure of response dispersion (IPR, defined as the 70th percentile minus the 30th percentile), (iii) interpercentile range central point (IPRCP), the center point of the IPR ($IPRCP = IPR/2$), (iv) asymmetry index (AI), the distance between the IPRCP and the central point of the 9-point Likert scale, ($AI = \text{Absolute Value}[5 - IPRCP]$), and (v) interpercentile range adjusted for symmetry (IPRAS, equal to $2.35 + [AI * 1.5]$, developed based on the recognition that when ratings are symmetric, the IPR needed to define disagreement among panelists is smaller than when they are asymmetric). Further details regarding these statistical methods are provided in the RAND/UCLA Appropriateness Manual.¹³

On the basis of these calculations we evaluated each item to determine: (i) the item's appropriateness (categorized as appropriate, inappropriate, or uncertain appropriateness); (ii) the item's necessity (categorized as necessary, unnecessary, or uncertain necessity); and (iii) agreement in responses among the panelists (categorized as agreement or disagreement). Disagreement was defined as an IPR greater than the IPRAS, indicating response dispersion.¹³ An item was considered appropriate and necessary when its median score on the 9-point Likert scale was between 7 and 9 and there was agreement among panelists. An intervention was considered inappropriate or unnecessary when the median score was between 1 and 3 with agreement among panelists. An intervention was considered to have uncertain appropriateness or uncertain necessity when the median score was between 4 and 6, or when there was disagreement among panelists, regardless

of the median.⁷⁷ These determinations were made separately for children's hospitals and community hospitals. For items rated in both the first and second rounds of data collection, the second round of responses was used to determine appropriateness and necessity categorizations. Items were included in the set of endorsed guideline components if they were rated as appropriate and necessary at both children's hospitals and community hospitals.

6.5. Supplementary Results (Chapter 4). Direct admission guideline components rated as appropriate and necessary at both children's hospitals and community hospitals by Delphi panelists

Pre-admission Communication

1. As part of the direct admission referral process, a direct conversation occurs between the referring and accepting physician in order to exchange information about the patient.
2. The person(s) taking the call from the referring physician are aware of current bed and staff availability at the hospital, so that decisions to accept patients can be made in real-time with this knowledge
3. Both an accepting physician and a nurse manager or charge nurse receive information about the referred patient, so that decisions about accepting patients for direct admission can be made in the context of available beds and staff availability (for example, nurse and physician take the call from the referring provider together)
4. Hospitals have an established, consistent system to receive direct admission referrals, allowing referring providers to make one phone call and connect with an accepting provider in an efficient manner
5. The accepting hospital has a secure fax number or electronic medical record system that allows the referring provider to share relevant information at the time of the patient referral (for example, lab results)
6. The anticipated wait time for an available bed should be communicated to the referring provider at the time of the request for the direct admission.
7. For consistency in communication with referring providers, all physicians or associate providers who accept direct admissions are aware of the hospital's direct admission guidelines.
8. The physician or nurse receiving the call to accept the direct admission communicates with respect towards the referring healthcare provider and acknowledges the work they have done to care for the patient.
9. The hospital-based healthcare team has a formal system for sharing information about accepted patients between the person(s) who took the phone call about the patient and the nurse, resident physician, and attending physician who will admit the patient
10. Healthcare providers who take phone calls for patients referred for direct admission should use a form or template to document key information about the patient in a consistent way

Referring providers should have the following information available at the time they refer a patient for direct admission:

1. Patient's full name and date of birth
2. Patient's weight
3. Recent vital signs (heart rate, respiratory rate, oxygen saturation, temperature, blood pressure)
4. Recent vital sign trends (i.e. changes over time such as increasing respiratory rate or decreasing oxygen saturation)

5. Allergies
6. Whether the patient has an IV or central line
7. Whether the patient is currently receiving oxygen, how much oxygen, and mode of administration (for example, nasal cannula or face mask)
8. Current medications
9. Treatments given for the current illness (for example, IV fluids, nebulizer treatments)
10. Recommended time for the next medications or treatments
11. Current neurologic status/presence of any mental status changes
12. Labs performed during the current illness
13. Focused past medical and surgical history
14. Contact number for the referring provider
15. Chronic conditions and technology dependence, if applicable (for example, ventilator use, g-tube)
16. Estimated arrival time at the accepting hospital
17. Mode of transportation from the referring location to the hospital (i.e. ambulance, private vehicle, other)
18. Isolation precautions (for example, need for single room because of infectious disease risks/concerns)

