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## Ambulatory Surgery Data From Hospitals and Ambulatory Surgery Centers: United States, 2010

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### Abstract

**Objectives**—This report presents national estimates of surgical and nonsurgical ambulatory procedures performed in hospitals and ambulatory surgery centers (ASCs) in the United States during 2010. Patient characteristics, including age, sex, expected payment source, duration of surgery, and discharge disposition are presented, as well as the number and types of procedures performed in these settings.

**Methods**—Estimates in this report are based on ambulatory surgery data collected in the 2010 National Hospital Ambulatory Medical Care Survey (NHAMCS). NHAMCS has collected outpatient department and emergency department data since 1992 and began gathering ambulatory surgery data from both hospitals and ASCs in 2010. Sample data were weighted to produce annual national estimates.

**Results**—In 2010, 48.3 million surgical and nonsurgical procedures were performed during 28.6 million ambulatory surgery visits to hospitals and ASCs combined. For both males and females, 39% of procedures were performed on those aged 45–64. For females, about 24% of procedures were performed on those aged 15–44 compared with 18% for males, whereas the percentage of procedures performed on those under 15 was lower for females than for males (4% compared with 9%). About 19% of procedures were performed on those aged 65–74, while about 14% were performed on those aged 75 and over. Private insurance was listed as the principal expected source of payment for 51% of ambulatory surgery visits, Medicare for 31% of visits, and Medicaid for 8% of visits. The most frequently performed procedures included endoscopy of large intestine (4.0 million), endoscopy of small intestine (2.2 million), extraction of lens (2.9 million), insertion of prosthetic lens (2.6 million), and injection of agent into spinal canal (2.9 million). Only 2% of visits with a discharge status were admitted to the hospital as an inpatient.

**Keywords:** outpatient surgery • procedures • ICD–9–CM • National Hospital Ambulatory Medical Care Survey (NHAMCS)

### Introduction

This report presents nationally representative estimates of ambulatory surgery performed in hospitals and ambulatory surgery centers (ASCs) gathered by the 2010 National Hospital Ambulatory Medical Care Survey (NHAMCS). Ambulatory surgery, also called outpatient surgery, refers to surgical and nonsurgical procedures that are nonemergency, scheduled in advance, and generally do not result in an overnight hospital stay.

Ambulatory surgery has increased in the United States since the early 1980s (1,2). Two factors that contributed to this increase were medical and technological advancements, including improvements in anesthesia and in analgesics for the relief of pain, and the development and expansion of minimally invasive and noninvasive procedures (such as laser surgery, laparoscopy, and endoscopy) (3–6). Before these advances, almost all surgery was performed in inpatient settings. Any outpatient surgery was likely to have been minor, performed in physicians' offices, and paid for by Medicare and insurers as part of the physician's office visit reimbursement.



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The above advances and concerns about rising health care costs led to changes in the Medicare program in the early 1980s that encouraged growth in ambulatory surgery. Medicare expanded coverage to include surgery performed in ASCs (both hospital-based and freestanding). In addition, a prospective payment system for hospitals based on diagnosis-related groups was adopted, and that created strong financial incentives for hospitals to shift some surgery out of the hospital (1–5). Ambulatory surgery proved to be popular among both physicians and patients (3,4,7,8), and the number of Medicare-certified ASCs increased steadily, from 239 in 1983 to 5,316 in 2010 (9,10).

This report covers ambulatory surgery performed in hospitals and ASCs that are independent of hospitals. Ambulatory surgery procedures performed in physicians' offices and independent screening or diagnostic centers were not included in this report.

## Methods

### Data source and sampling design

Data for this analysis are from the ambulatory surgery component of the 2010 NHAMCS, a nationally representative survey of hospitals and ASCs conducted by the National Center for Health Statistics (NCHS). This survey has provided data on ambulatory medical care services provided in hospital emergency and outpatient departments since 1992. From 2010 through 2012, NHAMCS gathered data on ambulatory surgery procedures in both hospitals and ASCs. In 2013, data collection in ASCs was suspended so a new sampling frame could be developed. Previously, during 1994–1996 and in 2006, the National Survey of Ambulatory Surgery (NSAS) gathered data from hospital-based ASCs (HBASCs) and from facilities independent of hospitals [then called freestanding ASCs (FSASCs)] (2). The terms HBASC and FSASC are no longer in use because Medicare, and other insurers following Medicare's lead, changed the name and nature of the reimbursement categories for these services. Ambulatory surgery

performed in hospitals is now called hospital outpatient department surgery. Facilities independent of hospitals that specialize in ambulatory surgery are now known as ASCs.

Independent samples of hospitals and ASCs were drawn for the NHAMCS ambulatory surgery component. The NHAMCS hospital sample (11) was selected using a multistage probability design, first sampling geographic units and then hospitals. Locations within the hospital where the services of interest were provided, in this case ambulatory surgery, were sampled next. Lastly, patient visits within these locations were sampled.

The hospitals that qualify for inclusion in this survey (the universe) include noninstitutional hospitals (excluding federal, military, and Department of Veterans Affairs hospitals) located in the 50 states and the District of Columbia. Only short-stay hospitals (hospitals with an average length of stay for all patients of fewer than 30 days), those with a general specialty (medical or surgical), and children's general were included in the survey. These hospitals must also have six or more beds staffed for patient use. The 2010 NHAMCS hospital sample frame was constructed from the products of SDI Health's "Healthcare Market Index," which was updated July 15, 2006, and its "Hospital Market Profiling Solution, Second Quarter, 2006" (12). These products were formerly known as the SMG Hospital Market Database.

