
Surgical Site Infection Overview

Surgical site infections (SSI) are infections directly related to an operative procedure. Surgical procedures selected for SSI reporting are performed in a variety of facilities and tend to be associated with health facility-acquired infections. Many of the SSIs that occur in these procedures can:

- Be prevented by following established prevention techniques;
- Easily be detected and reported accurately; and
- Have a devastating impact on the patient's quality of life.

Evidence suggests that reporting of infections may lead to better adherence to preventive practices and decrease medical complications.

Surgical site infection rates are adjusted to take into account differences in patient risk factors for infection: length of the surgery, type of surgical wound and the patient's physical condition. The adjusted SSI rates (not displayed in the tables) are used to compute the Standardized Infection Ratio. The Standardized Infection Ratio (SIR) is a risk adjusted summary measure that accounts for the type of procedure and risk category. The SIR provides an overall score for a procedure at each health facility based on the expected number of infections after adjusting for the risk category. It is the ratio of the observed to expected number of SSIs. The SIR can be used as a comparison measure between facilities. However, overall crude rates for SSIs (not risk adjusted) should never be compared between facilities due to inherent differences in the patient risk distribution in each facility.

Interpretation of the SIR is straightforward: A hospital's SIR value is compared to 1.0 (observed and expected number of SSIs are the same). If the SIR value is greater than 1.0, there are more infections than expected. If the SIR value is less than 1.0, then fewer infections occurred than expected. A statistical test (Poisson test) is used to determine if the difference is statistically significant. It is important to note that it is possible for a facility's SIR to be higher or lower than 1.0, but due to statistical comparison and the total number of procedures and infections, not be significantly better or worse than the national rate. Also, it is possible for an SIR to be statistically high or low, even when a different facility has an even higher or lower (respectively) SIR that is not statistically significant. Again, this is due to the numbers of procedures, infections, and the statistical testing process. For an example of how this calculation works please refer to Appendix F.

A new analysis in this year's report is the comparison to the "historical data". For most of the data collected (excluding hysterectomy infection data), there are two to three years of data. The historical comparison calculates a Standardized Infection Ratio (or SIR) based on a facility specific infection rate from the previous year(s). An expected number of infections can be calculated based on previous infection rates and compared to the current year's number of infections. This allows for the comparison of the current data to previous years to ascertain if a facility is doing better, worse or the same. (See Appendix F for more information concerning the calculation and interpretation of an SIR.)

Abdominal Surgeries

Background

This section focuses on surgical site infections in abdominal surgeries. The surgeries included in this section are hernia repairs (herniorraphies) and hysterectomies. These surgeries can be performed as in- or outpatient procedures. Inpatient as defined by NHSN is a patient whose date of admission to the healthcare facility and the date of discharge are different calendar days. Outpatient is defined as a patient whose date of admission to the healthcare facility and the date of discharge are the same calendar day.

A herniorrhaphy is the repair of a hernia or bulging of internal organs or tissues which protrude through an abnormal opening in the muscle wall. Typical hernias occur in the inguinal, femoral, umbilical, or anterior abdominal wall. These are reportable procedures. Other types of hernias, however, such as repair of a diaphragmatic or hiatal hernia or hernias at other body sites do not meet NHSN operative procedure definition and are not reported.

A hysterectomy is the surgical removal of the uterus usually performed by a gynecologist. Hysterectomy may be total (removing the body, fundus, and cervix of the uterus; often called "complete") or partial (removal of the uterine body while leaving the cervix intact; also called "supracervical"). It is the most commonly performed gynecological surgical procedure. The two types of hysterectomies are abdominal and vaginal.

The oldest known technique is abdominal incision. Subsequently the vaginal (performing the hysterectomy through the vaginal canal) and later laparoscopic vaginal (with additional instruments inserted through a small hole, frequently close to the navel) techniques were developed. Most hysterectomies in the United States are done via laparotomy (abdominal incision, not to be confused with laparoscopy). Vaginal hysterectomy is performed entirely through the vaginal canal and has clear advantages over abdominal surgery such as less complications, shorter hospital stays and shorter healing time.

