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Shifts in National Rates of Inpatient Prolapse Surgery Emphasize Current Coding Inadequacies

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Abstract

Objective—This study aimed to assess national rates, types, and routes of inpatient surgery for pelvic organ prolapse in the United States in 1998 compared to those in 2007.

Methods—We used the 1998 and 2007 Nationwide Inpatient Sample, which represents a stratified, random sample of discharge data from US hospitals. We included women 20 years and older who underwent surgery for prolapse based on diagnosis and procedure codes of the International Classification of Disease, 9th Revision, Clinical Modification. We calculated the number of women undergoing surgery each year and incidence rates.

Results—The total number of women undergoing prolapse surgeries was 92,503 in 1998 versus 113,646 in 2007. The incidence rate of surgery increased slightly, from 90.8 to 100.9 per 100,000 women, respectively. The most common procedure was hysterectomy, representing approximately half of prolapse surgeries in 1998 and 2007. Suspension procedures accounted for 18.8% of procedures in 2007, an increase from 6.1% in 1998. Surgeries performed via a minimally invasive route increased from 4.8% in 1998 to 9.4% in 2007. However, it was difficult to determine the route for many procedures based on current *ICD-9* codes. There were also no codes that specifically designated mesh kit procedures or minimally invasive sacrocolpopexies.

Conclusions—During the last decade, the rate of inpatient prolapse surgery has slightly increased. The proportion of suspension procedures has increased; however, it is difficult to determine the route of these procedures based on current *ICD-9* codes. These findings emphasize that *ICD-9* procedure codes have not kept up with changes in clinical practice.

Keywords

pelvic organ prolapse; surgical procedures; trends

Pelvic organ prolapse is a major public health issue affecting more than half of all postmenopausal women.¹ Protrusion of one or more of the pelvic organs significantly impacts a woman's quality of life, and approximately 1 in 10 women opt for surgical management, with as many as 30% requiring reoperation.² In addition to the impact on individual women, prolapse surgery represents a significant economic burden as the direct costs for these surgeries totaled more than \$1 billion in the United States in 1997.³

It is possible that changes in the risk factors for prolapse may have impacted surgery rates for the last decade. For example, the prevalence of prolapse increases with age,⁴ and as the elderly population in our country increases,⁵ these changes may increase the number and rate of surgeries. Obesity is another risk factor for prolapse,⁶ and the obesity epidemic may have affected prolapse surgery rates as well. In fact, it has been projected that the number of women requiring health care for pelvic floor disorders will increase at twice the rate of population growth during the next 30 years.⁷

Trends in prolapse surgery are important to assess because they may have significant clinical and public health implications. As minimally invasive surgery has become more widely adopted,⁸ this may have translated into more laparoscopic or robotic-assisted urogynecologic procedures. Graduate medical training programs and resident and fellow trainees should be aware of these trends to ensure that an adequate number of surgeons are being appropriately trained in these procedures. In addition, it is unclear how many trocar-assisted mesh kit surgeries have been performed in the United States, and this information is vital given the 2008 Food and Drugs Administration warning regarding vaginal mesh procedures.⁹ An understanding of trends in prolapse surgery may also help to estimate future costs of national surgical expenditures, which is critical information given the uncertain results of health care reform.

Detailed data regarding prolapse surgery in the last decade are limited. In a recent study using the National Hospital Discharge Survey (NHDS), age-adjusted rates for inpatient prolapse procedures decreased from 2.93 procedures per 1000 women in 1979 to 1.52 in 2006.¹⁰ However, this study did not evaluate routes of prolapse surgery. Thus, the primary objective of our study was to estimate the total number and the rate of inpatient surgery for pelvic organ prolapse in the United States during 1 decade between 1998 and 2007 using the Nationwide Inpatient Sample (NIS). Our secondary objective was to evaluate changes in the types and routes of surgeries performed for prolapse.

MATERIALS AND METHODS

We used the NIS, a national, publicly available database of hospital discharge data maintained by the Agency for Healthcare Research and Policy.¹¹ The NIS includes information on 5 to 8 million hospitalizations every year from approximately 1000 hospitals in a majority of states. The database is designed to approximate a 20% sample of US hospitals, and the data can be weighted to calculate nationwide estimates. For every inpatient hospital stay, the database includes the associated International Classification of Disease, 9th Revision, Clinical Modification (ICD-9-CM), diagnosis and procedure codes.