In 2010, the sample consisted of 488 hospitals, of which 74 were out-of-scope (ineligible) because they went out of business or otherwise failed to meet the criteria for the NHAMCS universe. Of the 414 in-scope (eligible) hospitals, 275 had eligible ambulatory surgery locations. Of these, 227 participated, yielding an unweighted hospital ambulatory surgery response rate of 82.6% and a weighted response rate of 90.9%. All of the 321 ambulatory surgery locations within the 227 participating hospitals were selected for sampling, and 281 of these fully or adequately responded [at least one-half of the number of expected patient record forms (PRFs) were completed]. The resulting hospital ambulatory surgery

location sample response rate was 87.5% unweighted, and 86.9% weighted. The overall hospital response rate was 72.2% unweighted and 79.0% weighted. In all, 18,469 PRFs for ambulatory surgery visits were submitted by hospitals.

The ASCs that qualified for inclusion in the 2010 NHAMCS (the universe) only included facilities in the 2006 NSAS sample. This sample was drawn in 2005 from a universe consisting of facilities listed in the 2005 Verispan (later called SDI Health and then IMS Health) Freestanding Outpatient Surgery Center Database (13) or the Centers for Medicare & Medicaid Services' (CMS) Medicare Provider of Services file (14). Using both of these sources resulted in a list of facilities that were regulated or licensed by the states and those certified by CMS for Medicare participation. More details about the 2006 NSAS sample have been published elsewhere (2). Selection of the 2010 ASC sample began with the NSAS 2006 stratified list sample of 472 FSASCs, which had strata defined by four geographic regions and 17 facility specialty groups. Seventy-four facilities were out-of-scope, leaving 398 facilities from which to select the 2010 NHAMCS ASC sample. To the extent possible, the ASC sample was selected from the NHAMCS geographic sampling units. The 17 specialty group strata used in the 2006 NSAS sample were collapsed into 5 strata (ophthalmic, gastrointestinal, multispecialty, general, and other).

All of the in-scope 2006 NSAS sample facilities located within the NHAMCS geographic sampling units were selected, yielding 216 facilities. To achieve the desired 246 facilities, a stratified list sample of 30 facilities was drawn from the remaining in-scope 2006 NSAS sample facilities that were located outside of the NHAMCS geographic sampling units. Strata were defined by the four regions and the five collapsed surgery specialty groups.

There were 149 in-scope (eligible) ASCs and, of this number, 109 responded to the survey for an unweighted response rate of 73.2% and a weighted response rate of 70.2%. In all, 8,492 PRFs were submitted for ASCs.

The overall response rate for hospitals combined with ASCs was 72.2% unweighted and 79.0% weighted.

The combined number of PRFs from both of these settings was 26,961.

Facilities were selected using a multistage probability design, with facilities having varying selection probabilities. Patient visits to ASCs and to locations in the hospital where ambulatory surgery was provided were selected using systematic random sampling procedures.

Within each sampled hospital, a sample of ambulatory surgery visits was selected from all of the ambulatory surgery locations identified by hospital staff. These locations included main or general operating rooms; dedicated ambulatory surgery units; cardiac catheterization laboratories; and rooms for endoscopy, laparoscopy, laser procedures, and pain block. Locations within hospitals dedicated exclusively to abortion, dentistry, podiatry, family planning, birthing, or small procedures were excluded, but these procedures were included if performed at in-scope locations. In ASCs with in-scope specialties, all visits were sampled. Facilities specializing in abortion, dentistry, podiatry, family planning, birthing, or small procedures were excluded, but these procedures were included if performed at in-scope ASCs.

To minimize response burden for hospitals and ASCs, the samples were divided into 16 nationally representative panels, and those panels were randomly ordered for rotation over reporting periods of 4 weeks each. Within the reporting periods, patient visits were systematically selected. The visit lists could be sign-in sheets or appointment lists. The total targeted number of ambulatory surgery visit forms to be completed in each hospital and in each ASC was 100. In facilities or hospitals with volumes higher than these desired figures, visits were sampled by a systematic procedure that selects every  $n$ th visit after a random start. Visit sampling rates were determined from the expected number of patients to be seen during the reporting period and the desired number of completed PRFs.

## Data collection

Medical record abstraction was performed by facility staff or U.S. Census

Bureau personnel acting on behalf of NCHS. A PRF for each sampled visit was completed. A visit is defined as a direct personal exchange between a physician or a staff member operating under a physician's direction, for the purpose of seeking ambulatory surgery. Visits solely for administrative purposes and visits in which no medical care was provided are out-of-scope.

The PRF contains items relating to the personal characteristics of the patients, such as age, sex, race and ethnicity, and administrative items, such as the date of the procedure, expected source(s) of payment, and discharge disposition. Medical information collected includes provider of anesthesia and type of anesthesia, length of time in both the operating room and in surgery, symptoms present during or after the procedure, and up to five diagnoses and seven procedures, which were coded according to the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) (15). Information on up to 12 new or continuing prescription and over-the-counter drugs ordered, supplied, or administered during the visit or at discharge was also collected, and these drugs were coded using Multum Lexicon (16), a proprietary drug classification system used by NCHS.

## Limitations of NHAMCS Ambulatory Surgery Data

Limited resources did not permit updating the ASC frame for the 2010 NHAMCS, so the NSAS 2006 sample, based on ASCs in existence in 2005, was used. Based on annual data on the number of Medicare-certified ASCs from CMS, the increase in the number of these facilities was taken into account in the calculation of NHAMCS ASC survey weights. The visit total related to the increase in the number of ASCs was also accounted for in the weights, but any possible change in the number of visits per ASC was not accounted for because no data were available on the number of visits to ASCs over time. Final weighting is described in more detail elsewhere (11).

Based on the assumption that the characteristics of ambulatory surgery visits probably do not vary with facility age, the sample should enable the measurement of 2010 characteristics (if not numbers) of ambulatory visits. To the extent that the ASCs that existed in 2005 were different from those in existence in 2010, these differences would not have been fully captured by the 2010 NHAMCS (17).