Results

Tables 7 through 9 below show facility specific data for SSIs attributed to herniorrhaphies as described above. The tables contain HAI data for inpatient and outpatient surgeries performed in hospitals and ASCs from August 1, 2009 through July 31, 2010.

Each table lists all the healthcare facilities in Colorado that performed the procedure, the city where the facility is located, the number of procedures performed, the number of infections, the standardized infection ratio (SIR) based on the national infection rates, the comparison to the national infection rate, the SIR based on a facility specific historical infection rate, and the comparison with the historical rate. For the definition of SIR please refer back to page 1 or see Appendix F in the complete report. The three categories summarizing how a Colorado healthcare facility compares to the national infection rate for procedure performed are

1. Facilities can have a statistically lower (**better**) infection rate than the national rate:
2. Facilities can have an infection rate that is statistically the **same** as the national rate; or
3. Facilities can have a statistically higher (**worse**) rate than the national rate.

Table 7: Herniorrhaphy, Inpatient Procedures for Hospitals, 2009-2010

Surgical Site Infections (SSI) in Hernia Procedures (total or partial) in Hospitals, Inpatient Reporting Period: August 1, 2009-July 31, 2010.							
Health Facility and Region		Procedure Count	Infection Count	Standardized Infection Ratio (SIR)-National	National Comparison	Standardized Infection Ratio (SIR)-Historic	Historical Comparison
Animas Surgical Hospital	Durango	1	***	***	***	***	***
Arkansas Valley Regional Medical Center	La Junta	5	***	***	***	***	***
Aspen Valley Hospital	Aspen	13	***	***	***	***	***
Boulder Community Hospital	Boulder	50	2	2.1	Same	***	***
Boulder Community Hospital-Foothills	Boulder	24	0	0.0	Same	***	***
Centura Avista Adventist Hospital	Louisville	21	0	0.0	Same	0.0	Same
Centura Littleton Adventist Hospital	Littleton	37	2	3.3	Same	2.1	Same
Centura Penrose St. Francis Health	Colorado Springs	92	6	3.1	Worse	0.6	Same
Centura Porter Adventist Hospital	Denver	59	4	3.2	Same	5.3	Worse
Centura St. Anthony Central Hospital	Denver	69	3	2.1	Same	***	***

Health Facility and Region		Procedure Count	Infection Count	Standardized Infection Ratio (SIR)-National	National Comparison	Standardized Infection Ratio (SIR)-Historic	Historical Comparison
Centura St. Anthony North Hospital	Westminster	32	2	3.1	Same	***	***
Centura St. Francis Medical Center	Colorado Springs	22	0	0.0	Same	0.0	Same
Centura St. Mary Corwin Medical Center	Pueblo	48	5	4.7	Worse	***	***
Centura St. Thomas More Hospital	Canon City	36	0	0.0	Same	***	***
Colorado Plains Medical Center	Fort Morgan	13	***	***	***	***	***
Community Hospital	Grand Junction	49	3	2.8	Same	0.7	Same
Delta County Memorial Hospital	Delta	28	0	0.0	Same	0.0	Same
Denver Health Medical Center	Denver	98	3	1.6	Same	3.3	Same
East Morgan County Hospital	Brush	1	***	***	***	***	***
Exempla Good Samaritan Medical Center	Lafayette	31	1	1.7	Same	***	***
Exempla Lutheran Medical Center	Wheat Ridge	174	10	3.0	Worse	3.5	Worse
Exempla St. Joseph Hospital	Denver	70	3	1.6	Same	36.2	Worse
Grand River Medical Center	Rifle	2	***	***	***	***	***
Gunnison Valley Hospital	Gunnison	4	***	***	***	***	***
Heart of the Rockies Regional Medical Center	Salida	20	1	1.9	Same	***	***
Kit Carson Memorial Hospital	Burlington	12	***	***	***	***	***
Kremmling Memorial Hospital	Kremmling	1	***	***	***	***	***
Longmont United Hospital	Longmont	56	0	0.0	Same	0.0	Same
McKee Medical Center	Loveland	73	0	0.0	Same	0.0	Same
Medical Center of Aurora	Aurora	70	3	2.2	Same	1.7	Same
Medical Center of the Rockies	Loveland	110	2	0.7	Same	***	***
Memorial Hospital Central	Colorado Springs	143	1	0.3	Same	0.3	Same
Memorial Hospital North	Colorado Springs	22	1	1.8	Same	1.8	Same
Mercy Regional Medical Center	Durango	13	***	***	***	***	***
Montrose Memorial Hospital	Montrose	37	3	3.7	Same	1.3	Same
North Colorado Medical Center	Greeley	86	3	1.9	Same	***	***
North Suburban Medical Center	Thornton	28	1	1.6	Same	***	***
Parker Adventist Hospital	Parker	84	0	0.0	Same	***	***
Parkview Medical Center	Pueblo	87	1	0.6	Same	0.4	Same
Pikes Peak Regional Hospital	Woodland Park	7	***	***	***	***	***
Platte Valley Medical Center	Brighton	19	***	***	***	***	***