We analyzed the 1998 and 2007 records of the NIS database to evaluate changes that occurred for 1 decade. We included women 20 years and older who underwent surgery for pelvic organ prolapse. These women were identified based on the combination of *ICD-9* codes for both a diagnosis and a procedure for prolapse. Codes for the diagnosis of prolapse included the following: 618.0 prolapse of vaginal walls without mention of uterine prolapse, 618.1 uterine prolapse without mention of vaginal wall prolapse, 618.2 uterovaginal prolapse incomplete, 618.3 uterovaginal prolapse complete, 618.4 uterovaginal prolapse, unspecified, 618.5 prolapse of vaginal vault after hysterectomy, 618.6 vaginal enterocele, congenital or acquired, 618.7 old laceration of muscles of pelvic floor, and 618.8 incompetence or weakening of pelvic fundus. Procedure codes for prolapse surgeries categorized by route of surgery are shown in Table 1. We excluded any woman with a diagnosis of gynecologic or urologic malignancy.

Using the weighted sampling method provided in the NIS database,¹¹ we estimated the total number of surgeries performed in 1998 and 2007. We also calculated the number of women undergoing prolapse surgery each year, as each woman may have more than 1 surgical procedure at the same encounter. We used STATA 9.1 (StataCorp, College Station, Tex) to account for sampling weights, strata, and clusters to estimate the national data. The database included 60 strata and 1044 clusters in 2007,¹¹ and sampling weights were provided in the data set.

Crude and age-adjusted incidence rates were calculated. For crude rates, the total number of women undergoing prolapse surgery in each year was divided by the total number of women 20 years or older in the US population in that year. We also evaluated the crude rates of prolapse surgery among 20-year age groups (aged 20–39, 40–59, 60–79, and 80 years). For each cohort, we divided the number of women having prolapse surgery by the total number of women in that cohort to obtain agespecific crude rates. We used the age-specific crude rates from the 20-year cohorts to calculate age-adjusted rates using the published 2000 US census adjustment weights in a method previously described.¹² Age-adjusted rates were calculated to make more accurate comparisons between these 2 study populations that could have different age distributions given our aging population in the United States.

In addition to calculating rates, we also evaluated the type of surgery in 1998 versus 2007. For each of these years, we grouped the procedures by type of surgery as follows: (1) hysterectomy (*ICD-9-CM* codes 68.3, 68.39, 68.4, 68.49, 68.6, 68.69, 68.5, 68.59, 68.7, 68.79, 68.31, 68.41, 68.51, 68.61, 68.71, and 68.9), (2) anterior or posterior colporrhaphy (70.5, 70.51, 70.52, 70.53, 70.54, and 70.55), (3) suspension procedures (70.77, 70.78, 69.2, and 69.22), (4) colpocleisis (70.4 and 70.8), and (5) others, for procedures that did not fall into one of these categories (69.23, 70.6, 70.61, 70.62, 70.7, 70.9, 70.91, 70.92, and 69.29). There were no codes that differentiated the types of suspension procedure performed, for example, uterosacral ligament versus sacrospinous ligament suspension versus sacrocolpopexy.

We also compared the route of surgery in 1998 versus 2007. Each prolapse procedure was categorized by route as shown in Table 1. Abdominal surgeries were defined as those using an open laparotomy technique. Minimally invasive included both laparoscopic and

robotically assisted procedures. We attempted to specifically quantify the number of procedures performed with robotic assistance by using the *ICD-9-CM* modifier code 17.42 for robotic-assisted laparoscopic procedure.

We also abstracted demographic information for each patient, including age, race, and health insurance status. For each hospital, we collected data on region in the United States (northeast, south, midwest, and west), bed size (small, medium, large), and hospital type (rural, urban nonteaching, and urban teaching).

This study received exemption from institutional review board approval given that these data are publicly available and nonidentifiable.