Due to limited resources, the sample sizes for hospitals and for ASCs for the NHAMCS ambulatory surgery component were only about one-half of what they were for the 2006 NSAS, so the most recent estimates have larger standard errors. This makes it more difficult for differences to achieve statistical significance.

Until 2008, hospital ambulatory surgery was included under Medicare's HBASC payment category. Beginning in 2008, Medicare discontinued its use of this category and instead began paying for hospital ambulatory surgery as part of hospital outpatient department services. Hospitals also dropped the HBASC designation and, in some hospitals, this change led to a greater dispersion of ambulatory surgery procedures throughout the hospitals, including to various parts of the outpatient departments and locations within medical clinics.

Some hospitals had difficulty identifying all of the locations in the hospital where in-scope procedures were performed, especially in the first year of NHAMCS ambulatory surgery data collection (2009). This same year, after the problems became apparent, U.S. Census Bureau and NCHS staff provided additional information to field staff about how to identify locations in the hospital that were in-scope and out-of-scope for the ambulatory surgery component of NHAMCS. More formal training material on this point was provided in a 2010 training CD that was sent to all field staff. These efforts are believed to have corrected this problem. However, due to these issues, it is likely that some in-scope procedures were undercounted in 2009 and 2010.

A number of changes occurred in the health care system during 2008–2010 that could have affected the amount

of ambulatory surgery care that was provided in settings covered by this report and the amount provided in out-of-scope settings (e.g., physicians' offices). More information about the difficulties of gathering and comparing data on ambulatory surgery from these two time periods and surveys is available (18).

## Results

### Ambulatory surgery procedure and visit overview

- In 2010, 28.6 million ambulatory surgery visits to hospitals and ASCs occurred (Table 1). During these visits, an estimated 48.3 million surgical and nonsurgical procedures were performed (Table 2).
- An estimated 25.7 million (53%) ambulatory surgery procedures were performed in hospitals and 22.5 million (47%) were performed in ASCs (Table A).
- Private insurance was the expected payment source for 51% of the visits for ambulatory surgery, Medicare payment was expected for 31%, and Medicaid for 8%. Only 4% were self-pay (Figure 1).
- Ninety-five percent of the visits with a specified discharge disposition had a routine discharge, generally to the patient's home. Patients were admitted to the hospital as inpatients during only 2% of these visits (Table B).

### Ambulatory surgery procedures, by sex and age

- For both males and females, 39% of procedures were performed on those aged 45–64 (Figure 2).
- For females, about 24% of procedures were performed on those aged 15–44 compared with 18% for males, whereas the percentage of procedures performed on those under 15 was lower for females than for males (4% compared with 9%).
- About 19% of procedures were performed on those aged 65–74, with about 14% performed on those aged 75 and over.

**Table A. Ambulatory surgery procedures and visits to hospitals and ambulatory surgery centers: United States, 2010**

Ambulatory surgery utilization	Estimate	Standard error
Procedures (millions) . . . . .	48.3	4.3
in hospitals . . . . .	25.7	2.6
in ASCs . . . . .	22.5	3.3
Visits (millions) . . . . .	28.6	2.4
in hospitals . . . . .	15.7	1.6
in ASCs . . . . .	12.9	1.8

NOTE: ASC is ambulatory surgery center.

SOURCE: NCHS, National Hospital Ambulatory Medical Care Survey, 2010.

**Table B. Percent distribution of ambulatory surgery visits in hospitals and ambulatory surgery centers, by discharge disposition: United States, 2010**

Discharge disposition	Percent of visits
Routine discharge <sup>1</sup> . . . . .	95
Observation status <sup>2</sup> . . . . .	2
Admission to hospital as inpatient . . . . .	2
Other <sup>3</sup> . . . . .	1
Total <sup>4</sup> . . . . .	100

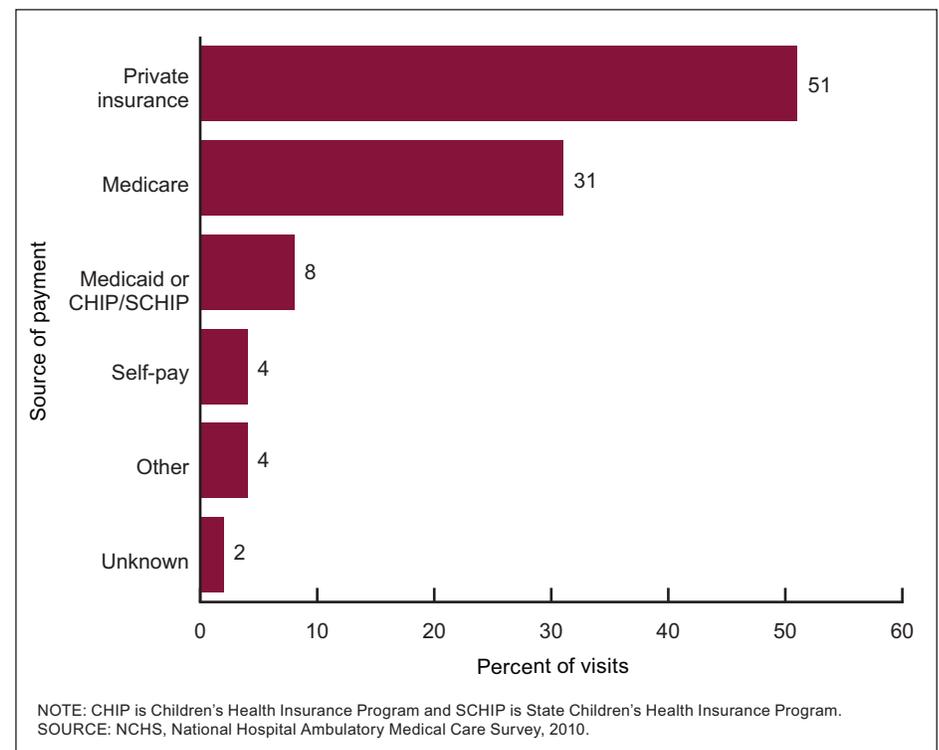
<sup>1</sup>Discharge to customary residence, generally home.