Direct admission guideline components

1. Direct admission guidelines include a list of diagnoses/conditions recommended for direct admission
Populations and diagnoses that may be particularly well suited for direct admission to hospital include:
 - a) Infants with neonatal hyperbilirubinemia (newborns who require phototherapy for jaundice)
 - b) Children admitted with failure to thrive
 - c) Children with skin and soft tissue infections (i.e. cellulitis)
2. Direct admission guidelines include a list of diagnoses/conditions for which direct admissions are NOT accepted
Populations that may be inappropriate for direct admission include
 - a) Children who have experienced trauma
 - b) Children in respiratory distress
 - c) Children being admitted because of new-onset seizures
 - d) Children with gastrointestinal bleeding
 - e) Children with hemoptysis (coughing blood)
3. Children referred for direct admission should not require emergent tests or treatments (for example, emergent IV placement)
4. Direct admissions are limited to the period of time that a physician or associate provider is available to see the patient when they arrive at the hospital
5. Patients referred for direct admission should be clinically stable such that they can safely wait on the hospital ward for up to 60 minutes prior to assessment/management by a member of the hospital team

6. Hospitals accepting direct admissions should have written direct admission guidelines
7. Hospitals accepting direct admissions should share written direct admission guidelines with referring practices and hospitals
8. Ambulance services bringing patients for direct admissions are provided with a contact number for a healthcare provider at the accepting hospital, and asked to call if the clinical status of the patient changes en route to the hospital.
9. Select patients can be directly admitted straight from home following phone contact with their physician (for example, infant with hyperbilirubinemia; cystic fibrosis patient failing outpatient antibiotics; oncology patient with fever/neutropenia)
10. To reduce unnecessary hospitalizations, patients who do not meet hospital admission/observation criteria at the time of the patient referral (based on accepting physician judgment) are directed to the ED for initial assessment/management

Hospital resources for patient care

1. A member of the healthcare team is available to assess the patient's vital signs and clinical status within 15 minutes of the patient's arrival on the pediatric ward
2. Medications and supplies commonly required for directly admitted patients are available on the admitting unit of the hospital
3. Hospitals have appropriate wheelchairs available at the planned site of entry into the hospital

Special populations

1. A child's risk from infectious disease exposures in the emergency department should be taken into account when deciding whether the patient should be admitted directly
2. Recognizing the potential risk of infectious disease exposures in the emergency room, particular efforts should be made to directly admit neonates (infants < 30 days)
3. Recognizing the potential risks of infectious disease exposures in the emergency room, particular efforts should be made to directly admit children who are immunocompromised
4. Particular efforts should be made to directly admit children who are well-known to the inpatient healthcare team (i.e. Children with medical complexity)
5. Recognizing that the emergency room department may be stressful to children with significant behavioral disorders (i.e. autism spectrum disorders), particular efforts should be made to directly admit these children if they are stable.
6. Particular efforts should be made to directly admit children who were recently discharged from the same hospital (readmitted patients)

Communication with Families:

1. If the patient is off-site from the hospital and not coming by ambulance, referring providers instruct families to come directly to the hospital, with a goal of arriving

- on the pediatric unit within 1 hour of the call from the referring provider (unless otherwise discussed between referring and accepting providers)
2. Families are given the name of the accepting physician at the hospital
 3. Families are given a phone number to call at the hospital, in case they get lost or experience other delays
 4. Families are given clear instructions regarding the time that they should arrive at the hospital, and whether they can or should make any stops en route from the referring provider office to the hospital
 5. Referring providers explain to families that their child will be evaluated by the hospital-based healthcare team, and that their child's treatment plan will be informed by this evaluation
 6. Families are given clear instructions about how to get to the pediatric unit where their child will be admitted
 7. Families are given clear instructions regarding who they should meet/ask for when they arrive at the hospital, and where to meet this person (for example, nursing station, hospital room)
 8. Families are told what they need to bring to the hospital (for example, any home medications or equipment/supplies).

