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Ambulatory procedures for female pelvic floor disorders in the United States

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Abstract

Objective—To estimate the number of women undergoing ambulatory surgical procedures for female pelvic floor disorders (PFDs) in the United States and to compare age-adjusted ambulatory surgical case rates between 1996 and 2006.

Study Design—We analyzed data from the 1996 and 2006 National Survey of Ambulatory Surgery, a federal public access de-identified database. Procedures for PFDs were identified using International Classification of Diseases-9th revision Clinical Modification procedure codes for urinary incontinence, fecal incontinence, and pelvic organ prolapse.

Results—The number of women undergoing ambulatory surgical procedures for urinary incontinence (UI) increased from 34,968 (95% CI 25,583–44,353) in 1996 to 105,656 (95% CI 79,033–132,279) in 2006. The age-adjusted ambulatory surgical case rates for all PFDs increased from 7.91 per 10,000 in 1996 to 12.10 per 10,000 in 2006 ($p=.0006$).

Conclusion—Ambulatory procedures for UI increased between 1996 and 2006 as well as the age-adjusted ambulatory case rate for all PFDs.

Keywords

Ambulatory procedures; fecal incontinence; pelvic floor disorders; pelvic organ prolapse; urinary incontinence

Introduction

Pelvic floor disorders (PFDs) is a general term for diseases of the pelvic floor caused by defects in the muscles or support structures of the pelvis. PFDs include urinary incontinence (UI), fecal incontinence (FI), and pelvic organ prolapse (POP). PFDs are common. The prevalence of these disorders among community-dwelling women over the age of 20 in the United States is

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estimated to be 15.7% for urinary incontinence, 9.0% for fecal incontinence, and 2.9% for symptomatic pelvic organ prolapse. [1]

Although conservative options exist, for many women, the treatment of PFDs is surgical. A woman's lifetime risk of undergoing a procedure for UI or POP by the age of 80 is estimated to be 11%. [2] Analysis of the National Hospital Discharge Summary (NHDS) estimated that over 200,000 and 100,000 inpatient surgical procedures are performed in the United States annually for POP and female UI, respectively.[3-8] Unfortunately, these estimates do not include ambulatory surgical procedures.

The National Survey of Ambulatory Surgery (NSAS) was conducted in 1994, 1995, and 1996. In 2003, Boyles et al. reported the rates of UI ambulatory procedures for these years. [9] After a 10-year hiatus, the NSAS survey was conducted again in 2006. The objective of this study was to estimate 1) the number of women undergoing ambulatory surgical procedures for female pelvic floor disorders (PFDs) in the United States, 2) to compare the proportion of ambulatory surgical visits for PFDs to all ambulatory surgical visits, and 3) to compare age-adjusted ambulatory surgical case rates for PFDs between 1996 and 2006.

Materials and Methods

We analyzed data from the 1996 and 2006 National Survey of Ambulatory Surgery (NSAS), a federal public access de-identified database. The National Survey of Ambulatory Surgery was conducted in 1994, 1995, 1996, and 2006 to capture information on ambulatory surgeries. The 2006 NSAS database was originally released January 4, 2009, however errors in the dataset prompted the database to be removed and revised. The revised dataset was released in August 2009. We analyzed the revised 2006 dataset which was downloaded from the National Center of Healthcare Statistics (NCHS) website on August 18, 2009.

NSAS covers ambulatory procedures performed at both hospitals and free-standing centers. Ambulatory procedures in the survey include procedures performed in general operating rooms, dedicated ambulatory surgery rooms, or other specialized rooms, such as endoscopy or cardiac catheterization suites. The NSAS does not report on non-surgical ambulatory visits or procedures performed in either physician's offices or emergency department. NSAS is the principal source for data on ambulatory procedures performed in the United States.