Health Facility and Region		Procedure Count	Infection Count	Standardized Infection Ratio (SIR)-National	National Comparison	Standardized Infection Ratio (SIR)-Historic	Historical Comparison
Poudre Valley Hospital	Fort Collins	99	1	0.4	Same	0.4	Same
Presbyterian St. Luke's Medical Center	Denver	78	1	0.5	Same	0.3	Same
Prowers Medical Center	Lamar	0	***	***	***	***	***
Rose Medical Center	Denver	95	0	0.0	Same	***	***
San Luis Valley Regional Medical Center	Alamosa	29	0	0.0	Same	***	***
Sky Ridge Medical Center	Lone Tree	57	0	0.0	Same	***	***
Southeast Colorado Hospital	Springfield	1	***	***	***	***	***
Southwest Memorial Hospital	Cortez	12	***	***	***	***	***
St. Anthony Summit Medical Center	Frisco	1	***	***	***	***	***
St. Mary's Hospital	Grand Junction	88	4	2.4	Same	3.1	Same
Sterling Regional Medical Center	Sterling	40	1	1.0	Same	0.7	Same
Swedish Medical Center	Englewood	142	4	1.2	Same	2.4	Same
The Children's Hospital	Aurora	113	0	0.0	Same	0.0	Better
The Memorial Hospital	Craig	1	***	***	***	***	***
University of Colorado Hospital	Aurora	72	6	2.7	Same	0.9	Same
Vail Valley Medical Center	Vail	9	***	***	***	***	***
Valley View Hospital	Glenwood Springs	23	1	2.7	Same	0.6	Same
Yampa Valley Medical Center	Steamboat Springs	5	***	***	***	***	***
Yuma District Hospital	Yuma	1	***	***	***	***	***

The standardized infection ration (SIR) is the ratio of observed to expected infections, and is adjusted for procedure risk.

National comparison based on data collected and reported by NHSN-participating hospitals from 2006-2008.

See "National Healthcare Safety Network (NHSN) Report, Data Summary for 2006-2008, Issued December 2009" (Am J Infect Control 2009;37:783-805).

Historical comparison based on data collected and reported for a given facility from August 1, 2007-July 31, 2009.

*** Indicates value not shown due to suppression of infections data, or no National or historical rate, or an expected count of zero, to which to compare facility rate.

Infections data for hospitals with fewer than 20 procedures performed in a 12-month period are suppressed to protect confidential health information. These hospitals have met the reporting requirements.

Source: National Healthcare Safety Network (NHSN) Database.

Prepared By: Colorado Patient Safety Program, Colorado Department of Public Health and Environment.