Evaluation of direct admission processes and outcomes

1. Hospitals should have a quality review process to review outcomes for directly admitted patients, to improve systems on an ongoing basis
2. Feedback from referring healthcare provider should be incorporated into evaluations of direct admission systems
3. Feedback to referring healthcare providers should be provided as part of the quality review process

Outcomes to evaluate the quality of direct admission include (listed in order from most highly recommended):

1. Unanticipated transfer to the pediatric intensive care unit or to another hospital for a higher level of care within 6 hours of hospital admission
2. Rapid response calls within 6 hours of hospital admission
3. Total time from the time of arrival on the pediatric ward to initial assessment by the admitting physician or associate provider
4. Time from initial call from the referring provider until the patient is accepted for direct admission or routed elsewhere
5. Total time from the time of arrival on the pediatric ward to initiation of treatment
6. Patient and family satisfaction/experience
7. Number/% of directly admitted patients thought to be unnecessary or inappropriate from the perspective of the accepting physician
8. Rates of medication errors
9. Referring provider satisfaction/experience
10. Inpatient team satisfaction/experience
11. Number/% of directly admitted patients who are discharged home within 8 hours of arrival

- 12.** Number/% of patients admitted to the unit or service that are admitted directly
- 13.** Total costs of the hospitalization

6.6. Supplementary Results (Chapter 4). Guideline components not endorsed as appropriate and necessary for inclusion in direct admission guidelines

| Appropriate but not necessary guideline components* |
|---|
| <p>Referring providers should have the following information available at the time they refer a patient for direct admission:</p> <p style="padding-left: 40px;">The type of bed required for the admitted child (for example, crib, net bed)</p> <p>If hospitals do not have dedicated observation units, hospitals should develop a plan of care for patients anticipated to require short stays (i.e. < 8 hrs.) for when that care can't be provided by the referring provider</p> <p>Personnel from the admission office come to the patient's room to complete admission processes at the bedside, so that families do not need to stop at the admission office en route to their hospital room</p> <p>Hospitals have a pre-admission system that allows orders to be placed for the patient in advance of their arrival</p> <p>Hospitals have a system to pre-order specific medications and supplies for a patient in advance of their arrival.</p> <p>To facilitate imaging for children who are directly admitted, hospitals should develop systems that allow children being directly admitted to have the same priority for imaging as children admitted through emergency departments (for example, requests for stat X-ray or CT can be accommodated for directly admitted patients)</p> <p>Children with cystic fibrosis may be particularly well suited for direct admission to hospital.</p> <p>Families are given instructions about which hospital entrance to use, and where to find wheelchairs, if needed.</p> <p>Families are given clear instructions about where to park at the hospital</p> |
| Guideline components categorized as neither appropriateness nor necessary |
| <p>Referring providers should have the following information available at the time they refer a patient for direct admission:</p> <ol style="list-style-type: none"> i. Referring physician's estimate re. how long the patient could safely wait before care is initiated in the hospital ii. Name and contact number of the parent/guardian who will be accompanying the child for admission <p>Patients should have vital signs within normal ranges for age in order to be directly admitted</p> <p>Direct admissions are not accepted from non-pediatric referring providers (for</p> |

example, non-pediatric ED physicians, nurse practitioners, or physicians assistants) unless an attending physician (i.e. not a resident) is available to see the patient within 4 hours of their admission to hospital

A patient should have been seen by the referring provider within 4 hours of the requested direct admission

In order to be directly admitted, patients must come directly from a physician's office, ED or urgent care clinic

Healthcare providers accepting the phone calls for direct admissions apply the Pediatric Early Warning System (PEWS) to information received from the referring healthcare provider to calculate a PEWS

Children being admitted directly first have their vital signs assessed in the hospital's emergency department and reviewed by the admitting physician prior to proceeding their admission location

Hospitals should work to discharge patients early in the day to free up nursing resources for direct admissions later in the day