<sup>2</sup>Discharge for further observation without being admitted to a hospital.

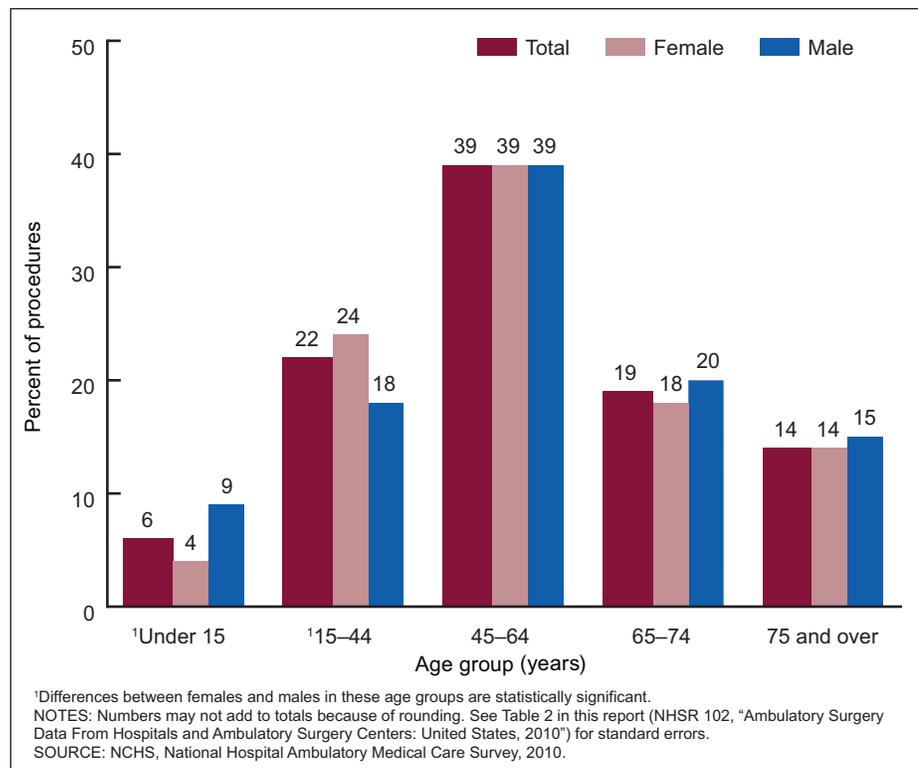
<sup>3</sup>Includes discharge to postsurgical or recovery care facility, referral to emergency department, surgery terminated, and other options.

<sup>4</sup>Excludes 1.2 million of the 28.6 million total visits with an unknown discharge disposition.

SOURCE: NCHS, National Hospital Ambulatory Medical Care Survey, 2010.



**Figure 1. Percent distribution of ambulatory surgery visits in hospitals and ambulatory surgery centers, by principal expected source of payment: United States, 2010**



**Figure 2. Percent distribution of ambulatory surgery procedures in hospitals and ambulatory surgery centers, by age and sex: United States, 2010**

## Types of procedures

Seventy percent of the 48.3 million ambulatory surgery procedures were included in the following clinical categories: operations on the digestive system (10 million or 21%), operations on the eye (7.9 million or 16%), operations on the musculoskeletal system (7.1 million or 15%), operations on the integumentary system (4.3 million or 9%), and operations on the nervous system (4.2 million or 9%) (Table 3). These procedure categories made up 72% of procedures performed on females and 67% of those performed on males. Within the above-mentioned categories, data on procedures performed more than 1 million times are presented below.

Under operations on the digestive system, endoscopy of large intestine—which included colonoscopies—was performed 4.0 million times, and endoscopy of small intestine was performed 2.2 million times. Endoscopic polypectomy of large intestine was performed an estimated 1.1 million times.

Eye operations included extraction of lens, performed 2.9 million times; insertion of lens, performed 2.6 million

times for cataracts; and operations on eyelids, performed 1.0 million times.

Musculoskeletal procedures included operations on muscle, tendon, fascia, and bursa (1.3 million).

Operations on the integumentary system included excision or destruction of lesion or tissue of skin and subcutaneous tissue (1.2 million).

Operations on the nervous system included injection of agent into spinal canal (2.9 million), including injections for pain relief.

## Duration of surgery

The average time in the operating room for ambulatory surgery was almost 1 hour (57 minutes). On average, about one-half of this time (33 minutes) was spent in surgery. Postoperative care averaged 70 minutes. Time spent in the operating room, surgery, and receiving postoperative care were all significantly longer for ambulatory surgery performed in hospitals compared with ASCs (Table C).

The average surgical times for selected ambulatory surgery procedures are shown in Table D. Endoscopies

averaged 14 minutes, while endoscopic polypectomy of the large intestine averaged 21 minutes. For cataract surgery, extraction or insertion of lens (often done together) averaged 10 minutes, and operations on the eyelids averaged 23 minutes. Arthroscopy of the knee averaged 32 minutes.

## Discussion

Keeping in mind the limitations that should be taken into account when comparing 2006 NSAS data and 2010 NHAMCS ambulatory surgery data, the 53.3 million ambulatory surgery procedures estimated using 2006 NSAS data were compared with the 48.3 million ambulatory surgery procedures estimated using 2010 NHAMCS data. The difference between these two figures was not statistically significant. A significant decrease of 18% (from 34.7 to 28.6 million) was seen in the number of ambulatory surgery visits during this same time period. It had been expected based upon the limited data that were available and on projections from past trends, that there would have been an increase in the numbers of both ambulatory surgery visits and procedures (9,10,19).