The NSAS samples facilities utilizing a multi-stage probability design. The 1996 NSAS survey included 323 hospitals and 277 free-standing ambulatory surgery centers.[10] The 2006 NSAS survey included 189 hospitals and 398 free-standing ambulatory surgery centers.[11] The response rate for eligible hospitals and free-standing centers invited to participate in the NSAS was 70% and 91% for 1996 and 74% and 76% for 2006. The 1996 and 2006 NSAS datasets included approximately 125,000 records corresponding to ~ 21.2 million visits and 52,000 records corresponding to ~34.7 millions visits, respectively. Both the absolute number of ambulatory surgical visits and the number of free-standing ambulatory surgical centers in the United States grew between 1996 and 2006. Additional details about the NSAS can be found at http://www.cdc.gov/nchs/nsas/about_nsas.htm.

This study was exempt from review by the Institutional Review Board. Exemption was verified in writing from both the Yale Human Investigation Committee (HIC) and Women and Infants' Hospital of Rhode Island's Institutional Review Board.

We defined ambulatory procedures for PFDs based on the International Classification of Diseases-9th-Clinical Modification revision (ICD-9-CM) *procedure codes* for UI, FI, and POP. A complete list of the procedure coded in the dataset can be found in Table 1. Not all queried codes had procedures listed in the dataset. A list of queried codes not in the dataset is provided

in the footnote to the table. Although both ICD-9-CM diagnosis codes and CPT codes have changed over the last 15 years, the ICD-9-CM *procedure codes* for PFDs remained constant between 1996 and 2006. We verified this by confirming ICD-9-CM code changes and revisions with the code conversion tables published by the National Center for Health Statistics.[12] Up to 6 ICD-9-CM *procedure codes*, representing concomitant procedures, were recorded in the NSAS per ambulatory surgical visit in both the 1996 and 2006 datasets.

We restricted our study population to women 21 years and older in order to examine adult women with PFDs. We used sampling weights provided by the NSAS documentation to obtain national estimates of ambulatory surgical cases and 95% confidence intervals (CI). We used SAS 9.1.3 (SAS institute, Inc, Cary, NC) and STATA 10.0 (Statcorp, College Station, TX) statistical software packages to calculate estimates and 95% confidence intervals. Because stratum and cluster variables were not supplied for the 1996 database, we were not able to account for clustering within the facilities sampled. Therefore we used a p-value <.01 as a cut-off for significance to account for the possible underestimation of procedures.

We first estimated the number of women undergoing ambulatory surgical procedures for PFDs with point estimates and 95% confidence intervals for each year. We then calculated the proportion of PFD ambulatory surgical visits in relation to ambulatory surgical visits for all medical indications in women 21 years and older which increased from 10.8 million visits in 1996 to 18.4 million visits in 2006.[10,11] Chi-square tests were used to compare proportions of PFD ambulatory surgical visits between 1996 and 2006. Finally, we calculated the age-adjusted ambulatory case rates by dividing the sampling weights by 2006 US census bureau estimates of the resident population of women 21 years and older in each year. The age-adjusted ambulatory surgical case rates were calculated per 10,000 US women over 21 years old. Wald tests were used to compare the means or rates between years. Because each record in the NSAS represents a variable number of visits in the population, we have not reported point estimates of procedures or ambulatory surgical case rates for procedures with less than 59 records as these estimates are unstable.

Results

The total number of women undergoing ambulatory surgical procedures for PFDs increased from 75,023 (95% CI 62,868-87,178) in 1996 to 132,518 (95% CI 103,295-161,741) in 2006. However, the proportion of ambulatory surgical visits for any PFDs in relation to all ambulatory surgical visits remained stable between 1996 and 2006 (0.69% vs. 0.72%; p=0.8). These findings are presented in Table 2. The age-adjusted ambulatory case rate for ambulatory surgical visits for any PFD increased from 7.91 per 10,000 in 1996 to 12.10 per 10,000 in 2006 (p=.006). Ambulatory surgical visits are counted as one admission, but multiple procedures may be performed during one admission. The average number of procedures performed per ambulatory surgical visit for PFDs was 1.09 in 1996 and 1.14 in 2006 (p =0.2).