Febrile infants < 60 days admitted to rule-out sepsis may be particularly well-suited for direct admission to hospital

Families are given a map and/or clear written instructions describing how to get from the parking lot to the unit where their child will be admitted

Outcomes to evaluate the quality of direct admissions include: length of stay in the hospital

**although panelists rated each item separately for community hospitals and children's hospitals, categorization of responses did not differ by hospital type*

Chapter 7

Bibliography

1. Institute of Medicine. Hospital-based emergency care: At the breaking point. Washington, DC: National Academies Press. 2006.
2. Merrill C, Owens PL. Reasons for Being Admitted to the Hospital through the Emergency Department for Children and Adolescents, 2004. Healthcare cost and utilization project (HCUP) Statistical Brief #33. 2007;(June):1-9.
3. Merrill C, Owens PL. Hospital Admissions That Began in the Emergency Department for Children and Adolescents, 2004. Healthcare costs and utilization project (HCUP) Statistical Brief Number 32.
4. Tang N, Stein J, Hsia RY, Maselli JH, Gonzales R. Trends and characteristics of US emergency department visits, 1997-2007. *JAMA*. 2010;304(6):664-670. PMID:20699458. .
5. Schuur J, Venkatesh A. The growing role of emergency departments in hospital admissions. *N Engl J Med*. 2012;367(5):391-393. PMID:22853011. .
6. Pitts SR, Carrier ER, Rich EC, Kellermann AL. Where Americans get acute care: increasingly, it's not at their doctor's office. *Health Aff (Millwood)*. 2010;29(9):1620-1629. PMID:20820017. .
7. Neuman MI, Alpern ER, Hall M, Kharbanda AB, Shah SS, Freedman SB, Aronson PL, Florin T a, Mistry RD, Berry JG. Characteristics of recurrent utilization in pediatric emergency departments. *Pediatrics*. 2014;134(4):e1025-31. PMID:25225134. .
8. Bourgeois FT, Monuteaux MC, Stack AM, Neuman MI. Variation in Emergency Department Admission Rates in US Children's Hospitals. *Pediatrics*. 2014;134(3):539-545. PMID:25113291. .
9. Kocher KE, Dimick JB, Nallamothu BK. Changes in the source of unscheduled hospitalizations in the United States. *Med Care*. 2013;51(8):689-698. PMID:23752257. .
10. Powell ES, Khare RK, Courtney DM, Feinglass J. Lower mortality in sepsis patients admitted through the ED vs direct admission. *Am J Emerg Med*. 2012;30(3):432-439. PMID:21354751. .
11. HCUP Kids' Inpatient Database (KID) 2009. Healthcare Cost and Utilization Project (HCUP). Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/kidoverview.jsp.
12. Leyenaar J, Shieh M-S, Lagu T, Pekow PS, Lindenauer PK. Direct admission to hospitals among children in the United States. *JAMA Pediatr*. 2015;169(5):500-502.
13. Snow V, Beck D, Budnitz T, Miller DC, Potter J, Wears RL, Weiss KB, Williams M V. Transitions of Care Consensus Policy Statement American College of Physicians-Society of General Internal Medicine-Society of Hospital Medicine-American Geriatrics Society-American College of Emergency Physicians-Society of Academic Emergency Medicine. *J Gen Intern Med*. 2009;24(8):971-976. PMID:19343456. .
14. Jack BW, Chetty VK, Anthony D, Greenwald JL, Sanchez GM. A Reengineered Hospital Discharge Program to Decrease Rehospitalization: a randomized trial. *Ann Intern Med*. 2009;150:178-187.
15. Kangovi S, Grande D. Hospital readmissions--not just a measure of quality. *JAMA*. 2011;306(16):1796-1797. PMID:22028356. .

