



Pediatric inguinal and scrotal surgery – Practice patterns in U.S. academic centers



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ABSTRACT

Purpose: Both pediatric urologists and pediatric surgeons perform hernia repairs, hydrocelectomies and orchiopexies. We hypothesized that surgeons perform more incarcerated and female hernia repairs while urologists perform more orchiopexies and hydrocelectomies.

Methods: The Vizient-AAMC Faculty Practice Solutions Center® database was queried from January 2009 to December 2014 to identify patients 10 years or younger who underwent the above procedures performed by pediatric specialists. Age, gender, race, insurance, geographic region and surgeon volume were examined.

Results: In the study 55,893 surgeries were identified: 26,073 primary hernia repairs, 462 recurrent hernia repairs, 3399 laparoscopic hernia repairs, 9414 hydrocele repairs and 16,545 orchiopexies. Pediatric surgeons performed 89% of primary hernia repairs with an annual median surgeon volume of 4 cases/year. Pediatric urologists performed 62% of hydrocelectomies and 83% of orchiopexies with annual median surgeon volumes of 6 and 24, respectively. Pediatric surgeons performed all procedures in younger patients and performed more female and incarcerated hernia repairs.

Conclusions: Pediatric surgeons operate on younger patients and treat more patients with inguinal hernias while pediatric urologists care for more boys with undescended testes and hydroceles. This knowledge of referral patterns and care between specialties with overlapping expertise will allow improvements in training and access.

Levels of evidence: Cost Effectiveness Study, Level of Evidence III.

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Pediatric hernia repairs, hydrocelectomies and orchiopexies are common procedures performed by both pediatric surgeons and pediatric urologists. Using the Taiwan National Health Insurance database, Chang et al. estimated the cumulative incidence of pediatric hernias to be 6.62% in boys and 0.74% in girls aged 15 years and younger [1]. Using the same database, Pan et al. estimated the incidence of inguinal hernia repairs to be 4.2% in children aged 6 years and younger over a 7 year period [2]. The incidence of congenital undescended testicles in full term boys is estimated to be 2–4% at birth and 1% by age 1 year with cumulative incidences of orchiopexy to be 2–4% [3]. Despite numerous outcome analyses and these being the most common procedures in children, there are no studies evaluating who are in fact performing these surgeries, pediatric urologists or pediatric surgeons [4–6].

In the United States, adults with hernias are almost universally referred to general surgeons. Similarly, men with hydroceles are referred to urologists. On the other hand, for children, both procedures are performed by pediatric urologists and surgeons. This study has aimed to evaluate the practice patterns of pediatric hernia, hydrocele and

undescended testicle repair in the United States academic centers. This type of data is very important when analyzing surgical training, volume-based outcomes, quality of care and access. We hypothesized that pediatric surgeons perform more female and incarcerated hernia repairs and pediatric urologists perform more hydrocelectomies and orchiopexies.

1. Methods and materials

1.1. Data source

The Vizient-AAMC Faculty Practice Solutions Center (FPSC) database was developed by the Vizient, Inc. and the Association of American Medical Colleges to characterize physician productivity [7]. The database includes data from more than 90 faculty practice plans from across the country and has been used to study patterns of surgical practice at academic institutions [8–10].

Within the database, surgery is subclassified into general, trauma, burn, thoracic, cardiac, plastic, oncology, vascular, pediatric and transplant surgery. Urology currently has no subcategorizations. To specifically identify pediatric surgeons and pediatric urologists, the FPSC database was queried from January 2009 to December 2014 to find any physician performing inguinal hernia repair, hydrocele repair or

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orchiopexy in patients younger than 10 years of age based on each respective CPT code (Supplemental Table 1). The number of new patient visits was determined for each identified physician and only cases performed by physicians whose practices consisted of 50% or greater patients age 18 years or less were included in analyses. The primary scrotal/inguinal pathology for which the patient was treated was identified based on ICD9 codes for each respective condition (Supplemental Table 2).

1.2. Statistical analysis

For each procedure, patient characteristics of age, gender, race, insurance and geographic region were examined. For hernia repair, subset analyses were performed for primary repair in preterm infants, incarcerated hernia, female hernia, laparoscopic hernia repair and recurrent hernia repair. For hydrocele repair, subset analyses were performed for repair by scrotal approach and inguinal approach. For orchiopexy, subset analyses were performed for inguinal, open abdominal and laparoscopic assisted approaches. The laparoscopic approach was included as this still includes scrotal or inguinal incisions and we did not want to bias the analysis by excluding abdominal testes.