The number of women undergoing ambulatory surgical procedures for UI increased significantly from 34,968 (95% CI 25,583-44,353) in 1996 to 105,656 (95% CI 79,033-132,279) in 2006 (p=.002). The proportion of ambulatory surgical visits for UI also increased between 1996 and 2006 (0.32% vs. 0.57%; p=0.002). The increase in UI procedures between the two time periods was primarily seen in the increase of procedures coded as *other repair of stress urinary incontinence* (ICD-9 59.79), with a total of 68,713 procedures with this code in 2006. The number of procedures coded as *other repair of stress urinary incontinence* (ICD-9 59.79) in 1996 was too small to be reliably reported. The age-adjusted ambulatory case rate for ambulatory admissions for any UI procedure increased from 3.87 per 10,000 in 1996 to 9.64 per 10,000 in 2006 (p<.0001).

The number of women undergoing ambulatory surgical procedures for POP remained stable at 42,938 (95% CI 34, 809-51,067) in 1996 and 44,394 (95% CI 29,785-59,003) in 2006. However, the proportion of ambulatory surgical visits for POP decreased between 1996 and 2006 (0.40% vs. 0.24%; $p=0.01$). The age-adjusted ambulatory case rate for POP remained stable at 4.37 per 10,000 in 1996 to 4.05 per 10,000 in 2006 ($p=.7$). The number of records for FI in the 1996 and 2006 database were too small to reliably report estimates of FI procedures alone. Procedures for FI were included in the estimation of number of procedures for total PFDs.

The mean age of women undergoing ambulatory procedures for PFDs increased between the time periods {52.1 vs. 57.0 years for 1996 and 2006 respectively, $p=.009$ }. (Table 3) The increase in mean age of women undergoing ambulatory procedures for PFDs was primarily driven by women undergoing POP procedures.

The proportion of ambulatory surgical visits performed in free-standing ambulatory surgery centers for all PFDs increased between 1996 and 2006 (8% vs. 21%, $p=.0008$). We were not able to examine ambulatory surgical visits for UI or POP alone as the number of records in the datasets were too small to reliably report estimates. Although there was an increase in the proportion of procedures performed for PFDs at free-standing ambulatory surgery centers, the type of anesthesia used for these procedures remained stable. The proportion of women undergoing general anesthesia for ambulatory surgical visits for PFDs in 1996 and 2006 was 29% vs. 23% ($p=0.4$).

Comment

There has been limited information on the number and rates of ambulatory surgical procedures for female PFDs. In our study, we found an increase in the number of ambulatory surgical visits for PFDs between 1996 and 2006. This increase was primarily driven by an increase in the number of ambulatory surgical visits for UI. This information allows for a more complete assessment of the epidemiology of surgical treatment for PFDs.

Our study has several limitations. Potential sources of sampling error inherent to the survey design of both the 1996 and 2006 NSAS are facility non-response, errors in coding at the provider level, and errors in data entry. An independent review of 10% of records in the 2006 NSAS database allowed for the calculation of error rates. The calculated error rate for coding at the provider level was 0.2% for ICD-9-CM procedure codes and 0.3% for errors in data entry of demographic information. In addition to errors in the NSAS data, our study is a secondary analysis of an existing database; therefore, some information is not available. We were unable to examine complications from these procedures as the number of complications reported in the dataset was too low to make statistically valid comparisons. Also, the classification of ambulatory procedures within the definition of the NSAS does not include all procedures performed in the United States. This is because the NSAS does not report on ambulatory procedures performed federal, military, and Veterans Affairs hospitals. In addition, the NSAS excludes ambulatory surgical procedures performed in free-standing ambulatory surgical centers with less than 6 patient beds, physician offices, emergency departments, or for freestanding centers that specialize exclusively in family planning, podiatry, dentistry, and abortion. We believe these omissions would encompass a relatively small number of ambulatory surgical procedures performed for PFDs, however our results may underestimate the actual number of ambulatory surgical procedures for PFDs performed in the United States. Finally, a small percentage of patients admitted for an ambulatory surgical visit will be admitted as inpatients instead of discharged home. In 2006, 1.9% of patients admitted for ambulatory surgical procedures admissions were upgraded to inpatient status. These unplanned inpatient admissions are included in the NSAS database.[10,11]