One reason for these findings could be an undercount in NHAMCS in 2010. Another reason that ambulatory surgery visit estimates could have decreased and ambulatory surgery procedures remained steady, could be the deep economic recession that began in 2007. By 2010, when NHAMCS began gathering ambulatory surgery data in both hospitals and ASCs, the economy had not fully recovered. The rate of unemployment and the number of people who did not have health insurance were higher in 2010 compared with 2006, and both of these factors could have affected patients' use of ambulatory surgery (20,21). Even for those who continued to have health insurance, increased out-of-pocket costs (higher deductibles and coinsurance payments) may have contributed to a decrease in the number of visits for ambulatory surgery (22).

An examination of various data sources, including Medicare, the American Hospital Association, and NHAMCS, was undertaken to evaluate if other national

**Table C. Distribution of times for surgical visits, by ambulatory surgery facility type: United States, 2010**

Calculated time of ambulatory surgical visit	Hospital		Ambulatory surgery center		All facilities	
	Average time (minutes)	Standard error	Average time (minutes)	Standard error	Average time (minutes)	Standard error
Operating room <sup>1</sup> .....	63	1.9	50	3.7	57	2.2
Surgical <sup>2</sup> .....	37	1.5	29	3.2	33	1.7
Postoperative care <sup>3</sup> .....	89	2.9	51	3.8	70	2.6

<sup>1</sup>Calculated by subtracting the time when the patient entered the operating room from the time the patient left the operating room.  
<sup>2</sup>Calculated by subtracting the time the surgery began from the time the surgery ended. Surgical time typically extends from when the first incision is made until the wound is closed.  
<sup>3</sup>Calculated by subtracting the time when the patient entered postoperative care from the time the patient left postoperative care.

SOURCE: NCHS, National Hospital Ambulatory Medical Care Survey, 2010.

data sources reached similar conclusions about trends in ambulatory surgery during 2006–2010 (19). This analysis revealed that the only nationally representative data during this time period were from the 2006 NSAS and the 2010 NHAMCS ambulatory surgery component. Medicare data on the number of certified ASCs over time existed, but only limited Medicare ambulatory surgery utilization and expenditure data were available, and almost all of it was from ASCs only and did not include data on ambulatory surgery in hospitals. Even so, Medicare utilization and expenditure data could not have been used to generalize to the entire population because Medicare only covers those aged 65 and over and people with disabilities. Close to 70% of ambulatory surgery procedures were paid for by sources other than Medicare.

## Ambulatory Surgery Data

The 2010 NHAMCS ambulatory surgery data used for this report have been released in a public-use file

available from: [ftp://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/Datasets/NHAMCS](ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Datasets/NHAMCS). The data base documentation for this file is available from: [ftp://ftp.cdc.gov/pub/Health\\_Statistics/NCHS/Dataset\\_Documentation/NHAMCS](ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHAMCS).

Among the options being explored for future data collection are the use of both claims data and electronic health record data.

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**Table D. Average surgical duration for selected procedures: United States, 2010**

Selected procedure <sup>1</sup>	ICD–9–CM codes	Average surgical time (minutes) <sup>2</sup>	Standard error
Endoscopy (including colonoscopy).....	45.11–45.14, 45.16, 45.21–45.25	14	0.87
Endoscopic polypectomy of large intestine.....	45.42	21	0.97
Extraction or insertion of lens (cataracts).....	13.1–13.7	10	1.20
Operations on eyelids.....	08	23	3.56
Arthroscopy of knee.....	80.26	32	2.69

<sup>1</sup>Times were counted only for patients who had each of these selected procedures and no others during their ambulatory surgery visit.

<sup>2</sup>Calculated by subtracting the time surgery began from the time surgery ended. Surgical time typically extends from when the first incision is made until the wound is closed.

NOTE: Procedure categories and code numbers are based on the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD–9–CM)*.

SOURCE: NCHS, National Hospital Ambulatory Medical Care Survey, 2010.

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**Table 1. Number and percent distribution of ambulatory surgery visits, by age and sex: United States, 2010**

Age group (years)	Both sexes		Female		Male	
	Estimate	Standard error	Estimate	Standard error	Estimate	Standard error
	Number (thousands)					
Total . . . . .	28,588	2424	16,481	1,365	12,108	1,084
Under 15 . . . . .	1,812	302	712	122	1,100	184
15–44 . . . . .	6,426	619	4,201	411	2,225	223
45–64 . . . . .	10,911	1,010	6,256	555	4,659	474
65–74 . . . . .	5,301	446	2,951	242	2,350	213
75 and over . . . . .	4,139	360	2,365	205	1,774	167
	Percent distribution					
Total . . . . .	100	...	100	...	100	...
Under 15 . . . . .	6	0.86	4	0.62	9	1.21
15–44 . . . . .	23	0.94	26	1.06	18	0.91
45–64 . . . . .	38	0.89	38	0.84	39	1.16
65–74 . . . . .	19	0.67	18	0.69	19	0.84
75 and over . . . . .	14	0.69	14	0.72	15	0.83

... Category not applicable.

NOTE: Numbers may not add to totals because of rounding.

SOURCE: NCHS, National Hospital Ambulatory Medical Care Survey, 2010.

**Table 2. Number and percent distribution of ambulatory surgery procedures, by age and sex: United States, 2010**

Age group (years)	Both sexes		Female		Male	
	Estimate	Standard error	Estimate	Standard error	Estimate	Standard error
Number (thousands)						
Total .....	48,263	4,253	27,595	2,373	20,669	1,932
Under 15 .....	2,916	500	1,118	199	1,798	310
15–44 .....	10,478	1,014	6,708	631	3,770	418
45–64 .....	18,783	1,876	10,789	1,060	7,994	857
65–74 .....	9,153	802	5,053	423	4,100	403
75 and over .....	6,933	619	3,926	356	3,007	285
Percent distribution						
Total .....	100	...	100	...	100	...
Under 15 .....	6	0.82	4	0.57	9	1.20
15–44 .....	22	0.89	24	0.92	18	1.10
45–64 .....	39	1.02	39	1.05	39	1.23
65–74 .....	19	0.79	18	0.78	20	1.00
75 and over .....	14	0.80	14	0.84	15	0.89

... Category not applicable.

