Seminars in Pediatric Surgery 24 (2015) 291–294

Contents lists available at ScienceDirect

Seminars in Pediatric Surgery

journal homepage: www.elsevier.com/locate/sempedsurg

Variation in pediatric surgical care

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ARTICLE INFO

Keywords:
Practice variation
Pediatric surgery
Resource utilization

ABSTRACT

Variation in care and outcomes are common in the management of children with surgical diseases. Differences in the availability of resources, patient and family preferences, ever-increasing fiscal pressure, and lack of high-quality data to guide clinical decision making are just a few factors that contribute to both the over and under-utilization of healthcare resources. Identification of data-driven, value-based "best practices" that are sensitive to differences in resource availability and patient preferences may be an important first step in establishing a practical framework for reducing unwarranted practice variation. The goal of this article is to explore the causes and influence of practice variation using appendicitis as a common condition to illustrate key concepts, and to propose solutions to mitigate unwarranted practice variation while preserving the spirit of innovation necessary to advance the field.

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Introduction

At 10 o'clock on a Saturday night, a 5-year-old girl presents to the emergency room with an 8-hour history of abdominal pain. A full set of laboratory tests are obtained including a CBC and chemistry panel, and the patient subsequently undergoes a CT scan. She is diagnosed with appendicitis and taken to the operating room as an "emergent" add-on case at 3 am. A three-port laparoscopic appendectomy is performed, and early gangrenous changes are noted without a frank perforation. She is discharged home the following morning on the first postoperative day after receiving 24 h of intravenous Zosyn. She recovers without complication and is seen back in clinic for a routine postoperative visit 1 week later. Meanwhile, across town at another hospital, a 5-year-old girl with a similar presentation undergoes an immediate ultrasound without a routine blood draw. She is also diagnosed with appendicitis and undergoes a single-port laparoscopic appendectomy the following morning and receives a single dose of cefotetan. Similar gangrenous changes are found. She is discharged home from the PACU the same day without receiving additional antibiotics. Her parents are instructed to contact the clinic only if there is a problem. Both children do well and have no complications.

The two cases of appendicitis above are common and considered routine by most pediatric surgeons. The differences between the two scenarios provide an illustrative example of the wide variation in clinical practice and resource utilization that can exist in the management of even "straightforward" pediatric surgical conditions. To some degree, we can and should expect variation in practice given the diversity of our patients and their preferences surrounding care. However, in the management of appendicitis and many other conditions, little data exists to define which aspects of practice variation may be considered a relatively poor use of resources, or even potentially harmful, compared to those where there are few, if any consequences in terms of clinical outcomes or fiscal impact.

Efforts to identify and address "meaningful" practice variation should begin by defining a framework for establishing what constitutes "unwarranted" variation in the context of over and under-utilization of healthcare resources. Defining "ideal" practices based on the best available clinical evidence followed by the development of practice guidelines that are sensitive to both resource availability and patient preferences at the hospital level will be necessary to provide a pragmatic approach for achieving this goal. The purpose of this article is to explore this approach and related concepts for reducing practice variation using appendicitis and other common pediatric surgical conditions to illustrate key concepts.

Defining "unwarranted" variation in care

Quality improvement initiatives designed to reduce practice variation should not hinder innovation, but rather target unwarranted variation that is defined by "differences in care that are not justified or explained by differences in patient needs or preferences."[1] Wennberg[2] proposed a classification system for

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http://dx.doi.org/10.1053/j.sempedsurg.2015.08.007
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categorizing unwarranted practice variation in the context of three *distinct categories*: effective care, preference-sensitive care, and supply-sensitive care.

Effective care

"Effective care" refers to practice that is supported by high-quality clinical evidence and, with few exceptions, represents a standard from which deviation ought to be minimized.[3] Variation in effective care occurs when evidence-based care pathways are not followed, or followed incompletely. For many pediatric surgical conditions, including pediatric appendicitis, the availability of high-quality clinical evidence from multi-center studies is limited. It is this reason that "effective," evidence-based consensus guidelines for many conditions are still lacking or remain poorly defined, at best.

Preference-sensitive care

"Preference-sensitive" care reflects what the informed patient or caregiver chooses to pursue after incorporating their own values into the decision-making process. Available diagnostic and treatment choices may represent very different trade-offs in terms of risks, side effects, and resource utilization. Misuse of preference-sensitive care occurs when the patient (or parent) is not provided adequate information to allow for a completely informed decision. This may occur if the physician does not provide an adequate account of the risks and benefits of each treatment choice or when patient preferences may not align with the physician's own biases or underlying motives.