Categorical patient characteristics such as gender, race (nonwhite vs. white for subjects with known race) and insurance (commercial vs. noncommercial) were compared between pediatric urologists and pediatric surgeons using logistic regression models with standard errors adjusted for within-hospital correlation using generalized estimating equations (GEE). Mean patient age was compared between pediatric urologists and surgeons using a linear mixed effects model including a random effect for hospital. Geographic regions were compared between pediatric urologists and surgeons using chi-square tests. As the FPSC database has surgeon specific identifiers, the annual case volume for each surgeon for each procedure was calculated. Concurrent bilateral procedures in a single patient were considered a single case. Surgeon volume was compared between pediatric urologists and surgeons using negative binomial regression models with standard errors adjusted for within-hospital correlation using GEE. Analyses were conducted using SAS software for Windows, version 9.4 (SAS Institute, Cary, NC).

2. Results

During the 6-year period, 55,893 cases were performed by 632 doctors, 443 pediatric surgeons and 189 pediatric urologists at 73 hospitals.

2.1. Hernia repair

2.1.1. Primary hernia repair

A total of 26,073 primary hernia repairs were performed by both specialties and 89% were performed by pediatric surgeons (Fig. 1). For all primary repairs, pediatric surgeons treated younger patients than pediatric urologists ($p < 0.001$) with patients 2 years and younger accounting for greater than 50% of the general surgery cases. Pediatric surgeons also treated a higher proportion of nonwhite patients than pediatric urologists ($p = 0.008$) (Table 1, Fig. 1).

The distribution of surgeons by specialty and region was evaluated to see if the differences were secondary to availability of urologists in the region. The proportions of urologists did not differ significantly between regions (data not shown). Surgeon volume was higher for pediatric surgeons than pediatric urologists for all hernia surgery types (Supplemental Table 3). For primary hernia repairs, pediatric surgeons had a median surgeon volume of 4 cases/year (range 0–36) compared to that of urologists of 1 case/year (range 0–20) (Supplemental Table 3, Fig. 2).

2.1.2. Incarcerated hernia repair

There were 1460 cases of incarcerated hernia repair and 94% were performed by pediatric surgeons. Pediatric surgeons performed repairs of incarcerated hernias in younger patients ($p < 0.001$); patients aged 1 year and less accounted for 40% of these cases. Pediatric surgeons also performed incarcerated hernia repairs in a higher proportion of patients with noncommercial insurance ($p < 0.001$) (Supplemental Table 4).

2.1.3. Hernia repair in preterm infants

Of the 26,073 cases, 5375 cases were performed in preterm infants and 97% of these cases were performed by pediatric surgeons. Pediatric

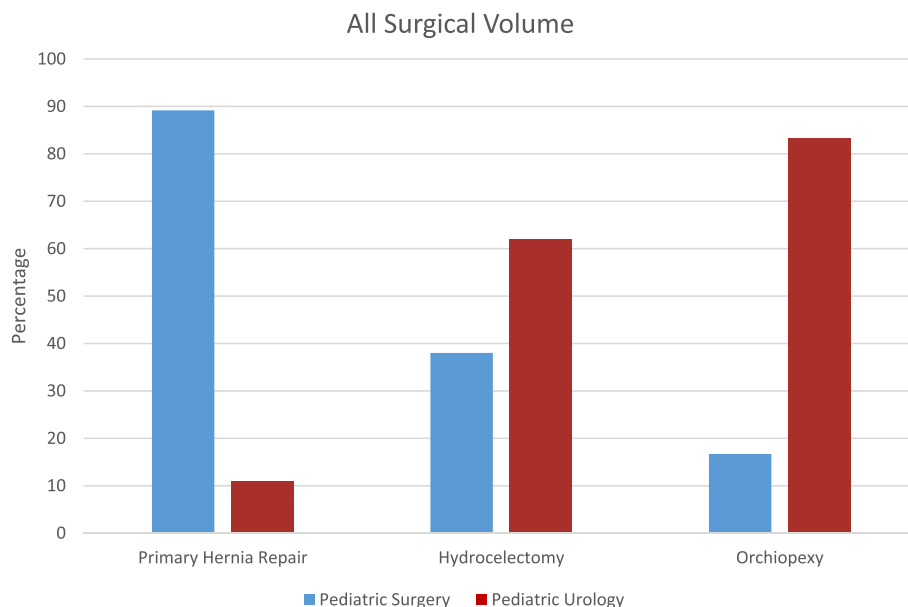


Fig. 1. Comparison of case volumes between pediatric surgeons and urologists.

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