Table 8: Herniorrhaphy, Outpatient Procedures for Hospitals, 2009-2010

Surgical Site Infections (SSI) in Hernia Procedures (total or partial) in Hospitals, Outpatient Reporting Period: August 1, 2009-July 31, 2010.							
Health Facility and Region		Procedure Count	Infection Count	Standardized Infection Ratio (SIR)-National	National Comparison	Standardized Infection Ratio (SIR) -Historic	Historical Comparison
Animas Surgical Hospital	Durango	7	***	***	***	***	***
Arkansas Valley Regional Medical Center	La Junta	50	0	0.0	Same	***	***
Aspen Valley Hospital	Aspen	67	0	0.0	Same	***	***
Boulder Community Hospital	Boulder	284	0	0.0	Same	***	***
Boulder Community Hospital-Foothills	Boulder	102	0	0.0	Same	***	***
Boulder Medical Center	Boulder	57	0	0.0	Same	***	***
Centura Avista Adventist Hospital	Louisville	153	0	0.0	Same	***	***
Centura Littleton Adventist Hospital	Littleton	133	1	1.5	Same	***	***
Centura Penrose St. Francis Health	Colorado Springs	207	0	0.0	Same	***	***
Centura Porter Adventist Hospital	Denver	176	0	0.0	Same	***	***
Centura St. Anthony Central Hospital	Denver	195	0	0.0	Same	0.0	Same
Centura St. Anthony North Hospital	Westminster	132	0	0.0	Same	0.0	Same
Centura St. Francis Medical Center	Colorado Springs	62	1	3.2	Same	***	***
Centura St. Mary Corwin Medical Center	Pueblo	167	0	0.0	Same	***	***
Centura St. Thomas More Hospital	Canon City	66	0	0.0	Same	***	***
Colorado Plains Medical Center	Fort Morgan	24	0	0.0	Same	***	***
Community Hospital	Grand Junction	240	2	1.6	Same	0.6	Same
Delta County Memorial Hospital	Delta	67	0	0.0	Same	***	***
Denver Health Medical Center	Denver	201	1	1.0	Same	0.7	Same
East Morgan County Hospital	Brush	39	0	0.0	Same	***	***
Estes Park Medical Center	Estes Park	37	0	0.0	Same	***	***
Exempla Good Samaritan Medical Center	Lafayette	566	1	0.4	Same	0.8	Same
Exempla Lutheran Medical Center	Wheat Ridge	259	0	0.0	Same	***	***
Exempla St. Joseph Hospital	Denver	324	4	2.0	Same	***	***
Grand River Medical Center	Rifle	33	0	0.0	Same	***	***

Health Facility and Region		Procedure Count	Infection Count	Standardized Infection Ratio (SIR)-National	National Comparison	Standardized Infection Ratio (SIR)-Historic	Historical Comparison
Grand Valley Surgical Center	Grand Junction	199	0	0.0	Same	0.0	Same
Gunnison Valley Hospital	Gunnison	40	0	0.0	Same	***	***
Heart of the Rockies Regional Medical Center	Salida	60	0	0.0	Same	0.0	Same
Kit Carson Memorial Hospital	Burlington	25	0	0.0	Same	***	***
Kremmling Memorial Hospital	Kremmling	11	***	***	***	***	***
Lincoln Community Hospital	Hugo	8	***	***	***	***	***
Longmont United Hospital	Longmont	116	0	0.0	Same	***	***
McKee Medical Center	Loveland	51	0	0.0	Same	***	***
Medical Center of Aurora	Aurora	407	2	1.0	Same	1.3	Same
Medical Center of the Rockies	Loveland	269	0	0.0	Same	***	***
Melissa Memorial	Holyoke	4	***	***	***	***	***
Memorial Hospital Central	Colorado Springs	589	5	1.5	Same	0.4	Better
Memorial Hospital North	Colorado Springs	229	0	0.0	Same	***	***
Mercy Regional Medical Center	Durango	57	1	2.8	Same	***	***
Montrose Memorial Hospital	Montrose	133	1	1.5	Same	***	***
Mt San Rafael Hospital	Trinidad	20	0	0.0	Same	***	***
North Colorado Medical Center	Greeley	222	0	0.0	Same	0.0	Same
North Suburban Medical Center	Thornton	111	1	1.9	Same	***	***
Parker Adventist Hospital	Parker	250	0	0.0	Same	***	***
Parkview Medical Center	Pueblo	297	0	0.0	Same	***	***
Pikes Peak Regional Hospital	Woodland Park	30	0	0.0	Same	***	***
Platte Valley Medical Center	Brighton	141	1	1.5	Same	***	***
Poudre Valley Hospital	Fort Collins	181	0	0.0	Same	***	***
Presbyterian St. Luke's Medical Center	Denver	479	1	0.4	Same	0.7	Same
Prowers Medical Center	Lamar	20	0	0.0	Same	***	***
Rose Medical Center	Denver	204	0	0.0	Same	***	***
San Luis Valley Regional Medical Center	Alamosa	96	0	0.0	Same	0.0	Same
Sky Ridge Medical Center	Lone Tree	290	0	0.0	Same	0.0	Same
Southeast Colorado Hospital	Springfield	8	***	***	***	***	***
Southwest Memorial Hospital	Cortez	68	0	0.0	Same	***	***