RESULTS

The total number of inpatient procedures for pelvic organ prolapse increased from 112,692 in 1998 to 188,659 in 2007 (Table 2). The total number of women undergoing prolapse surgeries also increased, from 92,503 in 1998 to 113,646 in 2007. The crude incidence rate increased slightly, from 90.8 per 100,000 women in 1998 to 100.9 per 100,000 women in 2007. The increase in the overall surgery rate reflects an increase in the rates among all age groups (Table 2). The highest rate of surgery occurred in women aged 60 to 79 years in both 1998 and 2007. Similarly, the age-adjusted rate of prolapse surgery also increased slightly, from 90.4 in 1998 to 97.4 in 2007.

The most common type of procedure performed for inpatient repair of prolapse was hysterectomy, representing 55.2% and 41.5% of surgeries in 1998 and 2007, respectively (Table 3). Repair of vaginal wall defects was also common, accounting for 23.9% of procedures in 1998 and 19.8% of procedures in 2007. There was an increase in uterine or vaginal suspension procedures from 6.1% in 1998 to 18.8% of procedures in 2007. Most surgeries were reconstructive rather than obliterative, which accounted for only 0.9% and 1.6% of procedures in 1998 and 2007, respectively. Other types of vaginal repair, which were not categorized, accounted for 13.9% of procedures in 1998 and 18.3% in 2007.

On the basis of surgeries for which we can determine route, most surgeries for prolapse were performed via a vaginal method, although the proportion of surgeries completed in this manner declined from 64.6% in 1998 to 46.6% in 2007 (Table 3). There was also a decrease in the percentage of surgeries performed via the abdominal route, from 10.8% in 1998 to 7.8% in 2007. Prolapse surgeries performed via a minimally invasive route increased from 4.8% in 1998 to 9.4% in 2007. There were no robotically assisted procedures identified by using the *ICD-9-CM* modifier code 17.42 for robotic-assisted laparoscopic procedure. However, one major issue is that there were a significant number of surgeries for which route was not able to be categorized secondary to nonspecific *ICD-9-CM* codes. The percentage of these uncategorized procedures increased from 19.8% in 1998 to 36.2% in 2007, representing the largest increase in procedures during this decade.

More than 80% of women having prolapse surgery were white in both 1998 and 2007 (Table 4). More than half of the women had private insurance, although Medicare also covered approximately 30% of procedures. The highest proportion of prolapse procedures was in the

south in both 1998 and 2007 (Table 4). The characteristics of hospitals performing prolapse surgeries were similar in both 1998 and 2007, with more than 80% of surgeries being performed in urban hospitals and 60% in large hospitals.

DISCUSSION

The overall number of inpatient prolapse surgeries and the number of women having surgery for prolapse increased in the United States during 1 decade from 1998 to 2007. The crude and age-adjusted rates of these procedures have also slightly increased during this time when accounting for population growth.

The age-adjusted rates we report here are slightly lower than those reported from 1979 to 1997 by Boyles et al.¹³ They reported an age-adjusted rate of 1.5 procedures per 1000 women in 1997 in comparison to our age-adjusted rate of 90.4 (or 0.904 procedures per 1000 women) 1 year later in 1998. Our 2007 rate of 0.974 was also slightly lower but similar to the 1.52 per 1000 women in 2006 reported by Jones et al.¹⁰ Both of these studies used the NHDS, and therefore, comparison with their results is limited by our use of a different database. Our utilization of the NIS database may actually result in more accurate estimates because the NIS samples significantly more hospitals and discharges than the NHDS data set. For example, in 2007, the NIS included 8,043,415 discharges from 1044 hospitals compared to only to 376,000 discharges from 438 hospitals in the 2006 NHDS.¹⁴

In contrast to the slightly decreasing rates of prolapse surgery from 1979 to 2006 reported previously,¹⁰ we report a slight increase in the rates of prolapse surgery. Taken together, our data and the aforementioned studies suggest that the rate of inpatient prolapse surgeries in the United States may have decreased slightly until the late 1990s, at which time rates began to level off. As the increase we report in the age-adjusted rate from 1998 to 2007 represents only 7 additional women per 100,000 undergoing prolapse surgery, it is unlikely that this change corresponds to a clinically significant difference.