NOTE: Numbers may not add to totals because of rounding.

SOURCE: NCHS, National Hospital Ambulatory Medical Care Survey, 2010.

**Table 3. Number of ambulatory surgery procedures in hospitals and ambulatory surgery centers, by procedure category, sex, and age: United States, 2010**

Procedure category and ICD-9-CM code	Total	Sex		Age group (years)				
		Female	Male	Under 15	15-44	45-64	65-74	75 and over
		Number (thousands)						
All procedures	48,263	27,595	20,669	2,916	10,478	18,783	9,153	6,933
Operations on the nervous system	4,226	2,385	1,841	*	1,002	1,981	631	590
Injection of agent into spinal canal	2,918	1,588	1,330	*	712	1,313	437	453
Release of carpal tunnel	444	266	178	-	66	240	80	*58
Operations on the eye	7,880	4,622	3,258	93	321	2,122	2,697	2,646
Operations on eyelids	1,021	651	371	*	*	482	276	*
Extraction of lens	2,861	1,705	1,156	*	*	584	1,081	1,173
Insertion of prosthetic lens (pseudophakos)	2,553	1,526	1,027	*	*	511	951	1,043
Operations on the ear	1,054	442	612	847	72	58	*	*
Myringotomy with insertion of tube	754	323	431	699	*	*	*	*
Operations on the nose, mouth, and pharynx	2,407	1,117	1,290	903	689	575	166	*75
Incision, excision and destruction of nose and lesion of nose	302	152	*	*	126	*	*	*
Turbinectomy	190	78	112	*	106	*40	*	*
Repair and plastic operations on the nose	393	179	214	*	175	135	*	*
Operations on nasal sinuses	433	192	241	*	164	*	*	*
Tonsillectomy with or without adenoidectomy	399	205	193	289	102	*	*	*
Adenoidectomy without tonsillectomy	72	*32	*40	69	*	*	-	-
Operations on the respiratory system	282	141	141	*	*40	86	81	*37
Bronchoscopy with or without biopsy	106	*55	51	*	*	*30	*	*
Operations on the cardiovascular system	1,072	519	553	*	88	369	356	245
Cardiac catheterization	339	136	203	*	*	126	113	*
Operations on the digestive system	10,045	5,418	4,627	*	1,826	4,759	2,044	1,198
Dilation of esophagus	172	106	66	*	*	72	36	*38
Endoscopy of small intestine with or without biopsy	2,172	1,312	861	*	468	936	387	325
Endoscopy of large intestine with or without biopsy	3,987	2,202	1,785	*	474	2,132	916	431
Endoscopic polypectomy of large intestine	1,060	485	575	*	*	520	354	158
Laparoscopic cholecystectomy	436	325	111	*	196	162	*	*
Hernia repair	777	196	581	*	178	355	83	88
Repair of inguinal hernia	449	*52	*	*	82	198	54	66
Operations on the urinary system	1,349	590	759	*67	311	456	294	220
Cystoscopy with or without biopsy	479	219	260	*	128	155	104	82
Operations on the male genital organs	525	-	525	*	98	131	89	*54
Operations on the female genital organs	1,766	1,766	-	*	1,093	527	91	*
Hysteroscopy	198	198	-	*	83	83	*	*
Dilation and curettage of uterus	328	328	-	-	172	116	*	*

See footnotes at end of table.

**Table 3. Number of ambulatory surgery procedures in hospitals and ambulatory surgery centers, by procedure category, sex, and age: United States, 2010—Con.**

Procedure category and ICD–9–CM code	Total	Sex		Age group (years)				
		Female	Male	Under 15	15–44	45–64	65–74	75 and over
		Number (thousands)						
Operations on the musculoskeletal system..... (76–84,00.70–00.77,00.80–00.87)	7,076	3,802	3,275	173	2,114	3,456	885	448
Partial excision of bone..... (76.2–76.3,77.6–77.8)	241	132	109	*	49	141	*29	*
Reduction of fracture..... (76.7,79.0–79.3)	380	153	227	*52	160	111	*	*
Injection of therapeutic substance into joint or ligament..... (76.96,81.92)	267	183	84	*	*	127	*48	*
Removal of implanted devices from bone..... (76.97,78.6)	195	111	83	*	64	87	*	*
Excision and repair of bunion and other toe deformities..... (77.5)	379	327	*52	*	120	165	*55	*
Arthroscopy of knee..... (80.26)	692	332	359	*	254	333	80	*
Excision of semilunar cartilage of knee..... (80.6)	759	374	385	*	196	435	105	*
Replacement or other repair of knee..... (81.42–81.47,81.54–81.55,00.80–00.84)	571	285	286	*	201	*	*	*
Operations on muscle, tendon, fascia and bursa..... (82–83)	1,274	636	637	*	319	635	196	88
Operations on the integumentary system..... (85–86)	4,340	3,405	935	131	1,497	1,767	566	380
Biopsy of breast..... (85.11–85.12)	*	*	*	–	*	86	*	*
Local excision of lesion of breast (lumpectomy)..... (85.21)	268	*	*	*	64	151	*40	*
Excision or destruction of lesion or tissue of skin and subcutaneous tissue..... (86.2–86.4)	1,219	734	485	*	323	449	182	171
Miscellaneous diagnostic and therapeutic procedures and new technologies..... (87–99,00.01–00.03,00.09–00.19,00.21–00.25,00.28–00.29,00.31–00.35,00.39, 00.56, 00.58–00.59, 00.67–00.69,17.62,17.69,17.70,38.24,38.25,00.91–00.94,17.4)	5,892	3,102	2,790	228	1,225	2,358	1,158	923
Operations on the endocrine system, on the hemic and lymphatic system, and obstetrical procedures..... (06–07,40–41,72–75)	348	285	63	*	104	135	*62	32

\* Figure does not meet standards of reliability or precision. An asterisk with a number indicates that the estimate is based on a relatively small number of cases, and while reliable, should be used with caution.  
– Quantity zero.