The current ICD-9-CM procedure codes for UI and midurethral sling procedures are somewhat vague. We noted an increase in the number of *other repair of stress urinary incontinence* (ICD-9 59.79) procedures performed in 1996 to 2006 which appear to coincide with the FDA approval of the first polypropylene mid-urethral sling in January 1998.[13] However, the number of ambulatory procedures coded as *other repair of stress urinary incontinence* (ICD-9 59.79) in 1996 in the NSAS was too small to report a weighted population estimate or make statistical comparisons. In addition, lack of clarity and specificity in the coding terminology for mid-urethral sling makes it impossible to estimate the number of ambulatory mid-urethral slings or the specific types of mid-urethral sling procedures performed annually in the United States.

Our study adds to the findings of previous investigators reporting on the number of inpatient procedures performed for UI.[4,5] Boyles et al. reported on the increasing number of inpatient procedures performed for UI in United States from 1979 to 1997 by analyzing the National Hospital Discharge Survey (NHDS). [5] The estimated number of women undergoing inpatient procedures for UI increased from 33,000 in 1979 to 84,000 in 1997. Oliphant et al. updated these findings by again analyzing the NHDS for inpatient UI procedures performed between 1979 and 2004, also noting an increasing trend. [4] Both of these studies reported on inpatient procedures only. Boyles et al. reported on ambulatory procedures for UI by analyzing the NSAS for 1994, 1995, and 1996.[9] We also found an increasing trend in UI ambulatory procedure rates. Our findings add to their data by reporting on ambulatory procedures since the FDA approval of a polypropylene mid-urethral sling in January 1998 [13] and include the most recent available data.

Previous studies have also reported on inpatient POP procedures.[6,7] Brown et al. reported 225,964 women were admitted for inpatient POP procedures in the United States in 1997 by analyzing the NHDS.[6] Boyles et al. compared the number of inpatient procedures reported in the NHDS from 1979 to 1997.[7] They reported a range of 165,000 to 225,000 annual inpatient procedures for POP, however a significant decrease in the age-adjusted case rate over the study period from 22 per 10,000 women to 15 per 10,000 women ($p=.01$). In our study, we found that the age-adjusted case rates for POP ambulatory procedures have remained stable over the past decade and the total annual number of POP procedures has decreased. Although the last decade has seen a flurry of different surgical approaches to POP procedures (i.e. mesh kits, laparoscopic, and robotic), the majority of these procedures remain inpatient admissions. This may be why ambulatory procedures for POP were not observed to increase. In 2007, three ICD-9-CM procedure codes were added to clarify the use of vaginal mesh or graft material: 70.53 *repair of cystocele and rectocele with graft*, 70.54 *repair of cystocele with graft*, and 70.55 *repair of rectocele with graft*. [12] However, this coding change would likely not affect the number of procedures coded for POP, but just the way they were reported.

Ambulatory procedures for any indication, not just PFDs, continue to rise in the United States. Ambulatory surgical visits for women for any medical indication increased from 10.8 million visits in 1996 and to 18.4 million visits in 2006.[10,11] Our findings of increases in ambulatory procedures visits for PFDs in women between 1996 and 2006 should be taken in context of an overall increase in all ambulatory procedures visits for any medical indication over the same study period. Therefore, we have also reported on the proportion of ambulatory surgical visits for PFDs and the age-adjusted ambulatory surgical case rates in order to reflect the general increases in all ambulatory surgeries and the general increase of the total population over the study period.

In conclusion, ambulatory procedures for PFDs in the United States increased between 1996 and 2006, primarily due to an increase in procedures for UI. This study adds to the current literature on the epidemiology of surgical treatment of female PFDs.

