

## GENERAL GYNECOLOGY

## Concomitant apical prolapse repair and incontinence procedures: trends from 2001-2009 in the United States

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**OBJECTIVE:** Recent evidence supports improved outcomes in women who undergo an incontinence procedure at the time of apical prolapse repair compared with apical repair alone. Our primary objective was to describe national trends in concomitant apical repair and incontinence procedures that were performed in the United States from 2001-2009. A secondary objective was to describe complications and length of stay.

**STUDY DESIGN:** We used the Nationwide Inpatient Sample to collect data on hospital discharges for women who had inpatient apical prolapse surgery from 2001-2009. We included women whose records included the *International Classification of Disease-9 Clinical Modification* procedure codes for apical procedures with and without incontinence procedures. We examined annual trends in the proportion of concomitant procedures using chi-square testing and multiple logistic regression.

**RESULTS:** Of all apical procedures, the percentage of concomitant incontinence procedures performed increased from 37.9% in 2001 to

47% in 2009 ( $P = .0002$  for trend). In-hospital complications (hemorrhage, bowel obstruction, and/or abscess) were less common with concomitant procedures (6.8% vs 11.7%;  $P = .02$ ). All geographic regions had increasing trends of concomitant incontinence procedures with no difference among regions ( $P = .7$  for interaction). Both community and academic institutions had increasing trends of concomitant procedures over the study period, with no difference among the types of institutions. Age was not associated with increasing trends in concomitant procedures.

**CONCLUSION:** The proportion of concomitant apical and incontinence procedures increased in the United States from 2001-2009. Length of stay was slightly longer for the concomitant group, but complications were not increased.

**Key words:** apical prolapse, concomitant, incontinence procedure, trend

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U rinary incontinence is expected to more than double from 2008-2050.<sup>1</sup> Costs associated with stress urinary incontinence (SUI) are substantial and will increase in the United States as the population ages.<sup>2</sup> Coexisting pelvic organ prolapse (POP) and SUI is common.<sup>3</sup> Additionally, many women with

POP may have what is referred to as occult or potential SUI, which occurs when the urethra is "obstructed" because of prolapse; therefore, SUI is demonstrable only with the prolapse reduced in otherwise continent women. Up to 25% of women who are continent before surgical repair of POP will experience SUI after the procedure.<sup>4,5</sup> This is an important consideration because unmasking of occult SUI can affect a woman's overall surgical outcome and satisfaction negatively, particularly if she was not expecting it.

To address this issue, there have been 2 landmark randomized trials that have estimated the effect of concomitant apical POP and SUI repair. The Colpopexy and Urinary Reduction Efforts (CARE) trial compared sacrocolpopexy with or without Burch colposuspension and the Outcomes following Vaginal Prolapse Repair and Midurethral Sling (OPUS) trial compared vaginal POP repair with and without midurethral sling.<sup>4,5</sup> Both studies reported improved urinary outcomes in women who underwent

concomitant repairs compared with POP repair alone. Although these trials demonstrated potential benefit for concomitant repairs, the effectiveness of these findings and how they have translated into clinical practice and patient care is unclear.

Our primary objective was to describe national trends in concomitant apical repair and incontinence procedures that were performed in the United States from 2001-2009, specifically comparing trends before and after publication of the CARE trial in 2006. Secondary objectives were to describe complications and length of stay and the effect of geographic location, hospital setting, and age group on the number of concomitant procedures.

## MATERIALS AND METHODS

We used the Nationwide Inpatient Sample (NIS; <http://www.hcup-us.ahrq.gov/databases.jsp>; Accessed Dec. 17, 2013), the Healthcare Cost and Utilization Project, and the Agency for Healthcare Research and Quality to examine hospital discharges for women who had

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inpatient apical prolapse surgery from 2001-2009 (<http://www.hcup-us.ahrq.gov/nisoverview.jsp>). The NIS is a stratified, random sample of discharge data from academic and community hospitals and is the largest publicly available all-payer inpatient care database in the United States. It contains data on 5 to 8 million hospital discharges from approximately 1000 hospitals that are sampled randomly to yield a 20% stratified sample of US community hospital discharges. Our sampled data contained >71 million records that represented 349 million discharges total after weighting.