NOTE: Procedure categories and code numbers are based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD–9–CM).

SOURCE: NCHS, National Hospital Ambulatory Medical Care Survey, 2010.

**Table 4. Standard errors of ambulatory surgery procedures in hospitals and ambulatory surgery centers, by procedure category, sex, and age: United States, 2010**

Procedure category and ICD-9-CM code	Total	Sex		Age group (years)				
		Female	Male	Under 15	15-44	45-64	65-74	75 and over
				Standard error				
All procedures	4,040	2,250	1,844	492	972	1,806	765	591
Operations on the nervous system (01-05,17.61)	703	398	316	*	240	377	90	92
Injection of agent into spinal canal (03.91-03.92)	557	305	265	*	208	297	74	82
Release of carpal tunnel (04.43)	102	61	45	-	14	61	24	*16
Operations on the eye (08-16)	1,005	569	454	21	80	318	322	392
Operations on eyelids (08)	203	130	100	*	*	106	69	*
Extraction of lens (13.1-13.6)	370	217	159	*	*	77	133	179
Insertion of prosthetic lens (pseudophakos) (13.7)	356	213	147	*	*	76	124	163
Operations on the ear (18-20)	188	107	94	184	12	16	*	*
Myringotomy with insertion of tube (20.01)	161	91	83	152	*	*	*	*
Operations on the nose, mouth, and pharynx (21-29)	312	155	173	194	88	101	35	*17
Incision, excision and destruction of nose and lesion of nose (21.1,21.3-21.4,21.6)	68	*	25	*	22	*	*	*
Turbinectomy (21.6)	31	18	20	*	19	*11	*	*
Repair and plastic operations on the nose (21.8)	78	*	32	*	35	29	*	*
Operations on nasal sinuses (22)	92	48	59	*	35	*	*	*
Tonsillectomy with or without adenoidectomy (28.2-28.3)	65	36	38	53	16	*	*	*
Adenoidectomy without tonsillectomy (28.6)	15	*8	*10	14	*	*	-	*
Operations on the respiratory system (30-34)	38	22	24	*	*11	17	17	*9
Bronchoscopy with or without biopsy (33.21-33.24,33.27,33.71-33.73,33.78-33.79)	18	*12	11	*	*	*8	*	*
Operations on the cardiovascular system (35-39,00.40-00.49,00.50-00.55,00.57,00.61-00.66,17.51-17.52,17.71)	197	98	109	*	18	62	105	53
Cardiac catheterization (37.21-37.23)	88	37	54	*	*	27	*	*
Operations on the digestive system (42-54,17.1-17.3,17.63)	1,148	608	555	*	196	599	278	144
Dilation of esophagus (42.92)	32	23	14	*	*	15	*9	*11
Endoscopy of small intestine with or without biopsy (45.11-45.14,45.16)	290	171	128	*	69	144	60	47
Endoscopy of large intestine with or without biopsy (45.21-45.25)	560	292	280	*	82	319	132	83
Endoscopic polypectomy of large intestine (45.42)	195	93	108	*	*	106	77	35
Laparoscopic cholecystectomy (51.23)	64	48	20	*	27	31	*	*
Hernia repair (53.0-53.9,17.1-17.2)	113	31	89	*	30	63	14	18
Repair of inguinal hernia (53.0-53.1,17.1-17.2)	72	*	61	*	19	37	11	16
Operations on the urinary system (55-59)	184	79	114	*20	61	67	49	33
Cystoscopy with or without biopsy (57.31-57.33)	75	38	44	*	31	25	21	15
Operations on the male genital organs (60-64)	106	-	106	*	16	*	*	*15
Operations on the female genital organs (65-71)	223	223	-	*	145	81	19	*
Hysteroscopy (68.12)	33	33	-	*	17	17	*	*
Dilation and curettage of uterus (69.0)	42	42	-	-	23	21	*	*

See footnotes at end of table.

**Table 4. Standard errors of ambulatory surgery procedures in hospitals and ambulatory surgery centers, by procedure category, sex, and age: United States, 2010—Con.**

Procedure category and ICD–9–CM code	Total	Sex		Age group (years)				
		Female	Male	Under 15	15–44	45–64	65–74	75 and over
		Standard error						
Operations on the musculoskeletal system..... (76–84,00.70–00.77,00.80–00.87)	1,156	667	501	36	305	685	144	77
Partial excision of bone..... (76.2–76.3,77.6–77.8)	35	27	18	*	9	26	*7	*
Reduction of fracture..... (76.7,79.0–79.3)	50	19	36	*10	24	16	*	*
Injection of therapeutic substance into joint or ligament..... (76.96,81.92)	58	43	20	*	*	32	*14	*
Removal of implanted devices from bone..... (76.97,78.6)	37	27	15	*	16	22	*	*
Excision and repair of bunion and other toe deformities..... (77.5)	72	69	*13	*	28	41	*15	*
Arthroscopy of knee..... (80.26)	168	80	91	*	47	100	22	*
Excision of semilunar cartilage of knee..... (80.6)	177	79	103	*	39	124	26	*
Replacement or other repair of knee..... (81.42–81.47,81.54–81.55,00.80–00.84)	141	80	66	*	36	*	*	*
Operations on muscle, tendon, fascia and bursa..... (82–83)	201	113	96	*	62	102	44	19
Operations on the integumentary system..... (85–86)	496	423	111	32	217	254	65	51
Biopsy of breast..... (85.11–85.12)	*	*	*	–	*	21	*	*
Local excision of lesion of breast (lumpectomy)..... (85.21)	39	39	*	*	15	26	*10	*
Excision or destruction of lesion or tissue of skin and subcutaneous tissue..... (86.2–86.4)	129	103	56	*	58	66	37	48
Miscellaneous diagnostic and therapeutic procedures and new technologies..... (87–99,00.01–00.03,00.09–00.19,00.21–00.25, 00.28–00.29,00.31–00.35,00.39,00.56, 00.58–00.59, 00.67–00.69,17.62,17.69,17.70,38.24,38.25,00.91–00.94,17.4)	750	376	385	50	186	327	183	123
Operations on the endocrine system, on the hemic and lymphatic system, and obstetrical procedures..... (06–07,40–41,72–75)	50	45	14	*	21	25	*13	*9