Health Facility and Region		Procedure Count	Infection Count	Standardized Infection Ratio (SIR)-National	National Comparison	Standardized Infection Ratio (SIR)-Historic	Historical Comparison
Spanish Peaks Regional Health Center	Walsenburg	11	***	***	***	***	***
St. Anthony Summit Medical Center	Frisco	9	***	***	***	***	***
St. Mary's Hospital	Grand Junction	105	1	1.7	Same	***	***
St. Vincent General Hospital District	Leadville	29	0	0.0	Same	***	***
Sterling Regional Medical Center	Sterling	57	0	0.0	Same	***	***
Swedish Medical Center	Englewood	112	1	1.7	Same	***	***
The Children's Hospital	Aurora	513	2	0.8	Same	***	***
The Memorial Hospital	Craig	22	0	0.0	Same	***	***
University of Colorado Hospital	Aurora	242	2	1.5	Same	0.4	Same
Vail Valley Medical Center	Vail	103	1	2.0	Same	***	***
Valley View Hospital	Glenwood Springs	213	1	1.0	Same	***	***
Wray Community Hospital	Wray	27	0	0.0	Same	***	***
Yampa Valley Medical Center	Steamboat Springs	78	0	0.0	Same	***	***
Yuma District Hospital	Yuma	13	***	***	***	***	***

The standardized infection ration (SIR) is the ratio of observed to expected infections, and is adjusted for procedure risk.

National comparison based on data collected and reported by NHSN-participating hospitals from 2006-2008.

See "National Healthcare Safety Network (NHSN) Report, Data Summary for 2006-2008, Issued December 2009" (Am J Infect Control 2009;37:783-805).

Historical comparison based on data collected and reported for a given facility from August 1, 2007-July 31, 2009.

*** Indicates value not shown due to suppression of infections data, or no National or historical rate, or an expected count of zero, to which to compare facility rate.

Infections data for hospitals with fewer than 20 procedures performed in a 12-month period are suppressed to protect confidential health information. These hospitals have met the reporting requirements.

Source: National Healthcare Safety Network (NHSN) Database.

Prepared By: Colorado Patient Safety Program, Colorado Department of Public Health and Environment.