Our study population included women with *International Classification of Disease—9 Clinical Modification* (ICD-9CM) procedure codes for apical procedures with and without incontinence procedures. Each discharge in the NIS contains up to 15 procedure codes. For our study, we included the following procedure codes for colpopexy procedures: 70.77 (vaginal suspension) and 70.78 (vaginal suspension and fixation with graft or prosthesis); we included the following codes for SUI procedures: 59.3, 59.4, 59.5, 59.6, and 59.79 (all codes correlate to a “general” incontinence procedure). We also extracted

patient age ( $\geq 65$  vs  $< 65$  years old), hospital region (Northeast, Midwest, South, and West), hospital type (community vs teaching), length of stay, and in-hospital complications that included hemorrhage (code 459.0), bowel obstruction (code 560.9), and peritoneal abscess (code 567.22).

Nationally representative frequencies were generated with the use of discharge weights, hospital identification (clustering variable), and NIS stratum (stratifying variable) according to NIS documentation (<http://www.hcup-us.ahrq.gov/db/nation/nis/nisdbdocumentation.jsp>).

Weights were defined as the number of discharges represented by each record in the database. The proportion of colpopexy procedures overall, with or without incontinence procedures, was examined among all hospital discharges, with the use of the appropriate ICD-9CM codes. A subpopulation analysis was used to limit the comparison with discharges with colpopexy. The proportion of colpopexy discharges with a concomitant urinary incontinence procedure was compared by individual year (2001-2009.) We compared trends before and after 2006, when the CARE trial was published.

Multiple logistic regression was used to examine trends in the frequency of concomitant apical and urinary incontinence procedures from 2001-2009. Multiple logistic regression was also used to assess trends over time by age, hospital region, and teaching status. Product interaction terms were included in the model to test for significant differences in trends by each of these 3 characteristics. Frequency of complications and mean length of stay were compared between discharges with and without urinary incontinence procedures by the Rao-Scott chi-square test and z-test, respectively. All analyses used procedures specific for survey data in SAS software (version 9.3 [SURVEYFREQ, SURVEYLOGISTIC, SURVEYMEANS, SURVEYREG]; SAS Institute Inc, Cary, NC). Standard errors were calculated by linearization of a Taylor series approximation. An institutional review board exemption was obtained because the NIS is a publicly available, deidentified database.

## RESULTS

From 2001-2009, there were 332,181 apical repairs performed. The mean age ( $\pm$  SD) was  $61 \pm 12.8$  years; 15% of the procedures were performed in the Northeast region; 25% of the procedures were performed in the Midwest; 40% of the procedures were performed in the South, and 20% of the procedures were performed in the West; 47% of the procedures were performed in community hospitals, and 53% of the procedures were performed in academic centers (Table 1).

The number of all apical procedures increased over the study time period (Table 2). Of all apical procedures, the percentage of concomitant incontinence procedures that were performed increased from 37.9% in 2001 to 47% in 2009 ( $P = .0002$  for linear trend). Concomitant procedures increased from an annual average of 43% for 2001-2006 before the publication of the CARE trial to 46.5% for 2007-2009 ( $P = .002$ ; Figure 1). In the Northeast, the proportion of concomitant procedures increased from 30.9% in 2001 to 47.1% in 2009 ( $P = .03$ ). In the Midwest, the proportion of concomitant procedures

**TABLE 1**  
**Demographics**

Variable	Procedure		P value
	Urinary incontinence	No urinary incontinence	
Weighted total, n	147,291	184,891	
Age, y <sup>a</sup>	61.3 $\pm$ 12.4	60.7 $\pm$ 13.2	.005
Age $\geq 65$ y, %	44.0	43.2	.2
Region, %			1.0
Northeast	14.8	14.7	
Midwest	25.3	24.8	
South	39.6	40.2	
West	20.3	20.3	
Hospital, %			.002
Academic center	55.1	50.8	
Community	44.9	49.2	

All colpopexies were from 2001-2009. All values are weighted.

<sup>a</sup> Data are given as mean  $\pm$  SD.

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