16. Leyenaar JK, Shieh M, Lagu T, Pekow PS, Lindenauer PK. Variation and outcomes associated with direct admission among children with pneumonia in the United States. *JAMA Pediatr.* 2014;168(9):829-836.
17. Gosdin C, Simmons J, Yau C, Sucharew H, Carlson D, Paciorkowski N. Survey of academic pediatric hospitalist programs in the US: organizational, administrative, and financial factors. *J Hosp Med.* 2013;8(6):285-291. PMID:23447445. .
18. Oshimura J, Sperring J, Bauer BD, Rauch D a. Inpatient staffing within pediatric residency programs: work hour restrictions and the evolving role of the pediatric hospitalist. *J Hosp Med.* 2012;7(4):299-303. PMID:22038872. .
19. Lassman D, Hartman M, Washington B, Andrews K, Catlin A. US health spending trends by age and gender: selected years 2002-10. *Health Aff (Millwood).* 2014;33(5):815-822. PMID:24799579. .
20. Moore B, Levit K, Elixhauser A. Ph.D.Costs for Hospital Stays in the United States, 2012. Healthcare Cost and Utilization Project 181. Available at: <http://www.hcup-us.ahrq.gov/reports/statbriefs/sb181-Hospital-Costs-United-States-2012.pdf>. Accessed Septe.
21. Sabbatini AK, Nallamotheu BK, Kocher KE. Reducing variation in hospital admissions from the emergency department for low-mortality conditions may produce savings. *Health Aff.* 2014;33(9):1655-1663.
22. Abualenain J, Frohna WJ, Shesser R, Ding R, Smith M, Pines JM. Emergency department physician-level and hospital-level variation in admission rates. *Ann Emerg Med.* 2013;61(6):638-643. PMID:23415741. .
23. Pines JM, Mutter RL ZM. Variation in emergency department admission rates across the United States. *Med Care Res Rev.* 2013;70(2):218-231.
24. Kripalani S, Theobald CN, Anctil B, Vasilevskis EE. Reducing hospital readmission rates: current strategies and future directions. *Annu Rev Med.* 2014;65:471-485. PMID:24160939. .
25. Auger K a, Kenyon CC, Feudtner C, Davis MM. Pediatric hospital discharge interventions to reduce subsequent utilization: a systematic review. *J Hosp Med.* 2014;9(4):251-260. PMID:24357528.
26. Reese J, Deakyne S, Blanchard A, Bajaj L. Rate of preventable early unplanned intensive care unit transfer for direct admissions and emergency department admissions. *Hosp Pediatr.* 2015;5(1):27-34.
27. Agency for Health Care Research and Quality. Prevention Quality Indicators Overview. Available at: https://www.qualityindicators.ahrq.gov/Modules/pqi_resources.aspx. Accessed May 28, 2017.
28. Leyenaar JK, Ralston SL, Shieh M, Pekow PS, Mangione-Smith R, Lindenauer PK. Epidemiology of Pediatric Hospitalizations at General Hospitals and Freestanding Children ' s Hospitals in the United States. *J Hosp Med.* 2016;0(0):1-7. PMID:27373782. .
29. Sofaer S. Qualitative Methods : What Are They and Why Use Them ? *Health Serv Res.* 1999;34(5):1101-1118.
30. Ulin P, Robinson E, Tolley E. *Qualitative Methods in Public Health: A Field Guide for Applied Research.*
31. Seidel J V. Qualitative Data Analysis; www.qualisresearch.com (originally