Table 9: Herniorrhaphy Procedures in Ambulatory Surgical Centers, 2009-2010

Surgical Site Infections (SSI) in Hernia Procedures (total or partial) in Ambulatory Surgical Centers Reporting Period: August 1, 2009-July 31, 2010.							
Health Facility and Region		Procedure Count	Infection Count	Standardized Infection Ratio (SIR)-National	National Comparison	Standardized Infection Ratio (SIR)-Historic	Historical Comparison
ASC Durango at Mercy Medical Center	Durango	106	0	0.0	Same	***	***
Aberdeen Ambulatory Surgical Center	Pueblo	2	***	***	***	***	***
Arkansas Valley Surgery Center	Canon City	86	0	0.0	Same	***	***
Audubon Ambulatory Surgery Center	Colorado Springs	28	0	0.0	Same	***	***
Audubon Ambulatory Surgery Center at St. Francis	Colorado Springs	440	0	0.0	Same	0.0	Same
Aurora Surgery Center	Aurora	53	0	0.0	Same	***	***
Black Canyon Surgical Center	Montrose	33	1	6.6	Same	***	***
Centrum Surgical Center	Greenwood Village	7	***	***	***	***	***
Children's North Surgery Center	Broomfield	13	***	***	***	***	***
Clear Creek Surgery Center	Wheat Ridge	387	2	1.1	Same	***	***
Colorado Springs Surgery Center	Colorado Springs	20	0	0.0	Same	***	***
Crown Point Surgery Center	Parker	263	0	0.0	Same	***	***
Denver Midtown Surgery Center	Denver	235	0	0.0	Same	***	***
First Choice Outpatient Surgery Center at Community Hospital	Grand Junction	116	0	0.0	Same	***	***
Harmony Ambulatory Surgery Center	Fort Collins	476	1	0.4	Same	0.8	Same
Kaiser Permanente Ambulatory Surgery Center	Denver	879	6	1.3	Same	1.8	Same
Lakewood Surgical Center	Lakewood	24	0	0.0	Same	***	***
Lincoln Surgery Center	Parker	21	0	0.0	Same	***	***
Longmont Surgery Center	Longmont	143	0	0.0	Same	***	***
MCR Surgery Center	Loveland	7	***	***	***	***	***
Minimally Invasive Spinal Institute	Lafayette	6	***	***	***	***	***
North Suburban Surgery Center	Thornton	123	0	0.0	Same	***	***
Parkwest Surgery Center	Pueblo	22	0	0.0	Same	***	***

Health Facility and Region		Procedure Count	Infection Count	Standardized Infection Ratio (SIR)-National	National Comparison	Standardized Infection Ratio (SIR)-Historic	Historical Comparison
Pueblo Surgery Center	Pueblo	15	***	***	***	***	***
Rocky Mountain Surgery Center	Englewood	428	0	0.0	Same	***	***
Rose Surgical Center	Denver	479	1	0.4	Same	***	***
Sky Ridge Surgical Center	Lone Tree	188	0	0.0	Same	***	***
Skyline Surgery Center	Loveland	160	0	0.0	Same	***	***
Summit View Surgery Center	Littleton	293	1	0.7	Same	0.5	Same
Surgery Center At Lutheran	Wheat Ridge	129	0	0.0	Same	***	***
Surgery Center At Printers Park	Colorado Springs	37	0	0.0	Same	***	***
Surgery Center Of Fort Collins	Fort Collins	7	***	***	***	***	***
Surgical Center At Premier	Colorado Springs	75	0	0.0	Same	***	***

The standardized infection ration (SIR) is the ratio of observed to expected infections, and is adjusted for procedure risk.

National comparison based on data collected and reported by NHSN-participating hospitals from 2006-2008.

See "National Healthcare Safety Network (NHSN) Report, Data Summary for 2006-2008, Issued December 2009" (Am J Infect Control 2009;37:783-805).

Historical comparison based on data collected and reported for a given facility from August 1, 2007-July 31, 2009.

*** Indicates value not shown due to suppression of infections data, or no National or historical rate, or an expected count of zero, to which to compare facility rate.

Infections data for ASCs with fewer than 20 procedures performed in a 12-month period are suppressed to protect confidential health information. These ASCs have met the reporting requirements.

Source: National Healthcare Safety Network (NHSN) Database.

Prepared By: Colorado Patient Safety Program, Colorado Department of Public Health and Environment.