Consistent with national trends for most gynecologic surgeries,⁸ the proportion of prolapse surgeries performed via an open abdominal route has decreased, whereas the percentage of surgeries performed laparoscopically has increased. However, these proportions need to be interpreted in the context of 36.2% of procedures in 2007 for which it is not possible to determine the route of surgery. The *ICD-9-CM* procedure codes for many of the procedures with no clear route correspond to apical suspension procedures. For example, in the current coding system, 70.77 (vaginal suspension) could refer to a uterosacral or sacrospinous ligament suspension performed via a vaginal approach, but it could also refer to an abdominal sacrocolpopexy. Thus, the increase in apical suspension procedures to 18.8% of the total in 2007 may have helped drive the increase in the proportion of prolapse procedures that have no clear route.

There are also currently no *ICD-9* procedure codes that specifically designate minimally invasive sacrocolpopexies, whether laparoscopic or robotic-assisted. Given published studies in the literature,¹⁵ it is clear that these procedures are being performed; however, without a specific *ICD-9* procedure code which both the NHDS and NIS employ, it will be

incredibly difficult to obtain national estimates and to follow national trends in these minimally invasive procedures. Similarly, there are currently no codes specific for mesh kit prolapse procedures, and therefore, it is difficult to assess what the rate of these procedures was before the 2008 Food and Drugs Administration warning.

These findings emphasize the inadequacies of the current *ICD-9-CM* coding system, which do not reflect specific types and routes of surgery for a significant number of procedures. In contrast to the *ICD-9* coding system, *Current Procedural Terminology* codes are more specific as to the surgical procedure and are more widely used for billing purposes.¹⁶ However, both the NIS and NHDS use only *ICD-9* codes. Therefore, definitive data on the routes of prolapse surgery may not be available until after the *ICD-10-CM* coding system is implemented in October 2013.¹⁷

An important limitation of this study is that the NIS contains data on inpatient procedures only, and thus, we could not account for outpatient prolapse surgeries. Recent data using the National Survey of Ambulatory Surgery reported that 42,938 women underwent outpatient prolapse surgery in 1996, which increased slightly to 44,394 women in 2006.¹⁸ It is critical to consider both inpatient and outpatient surgery for prolapse, and these data suggest that most prolapse surgeries continue to be performed on an inpatient basis.

The greatest strength of this study is our use of the NIS database. This data set provides national data that are more representative and generalizable than those from any other available database. In addition, we assessed trends in prolapse surgery during a 10-year period rather than examining cross-sectional data from 1 year. Our use of age-adjusted rates in addition to crude incidence rates also allowed us to control for the impact of different age distributions during the study period.

In conclusion, the overall rate of surgery for pelvic organ prolapse has slightly increased from 1998 to 2007. However, it is difficult to determine the type and route of many of these procedures based on current *ICD-9* codes. These findings emphasize that *ICD-9* procedure codes have not kept up with changes in clinical practice and demonstrate the importance of ICD coding revisions. The lack of specificity in *ICD-9* severely limits our ability to accurately assess and anticipate changes in national trends in prolapse surgery, which have important clinical and public health implications.

