A Pediatric Residency Experience With Surgical Co-management

**abstract**

**BACKGROUND AND OBJECTIVE:** Acquisition of knowledge and skills in the care of surgical patients is defined as an essential element of training by the Pediatric Residency Review Committee. The pediatric–surgical comanagement model of care is increasingly utilized, yet its impact on residency training has not been described. The goal of this study was to describe a 5-year experience with a co-management model in a pediatric residency program.

**METHODS:** We describe the planning and implementation of a surgical co-management model in a pediatric residency program and report on case volume and diversity from 2005 to 2010. We assessed the experience of pediatric residents and faculty through rotation evaluations, program leadership meetings, and an anonymous online survey. In the survey, residents rated the value of their exposure on knowledge and skills in selected perioperative domains and their experience with interprofessional teamwork.

**RESULTS:** The volume of co-managed patients increased threefold from 2005 to 2010; most (79%) had concurrent medical conditions, and one-third (36%) were children with special health care needs (CYSHCN). Residents reported that co-management helped them gain knowledge and skills in pain management, fluid and electrolytes, respiratory, and nutritional support, as well as in interprofessional teamwork. Other strengths included greater exposure to CYSHCN and subspecialty faculty, and preparedness for critical care rotations. Challenges included clarity of roles and responsibilities between pediatric and surgery residents and interservice communication.

**CONCLUSIONS:** A surgical co-management model in pediatric residency training presented important opportunities for development of residents’ knowledge and skills in perioperative care and interprofessional teamwork.

Pediatricians have traditionally served as consultants to their surgical colleagues in the care of pediatric surgical patients. More recently, there has been a trend toward co-management replacing consultation. Factors creating the impetus for co-management include the increasing complexity of hospitalized children, the American Academy of Pediatrics’ guidelines stipulating pediatric involvement for all children with special health care needs, higher standards required for patient safety and quality, and the restriction on surgical resident duty hours. Under the co-management model, interdisciplinary teams of pediatricians and surgeons share responsibility for the care of the surgical patient, rounding daily, writing orders, coordinating care, and discharge planning. In the consultation model,
pediatricians play a more limited role of advisors to the surgeons. Studies suggest care provided through interprofessional teams, such as those in co-management, yields safer care with better health outcomes.

The recent literature on co-management has shown the potential for improvements in patient outcomes, length of stay, and provider satisfaction. Simon et al demonstrated a decreased length of stay and a trend toward improved quality of care for spinal fusion patients who received pediatric hospitalist co-management. Bekmezian et al described a decrease in cost and length of stay and a trend toward lower mortality and readmission rates for staff-only hospitalist co-management of pediatric subspecialty patients.

Care of the surgical patient has been designated by the Pediatric Residency Review Committee as an essential patient care experience of pediatric residency. Furthermore, training of pediatric residents in interprofessional teamwork has been identified as an important milestone within the systems-based practice competency. Pediatric–surgical co-management presents a unique opportunity in interprofessional team education but, to our knowledge, this has not been explored in the pediatric literature. In this program description and survey, we report our experience with a pediatric–surgical co-management model as an integral part of a residency inpatient training experience.

METHODS
This study was conducted in the pediatric residency program of the Albert Einstein Medical Center (Einstein) in Philadelphia, Pennsylvania. Thirty categorical pediatrics residents comprised the program at the time of this study. A unique feature of our residency program is its inpatient service. In 2003, Einstein established an independent inpatient teaching service at St Christopher’s Hospital for Children, staffed by Einstein faculty and residents with full access to St Christopher’s resources. The service is not housed in a specific area; rather, patients are assigned to units appropriate for diagnosis. Patients are referred from Einstein’s 3 emergency departments and large primary care network. Einstein and St Christopher’s services operate in parallel to provide patient care but interface during educational conferences and subspecialty consultations. Residents spend 6 required rotations on the service, 4 at the postgraduate year 1 level and 2 at the postgraduate year 2 and 3 levels.