- published in The Ethnograph v5.0: A Users Guide; Appendix E; 1998; Colorado Springs; Colorado: Qualis Research). Accessed April 4, 2016. *Ethnogr v4*. 1998;(c):1-15.
32. Dedoose Version 5.0.11, web application for managing, analyzing, and presenting qualitative and mixed method research data (2014). Los Angeles, CA: SocioCultural Research Consultants, LLC (www.dedoose.com).
 33. Creswell J, Miller D. Determining validity in qualitative inquiry. *Theory Pract*. 2000;39(3):124-130.
 34. Creswell J. *Qualitative Inquiry and Research Design: Choosing among Five Traditions*. 3rd ed. Thousand Oaks, CA: Sage Publications Inc.; 2013.
 35. Morse JM. Determining Sample Size. *Qual Health Res*. 2000;10(1):3-5.
 36. Guest G, Bunce A, Johnson L. How Many Interviews Are Enough?: An Experiment with Data Saturation and Variability. *Field methods*. 2006;18(1):59-82.
 37. Tom J, Tseng C, Davis J, Solomon C, Zhou C, Mangione-Smith R. Missed well-child care visits, low continuity of care, and risk for ambulatory care sensitive hospitalizations in young children. *Arch Pediatr Adolesc Med*. 2010;164(11):1052-1058.
 38. Enlow E, Passarella M, SA L. Continuity of Care in Infancy and Early Childhood Health Outcomes. *Pediatrics*. 2017;140(1):e20170339.
 39. Centers for Medicare and Medicaid Services. Bundled Payments for Care Improvement (BPCI) Initiative: General Information. Available at: <https://innovation.cms.gov/initiatives/bundled-payments/>. Accessed August 6, 2017.
 40. Kangovi S, Barg FK, Carter T, Long J a, Shannon R, Grande D. Understanding why patients of low socioeconomic status prefer hospitals over ambulatory care. *Health Aff (Millwood)*. 2013;32(7):1196-1203. PMID:23836734. .
 41. Johnson W, Rimsza M. The Effects of Access to Pediatric Care and Insurance Coverage on Emergency Department Utilization. *Pediatrics*. 2004;113(3):483-487.
 42. Luo X, Liu G, Frush K, Hey L. Children's Health Insurance Status and Emergency Department Utilization in the United States. *Pediatrics*. 2003;112(2):314-319.
 43. Racine AD, Alderman EM, Avner JR. Effect of Telephone Calls From Primary Care Practices on Follow-up Visits After Pediatric Emergency Department Visits. *Arch Pediatr Adolesc Med*. 2009;163(6):505-511.
 44. Academy A. American Academy of Family Physicians, American Academy of Pediatrics, American College of Physicians, American Osteopathic Association. Joint Principles of the Patient-Centered Medical Home. March 2007. :1-3.
 45. Coleman E a, Parry C, Chalmers S, Min S. The Care Transitions Intervention. *Arch Intern Med*. 2006;166(17):1822-1828. PMID:17000937. .
 46. Leyenaar JK, Desai AD, Burkhart Q, Parast L, Roth CP. Quality Measures to Assess Care Transitions for Hospitalized Children. *Pediatrics*. 2016;138(2):1-9. PMID:27471218. .
 47. Parast L, Burkhart Q, Desai AD, Simon TD, Allshouse C, Parast L, Leyenaar JK, Gidengil CA, Toomey SL, Britto MT, et al. Validation of New Quality Measures for Transitions Between Sites of Care. *Pediatrics*. 2017;139(5):e20164178.
 48. Desai AD, Burkhart Q, Parast L, Simon TD, Allshouse C, Britto MT, Leyenaar JK,