\* Figure does not meet standards of reliability or precision. An asterisk with a number indicates that the estimate is based on a relatively small number of cases, and while reliable, should be used with caution.  
 – Quantity zero.

NOTE: Procedure categories and code numbers are based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD–9–CM).

SOURCE: NCHS, National Hospital Ambulatory Medical Care Survey, 2010.

## Technical Notes

Data processing and medical coding were performed by SRA International, Inc., Durham, N.C. Editing and estimation were completed by the National Center for Health Statistics.

### Estimation

Because of the complex multistage design of the National Hospital Ambulatory Medical Care Survey (NHAMCS), the survey data must be inflated or weighted to produce national estimates. The estimation procedure produces essentially unbiased national estimates and has three basic components: (a) inflation by reciprocals of the probabilities of sample selection, (b) adjustment for nonresponse, and (c) population weighting ratio adjustments. These three components of the final weight are described in more detail elsewhere (11).

Because NHAMCS ambulatory surgery data are collected from a sample of visits, persons with multiple visits during the year may be sampled more than once. Therefore, estimates are of the number of visits to, or procedures performed in, hospital ambulatory surgery locations and ASCs, and not the number of persons served by these facilities.

### Standard errors

The standard error is primarily a measure of sampling variability that occurs by chance because only a sample, rather than the entire universe, is surveyed. Estimates of the sampling variability for this report were calculated using Taylor approximations in SUDAAN, which take into account the complex sample design of NHAMCS. A description of the software and the approach it uses has been published elsewhere (23). The standard errors of estimates presented in the tables of this report are included, either as part of the table or, in the case of [Table 3](#), in a separate table ([Table 4](#)).

Data analyses were performed using the statistical packages SAS, version 9.3 (SAS Institute, Cary, N.C.) and SAS-callable SUDAAN, version 10.0

(RTI International, Research Triangle Park, N.C.).

### Testing of significance and rounding

Differences in the estimates were evaluated using a two-tailed *t* test ( $p < 0.05$ ). Terms such as “higher than” and “less than” indicate that differences are statistically significant. Terms such as “similar” or “no difference” indicate that no statistically significant difference exists between the estimates being compared. A lack of comment on the difference between any two estimates does not mean that the difference was tested and found not to be significant.

Estimates of counts in the tables have been rounded to the nearest thousand. Therefore, estimates within tables do not always add to the totals. Rates and percentages were calculated from unrounded figures and may not precisely agree with rates and percentages calculated from rounded data.

### Nonsampling errors

As in any survey, results are subject to both sampling and nonsampling errors. Nonsampling errors include reporting and processing errors as well as biases due to nonresponse and incomplete response. The magnitude of the nonsampling errors cannot be computed. However, efforts were made to keep these errors to a minimum by building procedures into the operation of the survey. To eliminate ambiguities and encourage uniform reporting, attention was given to the phrasing of items, terms, and definitions.

Quality control procedures and consistency and edit checks reduced errors in data coding and processing. A 5% quality control sample of survey records was independently keyed and coded. Item nonresponse rates were generally low, but levels of nonresponse did vary among different variables. The data shown in this report are based upon items with low nonresponse.

### Use of tables

The estimates presented in this report are based on a sample, and therefore may differ from the number that would

be obtained if a complete census had been taken. The estimates shown in this report include surgical procedures, such as tonsillectomy; diagnostic procedures, such as ultrasound; and other therapeutic procedures, such as injection or infusion of cancer chemotherapeutic substance.

In 2010, up to seven procedures were coded for each visit. All listed procedures include all occurrences of the procedure coded regardless of the order on the medical record.

The procedure data in this report are presented by chapter of the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM). In the Results section, selected chapters with large numbers of procedures are discussed along with specific categories of procedures performed 1 million or more times. The latter categories are included to give some examples of what was included under the chapters.

[Table 3](#) presents data using ICD-9-CM codes for chapters of procedures as well as selected procedures within these chapters. The procedures selected for inclusion in [Table 3](#) were those with relatively large frequencies, or because there was a clinical, epidemiological, or health services interest in them.

Data from the 2010 NHAMCS showed that an estimated 479,000 ambulatory surgery visits ended with an admission to the hospital as an inpatient. The visits made by these patients were included in this report [as they were in the 2006 National Survey of Ambulatory Surgery (NSAS) Report] (2), and the ambulatory surgery procedures they received were included in the estimates for all listed procedures.

Estimates were not presented in this report if they were based on fewer than 30 cases in the sample data or if the relative standard error (RSE) was greater than 30%. In these cases, only an asterisk (\*) appears in the tables. The RSE of an estimate is obtained by dividing the standard error by the estimate itself. The result is then expressed as a percentage of the estimate. Estimates based on 30 to 59 cases include an asterisk because, while their RSE is less than 30%, these estimates are based on a relatively small number of cases and should be used with caution.

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