Acknowledgments

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Table 1

ICD-9-CM procedure codes for Pelvic Floor Disorders

Procedure	ICD-9-CM procedure code
Urinary Incontinence	
Cystourethroplasty and repair of bladder neck	57.85
Cystopexy NOS	57.89
Plication of the urethrovesical junction	59.3
Suprapubic sling operation	59.4
Retropubic urethral suspension	59.5
Paraurethral suspension	59.6
Levator muscle operation (pubococcygeal sling)	59.71
Injection of implant (urethral bulking agent)	59.72
Other repair of stress urinary incontinence	59.79
Fecal Incontinence	
Repair of old obstetric laceration of the anus	49.79
Pelvic Organ Prolapse	
Vaginal hysterectomy with repair of pelvic floor	68.5
Uterine suspension	69.22
Obliteration of the vagina	70.4
Cystocele and rectocele repair	70.5
Cystocele repair	70.51
Rectocele repair	70.52
Vaginal reconstruction	70.62
Vaginal suspension and fixation	70.77
Repair of pelvic floor	70.79
Le Fort operation	70.8
Other operations or repair of the vagina	70.91
Repair of vaginal enterocele	70.92
Repair of old obstetric laceration of the perineum	71.79

ICD-9-CM = International Classification of Diseases-9th -Clinical Modification revision

No procedures were recorded for the following codes: 58.4 *Repair of the urethra*, 86.94 *insertion or removal of neurostimulation*, 86.96 *insertion or replacement of other neurostimulation*, 86.97 *insertion or replacement of neurostimulation (single)*, 86.98 *insertion or replacement of neurostimulation (dual)*, 49.7 *repair of the anus*, 49.72 *anal cerclage*, 49.74 *gracilis muscle transplant for anal incontinence*, 49.75 *implantation of artificial anal sphincter*, 69.23 *vaginal repair of chronic uterine inversion*, 69.68 *other operations on supporting structures of the uterus*, 70.53 *repair of cystocele and rectocele with graft*, 70.54 *repair of cystocele with graft*, 70.55 *repair of rectocele with graft*, 70.6 *vaginal construction and reconstruction*, 70.61 *vaginal construction*, 70.7 *other repairs of the vagina*, 70.78 *vaginal suspension with graft*, 70.93 *repair of vaginal enterocele with graft or prosthesis*, 70.94 *insertion of biologic graft*, 70.95 *insertion of graft*, and 71.7 *repair of vulva or perineum*.

Table 2

Number of women undergoing ambulatory surgical procedures for Pelvic Floor Disorders by ICD-9-CM procedure codes: 1996 and 2006

Visits for PFD procedures	1996		2006		p-value
	Procedure Estimates (95% CI)	Proportion [*]	Procedure Estimates (95% CI)	Proportion [*]	
Urinary Incontinence	34,968 (25,583-44,353)	0.32%	105,656 (79,033-132,279)	0.57%	0.002 [‡]
Pelvic Organ Prolapse	42,938 (34,809-51,067)	0.40%	44,394 (29,785-59,003)	0.24%	0.01 [‡]
Any PFD surgical visit	75,023 (62,868-87,178)	0.69%	132,518 (103,295-161,741)	0.72%	0.8 [‡]

ICD-9-CM = International Classification of Diseases-9th -Clinical Modification revision

CI = confidence interval

PFD = Pelvic floor disorder

^{*} Proportion = procedure visits for PFDs/total ambulatory procedures

[‡] Chi-square test comparing proportion between 1996 and 2006

Table 3

Mean age of women admitted for ambulatory surgical procedures for Pelvic Floor Disorders by ICD-9-CM procedure codes: 1996 and 2006

Admissions for PFD Procedure	1996 (95% CI)	2006 (95% CI)	p-value *
Urinary Incontinence	58.5 (55.0, 62.0)	57.8 (54.7, 60.9)	0.8
Pelvic Organ Prolapse	47.2 (44.3, 50.2)	55.5 (51.3, 59.7)	.002
Any PFD procedure admission	52.1 (49.6, 54.6)	57.0 (54.2, 59.7)	.009

ICD-9-CM = International Classification of Diseases-9th-Clinical Modification revision

CI = confidence interval

PFD = Pelvic floor disorder

*
Wald test