- Gidengil CA, Toomey SL, Elliott MN, et al. Development and Pilot Testing of Caregiver-Reported Pediatric Quality Measures for Transitions Between Sites of Care. *Acad Pediatr*. 2016;16(8):760-769. PMID:27495373. .
49. Toomey SL, Elliott MN, Zaslavsky AM, Klein DJ, Ndon S, Hardy S, Wu M, Schuster MA. Variation in Family Experience of Pediatric Inpatient Care As Measured by Child HCAHPS. 2017;139(4).
 50. Pitts SR, Pines JM, Handrigan MT, Kellermann AL. National trends in emergency department occupancy, 2001 to 2008: effect of inpatient admissions versus emergency department practice intensity. *Ann Emerg Med*. 2012;60(6):679-686.e3. PMID:22727201. .
 51. Sun BC, Hsia RY, Weiss RE, Zingmond D, Liang L-J, Han W, McCreath H, Asch SM. Effect of emergency department crowding on outcomes of admitted patients. *Ann Emerg Med*. 2013;61(6):605-611.e6. PMID:23218508. .
 52. Morganti KG, Bauhoff S, Blanchard J, Abir M, Iyer N, Smith A, Vesely J, Okeke E, Kellermann A. *The Evolving Role of Emergency Departments in the United States*. RAND Corporation; 2013.
 53. Leyenaar JK, O'Brien ER, Malkani N, Lagu T, Lindenauer PK. Direct Admission to Hospital: A Mixed Methods Survey of Pediatric Practices, Benefits, and Challenges. *Acad Pediatr*. August 2015:1-8. PMID:26293551. .
 54. Keren R, Luan X, Localio R, Hall M, McLeod L, Dai D, Srivastava R. Prioritization of comparative effectiveness research topics in hospital pediatrics. *Arch Pediatr Adolesc Med*. 2012;166(12):1155-1164. PMID:23027409. .
 55. The American Hospital Association. American Hospital Association Data and Directories. Available at: <http://www.aha.org/research/rc/stat-studies/data-and-directories.shtml>. Accessed January 3, 2015.
 56. Simon TD, Cawthon ML, Stanford S, Popalisky J, Lyons D, Woodcox P, Hood M, Chen AY, Mangione-Smith R. Pediatric medical complexity algorithm: a new method to stratify children by medical complexity. *Pediatrics*. 2014;133(6):e1647-54. PMID:24819580. PMCID:PMC4035595.
 57. Averill RF, Goldfield N, Hughes JS, Bonazelli J, McCullough EC, Mullin R, Tang AM, Muldoon J, Gay J, Neff J, et al. 3M™ APR DRG Classification System 3M Health Information Systems. Available at http://www.hcup-us.ahrq.gov/db/nation/nis/v261_aprdrg_meth_ovrview.pdf. Accessed August 7, 2015.
 58. Madison K. Hospital – Physician Affiliations and Patient Treatments , Expenditures , and Outcomes. *Heal ser*. 2004;39(2):257-278.
 59. Ash AS, Fienberg SE, Louis TA, Normand SL, Stukel TA, Utts J. Statistical Issues in Assessing Hospital Performance. 2011 Available at: <http://www.cms.gov/Medicare/Quality-Initiatives-Patient-Assessment-Instruments/HospitalQualityInits/Downloads/Statistica>. 2012.
 60. Normand ST, Shahian DM. Statistical and Clinical Aspects of Hospital Outcomes Profiling. *Stat Sci*. 2007;22(2):206-226.
 61. Handel D, Fu R, Vu E, Augustine J, Hsia RY, Shufflebarger CM, Sun B. Association of emergency department and hospital characteristics with elopement and length of stay. *J Emerg Med*. 2014;46(6):839-846.
 62. Pines JM, Decker SL, Hu T. Exogenous Predictors of National Performance