Supply-sensitive care

Supply-sensitive care is perhaps the most susceptible to practice variation and refers to differences in care that are primarily influenced by local resource availability. These resources include medical supplies, technology, and adequately trained physicians and ancillary healthcare staff. Although supply-sensitive variation in care often reflects the inability to deliver the standard of care due to a lack of available resources at the hospital level, it may also refer to scenarios where overutilization of resources occurs if the intensity of treatment exceeds what is justified by the acuity of a patient's condition.

Causes of variation in surgical practice

Availability of resources

Wide variation in the management of children with appendicitis at free-standing children's hospitals has been well characterized.[4,5] In a case of suspected appendicitis, a child might present to a facility where the availability of an overnight ultrasound technician or pediatric radiologist is limited, thus prompting the ED physician to preferentially order a CT scan. The unavailability of overnight ultrasound imaging and technicians can have a significant impact on the ability to deliver effective care as defined by the American College of Radiology guidelines, which recommend that ultrasound should be attempted in all children with suspected appendicitis prior to obtaining a CT scan.[6,7]

In some conditions, variation in practice due to resource availability may be particularly sensitive to the time and day patients present for treatment. In the management of appendicitis and other conditions requiring an emergent or urgent operation, there are likely to be fewer available OR teams and reduced operating "capacity" on a weekend night compared to a weekday morning, leading to potential variation in the timeliness of surgical interventions. Practice variation influenced by reduced resource availability has also been shown to have a negative impact on outcomes and safety.[8–10] Goldstein et al.[11] demonstrated that children who were operated on during the weekend were more likely to die, receive a blood transfusion, or experience procedure-related complications compared to those undergoing the same surgery during the week. This "weekend effect" was observed even in children undergoing relatively common operations such as abscess drainage, appendectomy, inguinal hernia repair, open fracture repair, and insertion of ventricular shunts.[11]

Just as there are scenarios where limited resource availability can affect outcomes, there are also examples of practice variation where excessive use of resources can lead to inefficient and less cost-effective care. In the management of pediatric appendicitis, common examples include the routine treatment of uncomplicated appendicitis with extended-spectrum anti-pseudomonal agents (e.g., Zosyn), and utilization of emergency department services for mild constitutional symptoms (rather than the ambulatory surgery clinic) following discharge after appendectomy.

Patient preferences

Variation in surgical practice can be heavily influenced by patient and caregiver preferences. In the case of suspected appendicitis, options following equivocal diagnostic ultrasound may include further imaging with CT versus admission to the hospital for observation and serial abdominal exams. An informed parent might choose a CT scan over an inpatient admission if they are planning to leave on a family trip the following day, or if they believe the stress of an inpatient admission on the patient and family would exceed the risk of a CT scan. This example highlights the importance and potential role of shared decision making to ensure the preferences of patients and their caregivers are taken into account, particularly when their decisions may not be aligned with the goals of the hospital or treating physicians (e.g., desire to "protect" the child from CT-associated radiation).

Lack of high-quality clinical evidence

Currently, much of the pediatric surgical literature remains devoid of high-quality clinical evidence to support treatment guidelines for many conditions, including appendicitis. This has undoubtedly played a role in the relatively wide variation in the diagnostic approaches reported for suspected appendicitis, decisions regarding timing of operative interventions, and approaches to postoperative care.[12] When comparing resource utilization and management of appendicitis among free-standing children's hospitals, Rice-Townsend et al.[5] demonstrated a fivefold difference in preoperative laboratory utilization, and for children with complicated appendicitis, a 48-fold difference in PICC-line utilization, and a nearly 100-fold difference in the utilization of parenteral nutrition. While some of these decisions likely have greater impact on postoperative outcomes than others, the implementation of evidence-based clinical guidelines have been shown to reduce variation in care, when, in fact, such evidence exists.[13,14]

Knowledge and interpretation of available data

Though we currently lack high-quality consensus guidelines for many pediatric surgical conditions, we do not lack evidence entirely. Knowledge and interpretation of that evidence, however, has been shown to be quite variable among pediatric surgeons.[15] This may be a result of inadequate or ineffective dissemination of relevant study results to practicing clinicians, or due to variation in the perceived value of the available evidence to the surgeon's own

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