Description of the Co-management Model
Two years after the establishment of the Einstein service, Einstein leadership conducted an evaluation of the new inpatient model. Patient volume had increased, but there was concern regarding the limited exposure to surgical and subspecialty patients. At the same time, the St Christopher’s surgical subspecialty services were seeking greater medical input for their patients, particularly for children with special health care needs. In 2005, Einstein pediatrics and 5 of the surgical subspecialty services at St Christopher’s (orthopedics, neurosurgery, otolaryngology, plastic surgery, and ophthalmology) agreed to work collaboratively under a co-management model.

A plan for implementation of the model was developed jointly by pediatric and surgical leadership. The key features were: (1) all surgical patients from the 5 surgical subspecialty services would be co-managed with pediatrics; (2) pediatric and surgery residents would be responsible for daily clinical care; (3) surgical subspecialty faculty would provide Einstein pediatric residents with bedside teaching and small conferences; (4) pediatric residents would conduct perioperative evaluations, write daily progress notes and orders, communicate with parents, and assist with discharge planning; and (5) pediatric faculty would supervise all pediatric care provided by pediatric residents in concert with the surgeons’ knowledge and approval.

Over time, we implemented curricular and operational changes to the co-management model. Interprofessional team bedside rounds were implemented, with surgeons discussing aspects of surgical care and pediatricians presenting medical considerations. In collaboration with the orthopedics, neurosurgery, and otolaryngology services, we developed joint small group didactic sessions on perioperative management of common surgical conditions. Plastic surgery developed a clinical skills workshop on wound care and negative pressure wound therapy. Initially, patients were co-managed for the duration of their admission. Over time, the pediatricians conducted initial assessments on all surgical patients but did not provide ongoing co-management care to patients lacking active medical issues.

Outcome Measures

Patient Volume and Diversity
Co-management data for the period 2005–2010 were collected, including the number of co-managed patients and the percent according to surgical...
subspecialty, concurrent medical diagnoses, and special health care needs. The primary data source was the daily inpatient service log, updated twice daily by the senior resident, reviewed daily by the faculty hospitalist, and verified monthly by the inpatient director. The log included patient demographic characteristics, dates of admission and discharge, diagnoses, and the surgical subspecialty service involved. The percentage of concurrent medical conditions and percentage of children with special health care needs were extracted from a review of 1000 cases, based on a biannual review of 100 consecutive diagnoses (200 per year). Children with special health care needs were defined as children with “a chronic physical, developmental, behavioral, or emotional condition.”

Resident and Faculty Experiences
The experiences of pediatric residents and faculty were obtained through ongoing meetings with program leadership and anonymous rotation evaluations. In June 2010, the pediatric residents were invited to participate in an online anonymous survey. The survey asked residents to rate the impact of co-management on the development of residents’ knowledge and skills in selected perioperative domains and interprofessional teamwork. Responses used a 5-point Likert scale.

RESULTS
Patient Data
Between 2005 and 2010, the number of pediatric–surgical patients increased more than threefold per year (Fig 1). The distribution of patients among the surgical subspecialty services was: 68% orthopedics; 15% otolaryngology; 10% neurosurgery; 5% plastic surgery; and 2% ophthalmology. The majority of co-managed patients (79%) had concurrent medical conditions. More than one-third (36%) were identified as children with special health care needs. The 5 most common medical diagnoses were asthma, cerebral palsy, intellectual disability or developmental delay, central nervous system abnormalities, and obesity with insulin resistance. A sample of surgical patients with description of their concurrent medical conditions can be seen in Table 1. The next 5 most common medical diagnoses were trauma, deep soft tissue/joint/bone infections, neuro-myopathies and metabolic bone disorders, gastroesophageal reflux disease, swallowing dysfunction, and genetic disorders. Psychiatric, hematology/oncology, cardiology, pulmonary, and endocrine disorders categorized the remaining medical diagnoses.

