Value in Pediatric Orthopaedics

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Introduction

Recent and ongoing changes in the healthcare landscape have redirected the focus of healthcare delivery toward the importance of value and cost effective care[1-4]. As a component of this reform, it is important that individual healthcare providers seek areas of improvement within their own area of expertise. These improvements in value can be sought in several distinct domains which include increased efficiency[6], prevention[5], and systems level changes[7]. To that end, we provide a review of recent work to improve value-based care in pediatric orthopaedics.

Efficiency

Healthcare is growing increasingly dependent on the collaborative work of multi-disciplinary teams, and this is especially true in the operating room (OR). In the OR, the surgical team must coordinate with team members from anesthesia, nursing, and radiology among others. In long, complex operations, these interdisciplinary teams often include many individuals with new individuals entering the team as the case proceeds. Lack of familiarity between team members or lack of case-specific knowledge for new individuals can result in delays that hinder efficiency. In the operating room, these inefficiencies add to patient risk (for instance, increased risk of surgical site infection (SSI) and increased blood loss if the procedure is prolonged), as well as increasing cost of care[15-20]. This financial impact is magnified by the expense of operating a surgical suite[16-18]. For these reasons, dedicated teams with static team members have drawn the interest of research groups, particularly for posterior spinal fusion (PSF) for scoliosis. PSF represents an ideal target for dedicated teams because of the inherent need for an interdisciplinary team, the complexity of the procedure, and the relatively high case volume. Recently, Miyanji et al. demonstrated that the implementation of a standardized, dedicated team reduced rates of surgical site infections, as well as time in the operating room[6].

In response to the growing need for improved value of care, at The Children's Hospital of Philadelphia (CHOP) we implemented our own dedicated spinal surgery team. This project initially began with a single surgeon and a small group of anesthesiologists and nurses who underwent training and practiced their role in a posterior spinal fusion. The key component of this training dealt with the standardization of positioning, prep, drape, imaging, wake-up, and transport. To track the effects of implementation of this dedicated team data on time in the operating room and financial impact were collected. Data from the initial stages of this project showed significant reductions in operating room time and cost of care with the dedicated team. Given its success, this project was then expanded to include a second surgeon and more anesthesiologists and nurses. The initiative has continued to demonstrate positive results, maintaining decreased operating room times by more than an hour on average and lower costs on the order of thousands of dollars per patient, even after expanding the number of providers involved.

Systems Level Change

In order to provide more efficient, value-based care, it is important for both healthcare providers and hospital administrations to seek avenues to improve efficiency. Change at the level of the hospital system allows broad implementation of value-based changes, and recent study has demonstrated that there are potential systems level changes in pediatric orthopaedics than could vastly improve efficiency and value.

Securing operating room time can be difficult in a busy in-patient pediatric hospital, and this can be particularly challenging for unplanned surgical operations such as trauma cases. Traumatic orthopaedic injuries do not often require emergent surgery. For this reason, these operations are often scheduled as "add-ons" to proceed after the end of regularly scheduled procedures, after regular business hours, or on a subsequent day. This delay is imparted by the organizational structure of the OR scheduling system and is not due to lack physician availability or willingness to proceed with an operation. Brusalis et al. demonstrated that this systematic inefficiency can be addressed by the institution of a dedicated orthopaedic trauma operating room scheduled exclusively for these "add-on" cases[7]. Within this new policy, a single operating room was set aside daily for orthopaedic "add-on" procedures, and it was not used for any regularly scheduled operations.

This new policy reduced not only the volume of costly "after-hours" procedures, but it also reduced the wait time to surgery, the length of hospitalization, and the overall cost of care. This finding is supported by similar findings in the adult orthopaedic trauma literature[22-24].

Recent data have also demonstrated the value of performing procedures at ambulatory surgical centers. Though many pediatric orthopaedic procedures need to be performed at in-patient hospitals, there are some operations that are amenable to being conducted at ambulatory surgery centers, and Fabricant et al. demonstrated that ambulatory surgery centers can provide 17-43% savings for several common pediatric orthopaedic procedures[3]. This cost reduction came from decreases in both surgery and anesthesia related time expenditures. Kadhim et al. demonstrated similar findings when comparing anterior cruciate ligament (ACL) reconstruction at an in-patient facility versus an ambulatory surgery center. Procedures at ambulatory centers had increased work efficiency and shorter procedure times[21].

It is likely that several factors contribute to the increased efficiency seen at ambulatory surgery centers. One possible mechanism of increased efficiency at out-patient surgical centers is a reduced staff volume. A lower number of staff members translate into teams with high levels of familiarity with one another and the tasks involved in the procedure. Kadhim et al. noted the importance of team members being well-versed in the intricacies of ACL reconstruction in their recent publication[21].

Prevention

Children suffer millions of musculoskeletal injuries annually, and research has demonstrated that a significant portion of injuries can be avoided with appropriate primary prevention[5,8,9]. Nearly 33 billion dollars are spent on the treatment of musculoskeletal injuries in children every year[10]. Preventing injuries reduces both morbidity and associated cost of care. Because surgical care is expensive, preventive interventions are particularly effective when they prevent injuries that typically require operative intervention.

One such injury is ACL tear. An ACL injury can cost $5,000 to $38,000 to repair[5,11]. ACL injuries have been shown to occur more often in individuals with poor biomechanics[12,13]. The resultant interest in neuromuscular training to reduce strain on the ACL has been shown to significantly reduce the risk of ACL injury[14]. Neuromuscualr training has also been shown to be cost effective in preventing ACL reconstruction. Swart et al. demonstrated, using a decision-analysis model, that implementation of a universal ACL tear prevention program reduced the incidence of ACL injury from 3.0% to 1.1% and reduced costs by $100 per player per season[5].

Data Collection

For effective value-based change, data must be brought together from both the clinical and financial realms. Currently, there are well-developed research infrastructures to track clinical data and patient outcomes, but avenues for collection and incorporation of financial data into pediatric orthopaedic research continues to need development. Often, the barrier to making financially minded care decisions is often the availability of information.

Recently, Zygourakis et al. published on the effect of distributing scorecards to surgeons with information about their monthly median expenditure in the operating room. Subsequently, orthopaedists demonstrated a 6% reduction in cost, representing more than $1000 dollars in savings per case, on average[27]. Similarly, Tabib et al. showed that after providing real-time cost information to physicians in the operating room, they were able to make an 8% decrease in modifiable costs per case[26].

Physicians have shown awareness and interest in reducing cost of care, but in order to do so they need readily available data[27]. To address this issue at CHOP, we partnered with a colleague from our hospital's billing department. This connection has allowed for ready access to financial data for several projects and has fostered a departmental interest in delivering more value-based care.

Discussion

Delivering high value care is a vital component of the changing healthcare landscape, and these improvements can be found at all levels from the healthcare provider to the hospital infrastructure. Recent work has demonstrated that improvements can made through streamlining the practice of interdisciplinary teams, increasing efficiency at the system level, and preventing injury in the community. The first step in instituting the principles of value-based care, however, is the collection of high-quality data, and more work of this kind will be necessary as the American healthcare landscape continues to evolve towards delivery of cost-effective, value-based care.

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