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TABLE 1

ICD-9-CM Codes for Prolapse Procedures Categorized by Route

Abdominal procedures	68.3	Subtotal abdominal hysterectomy
	68.39	Other and unspecified subtotal abdominal hysterectomy
	68.4	Total abdominal hysterectomy
	68.49	Other and unspecified total abdominal hysterectomy
	68.6	Radical abdominal hysterectomy
	68.6	Other and unspecified radical abdominal hysterectomy
Vaginal procedures	68.5	Vaginal hysterectomy
	68.59	Other and unspecified vaginal hysterectomy
	68.7	Radical vaginal hysterectomy
	68.79	Other and unspecified radical vaginal hysterectomy
	70.5	Repair of cystocele and rectocele
	70.51	Repair of cystocele
	70.52	Repair of rectocele
	70.53	Repair of cystocele and rectocele with graft or prosthesis
	70.54	Repair of cystocele with graft or prosthesis
	70.55	Repair of rectocele with graft or prosthesis
	70.4	Obliteration of vaginal vault and total excision of vagina
	70.8	Obliteration of vaginal vault (LeFort)
	70.6	Vaginal construction and reconstruction
	70.61	Vaginal construction
	70.62	Vaginal reconstruction
	69.23	Vaginal repair of chronic inversion of uterus
Minimally invasive procedures	68.31	Laparoscopic supracervical hysterectomy
	68.41	Laparoscopic total hysterectomy
	68.51	Laparoscopic assisted vaginal hysterectomy
	68.61	Laparoscopic radical abdominal hysterectomy
	68.71	Laparoscopic radical vaginal hysterectomy
Other/not categorized	68.9	Other and unspecified hysterectomy
	69.2	Repair of uterine supporting structures
	69.22	Other uterine suspension
	69.29	Other repair of uterus and supporting structures
	70.7	Other repair of the vagina
	70.77	Vaginal suspension
	70.78	Vaginal suspension and fixation with graft of prosthesis
	70.9	Other repair of the vaginal and cul-de-sac
	70.91	Other operations on vagina
	70.92	Other operations on cul-de-sac

TABLE 2

Pelvic Organ Prolapse Surgery in the United States, 1998 Versus 2007

Prolapse Surgery	1998	2007
Total no. surgeries	112,692	188,659
Women undergoing prolapse surgeries	92,503	113,646
Crude rate per 100,000 women	90.8	100.9
Aged 20-39 yr	32.8	34.3
Aged 40-59 yr	108.2	115.9
Aged 60-79 yr	182.5	198.6
Aged 80 yr	73.4	84.0
Age-adjusted rate per 100,000 women	90.4	97.4

TABLE 3

Type and Route of Prolapse Procedures in the United States, 1998 Versus 2007

Surgical Procedures, n (%)	1998	2007
Type of procedure		
Hysterectomy	62,189 (55.2)	78,344 (41.5)
Anterior or posterior colporrhaphy	26,900 (23.9)	37,380 (19.8)
Apical suspension	6857 (6.1)	35,402 (18.8)
Colpocleisis (obliterative procedure)	1074 (0.9)	3082 (1.6)
Other vaginal repair	15,672 (13.9)	34,451 (18.3)
Route of procedure		
Abdominal	11,173 (10.8)	12,670 (7.8)
Vaginal	66,965 (64.6)	75,489 (46.6)
Minimally invasive	4950 (4.8)	15,165 (9.4)
Not categorized	20,594 (19.8)	58,642 (36.2)

TABLE 4

Patient Demographics and Hospital Characteristics of Women Undergoing Prolapse Surgeries, 1998 Versus 2007

Characteristic, n (%)	1998	2007
	n = 92,503	n = 113,646
Age, mean, yr	56.6	57.0
20-39	13,312 (14.4)	13,893 (12.2)
40-59	38,383 (41.5)	49,487 (43.5)
60-79	36,464 (39.4)	44,183 (38.9)
80	4344 (4.7)	6083 (5.4)
Race		
White	60,399 (87.1)	64,327 (81.1)
Black	3060 (4.4)	3691 (4.7)
Hispanic	3867 (5.6)	7560 (9.5)
Other/missing	2040 (2.9)	3732 (4.7)
Insurance type		
Medicare	29,515 (32.0)	36,158 (31.9)
Medicaid	4209 (4.6)	5821 (5.1)
Private/HMO	54,128 (58.8)	65,483 (57.8)
Other	4244 (4.6)	5873 (5.2)
Region		
Northeast	15,045 (16.3)	16,947 (14.9)
Midwest	21,374 (23.1)	31,037 (27.3)
South	36,483 (39.4)	41,790 (36.8)
West	19,602 (21.2)	23,833 (21.0)
Hospital type		
Rural	14,915 (16.1)	16,227 (14.3)
Urban, nonteaching	39,167 (42.3)	51,989 (45.8)
Urban, teaching	38,421 (41.5)	45,198 (39.9)
Hospital size		
Small	11,082 (12.0)	13,435 (11.8)
Medium	25,423 (27.5)	27,397 (24.2)
Large	92,503 (60.5)	113,413 (64.0)