TABLE 1 Profile of Selected Co-Managed Patients

<table>
<thead>
<tr>
<th>Patient</th>
<th>Age</th>
<th>Surgical Diagnosis</th>
<th>Medical Diagnoses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>Obstructive sleep apnea with tonsillectomy and adenoidectomy</td>
<td>Down syndrome, hypothyroidism, congenital adrenal hyperplasia, atrioventricular canal defect, gastroesophageal reflux</td>
</tr>
<tr>
<td>2</td>
<td>15</td>
<td>Spasticity with bilateral hamstring release</td>
<td>Klenefelter’s syndrome, spastic diplegia, joint contractures, self-mutilating behavior</td>
</tr>
<tr>
<td>3</td>
<td>10</td>
<td>Thyroglossal duct cyst resection with otoplasty</td>
<td>Wolff-Parkinson-White syndrome, gastroesophageal reflux, asthma, migraine headaches</td>
</tr>
<tr>
<td>4</td>
<td>22 mo</td>
<td>Filial lipoma excision with tethered cord release</td>
<td>VACTERL syndrome, congenital scoliosis, ventricular septal defect, developmental delay</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>Blount’s disease with proximal tibial hemiepiphiyseodesis</td>
<td>Status post–crianiopharyngioma resection, panhypopituitarism, diabetes insipidus, glucose intolerance</td>
</tr>
<tr>
<td>6</td>
<td>4</td>
<td>Genu varus for tibial osteotomy</td>
<td>Hypophosphatemic rickets, short stature</td>
</tr>
<tr>
<td>7</td>
<td>7</td>
<td>Microtia for reconstructive surgery with rib donor site</td>
<td>Autism, oral aversion</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>Cellulitis, rule out osteomyelitis</td>
<td>Status post–neuroblastoma, chemotherapy-induced peripheral neuropathy, neurogenic clubfoot</td>
</tr>
<tr>
<td>9</td>
<td>3</td>
<td>Decompressive surgery for Arnold-Chiari malformation</td>
<td>Incontinents pigmenti, chemical meningitis, developmental delay, oral aversion, failure to thrive</td>
</tr>
<tr>
<td>10</td>
<td>5</td>
<td>Tibial osteotomy</td>
<td>Amniotic band syndrome, clubfoot, status post–cleft lip/palate repair, obstructive hypoventilation</td>
</tr>
<tr>
<td>11</td>
<td>9</td>
<td>Varus derotational osteotomy</td>
<td>Spastic diplegia, Bruton’s X-linked agammaglobulinemia</td>
</tr>
<tr>
<td>12</td>
<td>8</td>
<td>Leg wound dehiscence and lymphedema</td>
<td>Klippel-Trenaunay-Weber syndrome</td>
</tr>
</tbody>
</table>

Perceptions of Pediatric Residents
Twenty-six (87%) of 30 residents responded to the survey. Residents reported that their co-management experience had helped them to gain knowledge and skills in several perioperative domains (Fig 2). A strong positive effect was perceived for pain control (92%), fluid and electrolytes (88%), respiratory care (84%), and...
skills, and this helped to further define the attending surgeons in their clinical role. Residents also noted that the skills acquired in the care of complex patients help you gain knowledge and experience with responses that were virtually identical to those described in the anonymous survey. Residents identified 2 key strengths of the model. First, they gained important experience in caring for children with complex medical needs. Second, they felt they contributed significantly to the quality care for the co-managed patients. Over time, residents appreciated the growing trust in the care of complex patients.

Challenges perceived by the pediatric residents involved the areas of communication and clarity of roles and responsibilities. Residents felt access to and communication with the surgical team was sometimes limited by the surgeons’ operating room demands. They felt communication improved over time and was better with surgical services that included physician assistants as permanent members of the team. Pediatric residents sometimes perceived a lack of clarity between their roles and those of the surgical residents. This uncertainty created practical challenges that could be categorized in 3 primary ways. First, both teams wanted to take responsibility, and there was disagreement in the clinical approach (ie, pain medication dosage and interval). Second, each team felt it was the other team’s responsibility for a specific task (ie, insurance preauthorization for discharge planning needs). Third, each surgical service had different role expectations of the pediatric residents.