- Measures for Emergency Department Crowding. *Ann Emerg Med.* 2012;60(3):293-298.
63. Wang H, Robinson RD, Garrett JS, Bunch K, Huggins CA, Watson K, Daniels J, Banks B, Etienne JPD, Zenarosa NR. Use of the SONET Score to Evaluate High Volume Emergency Department Overcrowding : A Prospective Derivation and Validation Study. *Emerg Med.* 2015;2015:11 pages.
 64. Cowling TE, Harris M, Watt H, Soljak M, Richards E, Gunning E, Bottle A, Macinko J. Access to primary care and the route of emergency admission to hospital : retrospective analysis of national hospital administrative data. *BMJ Qual Saf.* 2016;25:432-440.
 65. Lau M, Lin H, Flores G. Racial / Ethnic Disparities in Health and Health Care among U . S . Adolescents. *Health Serv Res.* 2012;47(2):2031-2059.
 66. Flores G, Tomany-Korman SC. Racial and Ethnic Disparities in Medical and Dental Health , Access to Care , and Use of Services in. *Pediatrics.* 2008;121(2):e286-298.
 67. Diao K, Tripodis Y, Long WE, Garg A. Socioeconomic and racial disparities in the parental perception and experience of having a medical home: 2007 to 2011-2012. *Press Acad Pediatr.* 2016.
 68. Jiang HJ, Reiter KL, Wang J. Measuring Mortality Performance. *Med Care.* 2016;54(7):648-656.
 69. Gaskin D, Hadley J. Population characteristics of markets of safety-net and non-safety-net hospitals. *J urban Heal.* 1999;76(3):351-370.
 70. Nguyen OK, Kruger J, Greysen SR, Lyndon A, Goldman LE. Understanding how to improve collaboration between hospitals and primary care in postdischarge care transitions: a qualitative study of primary care leaders' perspectives. *J Hosp Med.* 2014;9(11):700-706. PMID:25211608. .
 71. Leyenaar JK, Lagu T, Lindenauer PK. Direct Admission to the Hospital: An Alternative Approach to Hospitalization. *J Hosp Med.* 2016;11(4):303-305.
 72. Song Z, Hospital G, Fisher ES, Dartmouth T, Dartmouth T, Medical O. The ACO Experiment in Infancy — Looking Back and Looking Forward. *JAMA - J Am Med Assoc.* 2016;316(7):705-706.
 73. Agency for Healthcare Research and Quality. Using deliberative methods to engage patients, consumers and the public. Community Forum, December 2011. http://effectivehealthcare.ahrq.gov/tasks/sites/ehc/assets/File/CF_deliberative_methods_webinar.pdf. Acces.
 74. Abelson J, Forest P-G, Eyles J, Smith P, Martin E, Gauvin F-P. Deliberations about deliberative methods: issues in the design and evaluation of public participation processes. *Soc Sci Med.* 2003;57(2):239-251. PMID:12765705. .
 75. Watt AM, Hiller JE, Braunack-Mayer AJ, Moss JR, Buchan H, Wale J, Riitano DE, Hodgetts K, Street JM, Elshaug AG. The ASTUTE Health study protocol: deliberative stakeholder engagements to inform implementation approaches to healthcare disinvestment. *Implement Sci.* 2012;7(1):101. PMID:23088222. .
 76. Rychetnik L, Carter SM, Abelson J, Thornton H, Barratt A, Entwistle V a, Mackenzie G, Salkeld G, Glasziou P. Enhancing citizen engagement in cancer screening through deliberative democracy. *J Natl Cancer Inst.* 2013;105(6):380-386. PMID:23378639. .

77. Fitch K, Bernstein SJ, McDonnell J, Kahan JP. *The RAND / UCLA Appropriateness Method User ' S Manual.*; 2000.
78. Kuzel A. Sampling in qualitative inquiry. In: *Doing Qualitative Research: Research Methods for Primary Care.* ; 1992:31-44.
79. Carlsen B, Glenton C. What about N? A methodological study of sample-size reporting in focus group studies. *BMC Med Res Methodol.* 2011;11:26. PMID:21396104. .
80. Gagliardi AR, Fraser N, Wright FC, Lemieux-charles L, Davis D. Fostering knowledge exchange between researchers and decision-makers : Exploring the effectiveness of a mixed-methods approach. *Health Policy (New York).* 2008;86:53-63.
81. Snow V, Beck D, Budnitz T, Miller DC, Potter J, Wears RL, Weiss KB, Williams M V. Transitions of Care Consensus policy statement: American College of Physicians, Society of General Internal Medicine, Society of Hospital Medicine, American Geriatrics Society, American College Of Emergency Physicians, and Society for Academic Emergency M. *J Hosp Med.* 2009;4(6):364-370. PMID:19479781. .
82. Centers for Medicare and Medicaid Services Readmissions Reductions Program. Available at: <http://www.cms.gov/Medicare/Medicare-Fee-for-Servi>.
83. Kripalani S, Jackson AT, Schnipper JL, Coleman E a. Promoting effective transitions of care at hospital discharge: A review of key issues for hospitalists. *J Hosp Med.* 2007;2(5):314-323.
84. Health Policy Brief: Care Transitions. Health Affairs, September 13, 2012.
85. Coleman EA, Mahoney E PC. Assessing the quality of preparation for post hospital care from the patient' s perspective: the care transitions measure. *Med Care.* 2005;433:246-255.
86. Boulkedid R, Abdoul H, Loustau M, Sibony O, Alberti C. Using and reporting the Delphi method for selecting healthcare quality indicators: a systematic review. *PLoS One.* 2011;6(6):e20476. PMID:21694759. .
87. Sinha IP, Smyth RL, Williamson PR. Using the Delphi technique to determine which outcomes to measure in clinical trials: recommendations for the future based on a systematic review of existing studies. *PLoS Med.* 2011;8(1):e1000393. PMID:21283604.