Perceptions of Faculty

The faculty reported consistently receiving positive feedback from nurses and surgical faculty regarding the contribution of the pediatric residents in the care of the co-managed patients. The pediatric faculty perceived there was good rapport between themselves and the surgical subspecialty faculty. Pediatric faculty did share resident concerns regarding clarity of roles and responsibilities but perceived an overall positive balance of education and service.

DISCUSSION

To our knowledge, this is the first report of a pediatric-surgical co-management model as an integral part of a pediatric residency inpatient training experience. The strengths of the model included enhanced residents’ exposure to perioperative management of children, exposure to children with special health care needs, and increased teaching opportunities with subspecialty faculty and interprofessional teamwork. Not withstanding the challenges of lack of clarity of roles and responsibilities and some difficulties with communication, the co-management model proved a positive educational experience for the pediatric residents.

Shifting from a consultant to a co-management model, we initially did not define carved-out patient care roles. This approach created a culture in which frequent communication was required and the importance of the interprofessional teamwork was emphasized. This was perceived by the residents as both a strength (greater flexibility in providing comprehensive care to the surgical patient) and a weakness (lack of well-defined tasks). Developing skills in interprofessional teamwork (team communication, mutual support, and situation monitoring) relates to important Pediatric Milestones within the Systems-based Practice competency. The co-management model offers an experiential opportunity to develop and implement formal curriculum to address these milestones.

The co-management model enhanced pediatric residents’ exposure to children with special health care needs and resulted in a significant net effect in pediatric medical as well as surgical perioperative domains. Furthermore, the opportunity to care for children with special health care needs was noted to be a particularly valuable part.

FIGURE 2 Percentage of resident ratings of helpful/very helpful to the question: “How much did exposure to co-managed patients help you gain knowledge and skills in these areas?”

surgical patients enhanced their preparedness for critical care rotations.

<table>
<thead>
<tr>
<th>Interdisciplinary teamwork</th>
<th>Patient safety</th>
<th>Psychosocial concerns</th>
<th>Discharge planning</th>
<th>Rehabilitation assessment</th>
<th>Nutrition management</th>
<th>Fluids and electrolytes</th>
<th>Respiratory care</th>
<th>Procedural sedation</th>
<th>Pain control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20</td>
<td>40</td>
<td>60</td>
<td>80</td>
<td>100</td>
<td>80</td>
<td>60</td>
<td>40</td>
</tr>
</tbody>
</table>
of the co-management experience and consistent with a major goal of the American Academy of Pediatrics’ Future of Pediatric Education II project.15 Interprofessional teams are considered essential to the delivery of quality care for complex patients.25 Effective communication among members of interprofessional teams is crucial but is often difficult to achieve.16 Each discipline has a unique vocabulary, approach to problem solving, and a perceptual approach described by Petrie and others as the professional’s “cognitive map.”15,17 Differences in these cognitive maps lead to varying approaches to patient care, clinical priorities, and communication styles. The experience obtained by the pediatric residents under the co-management model may provide insight into potential bridging strategies that could improve interprofessional team functioning and lead to enhanced quality of care.

This program description study has several limitations. Our experience is that of a single pediatric residency and may not reflect the experiences of other training programs. We explored the perceptions of pediatric residents and faculty but not those of our surgical colleagues. We conducted an evaluation of our inpatient rotation, including co-management,22 but did not create a separate, formal evaluation of the co-management experience. Further research needs to explore the impact of pediatric resident participation in co-management models on the measured development of knowledge and skills in perioperative care and interprofessional teamwork.

CONCLUSIONS
Integration of a surgical co-management model into a pediatric residency provided both educational resources and challenges in perioperative training and interprofessional teamwork. Patient care forces will continue to provide impetus for the growth of pediatric-surgical co-management models. Providing resident training with this patient population in the context of interprofessional teams is 1 model for developing the skills of future pediatricians in collaborative patient care, safety, and quality.

ACKNOWLEDGMENTS
We gratefully acknowledge our surgical colleagues at St Christopher’s Hospital for Children in the divisions of orthopedics, otolaryngology, neurosurgery, plastic surgery, and ophthalmology for the exceptional care of the co-management patients and their education of our pediatric residents.

REFERENCES
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