TEXAS
Department of
State Health Services

2013

Annual Report on Health Care-Associated Infections

Prepared by:

Jennifer Vinyard, MPH, CIC
Epidemiologist
Texas Department of State Health Services
August 2014

Image courtesy of Melissa Brower, CDC

This illustration depicts a three-dimensional (3D) computer-generated image of a group of extended-spectrum ß-lactamase-producing Enterobacteriaceae (ESBLs) bacteria. The artistic recreation was based upon scanning electron micrographic imagery.

Table of Contents

Executive Summary

Health care-associated infections (HAIs) are infections that occur as a result of medical treatment at a health care facility. In the United States, an estimated 722,000 patients acquire HAIs annually, and as many as 75,000 of those patients die during their hospital stay (Magill, et al., 2014). In an effort to address the HAI problem and increase health care transparency in Texas, the Texas Department of State Health Services (DSHS) instituted a mandatory HAI reporting law which publishes HAI data from general hospitals and ambulatory surgery centers (ASCs) to the public. Therefore, helping to promote infection prevention activities within health care facilities and improving patient safety. This is the second annual report on Texas HAI data from January 2013 to December 2013 for the following infections:

- Central Line – Associated Bloodstream Infections (CLABSI) data for any Adult, Pediatric or Neonatal Intensive Care Units (ICU) in general hospitals
- Catheter Associated Urinary Tract Infections (CAUTI) data for any Adult or Pediatric ICU in general hospitals from July - December 2013.
- Surgical Site Infections (SSIs) and related data for the following surgical procedure categories in pediatric/children's general hospitals:
    - Spinal surgery with instrumentation (Laminectomies, Fusions, Refusions)
    - Cardiac procedures (including Heart Transplant)
    - Ventricular shunt operations
- Surgical Site Infections (SSIs) and related data for the following surgical procedure categories in adult care general hospitals and ASCs:
    - Colon surgeries
    - Hip arthroplasties
    - Knee arthroplasties
    - Abdominal hysterectomies
    - Vaginal hysterectomies
    - Coronary artery bypass grafts (with and without donor site incision)
    - Vascular procedures (abdominal aortic aneurysm repairs, carotid endarterectomies, peripheral vascular bypass grafts)

A total of 378 Texas health care facilities reported HAI data to Texas in 2013 with 974 CLABSIs, 869 CAUTIs (for the 6 month period between July and December 2013) and 2,585 SSIs identified.

- The overall CLABSI Standardized Infection Ratio (SIR) was 0.533 which showed that Texas had a statistically significantly better experience than the baseline national 2006-2008 data.
- The overall CAUTI SIR was 1.078 which showed that Texas had a statistically significantly worse experience than the baseline national 2009 data.
- The overall SSI SIR was 0.708 which showed that Texas had a statistically significantly better experience than the baseline national 2006-2008 data.

Introduction

Each year, millions of patients contract infections in health care settings, creating a tremendous burden on health care systems and public health. In 1999, the Institute of Medicine (IOM) published the report, *To Err is Human* which called for a national effort to make health care safer. The report stated that as many as 98,000 patients die needlessly due to preventable medical harm particularly, health care-associated infections (HAIs) (Institute of Medicine, 2000). This report garnered national attention and put health care safety in the spot light. Since this report was published, strides have been made to reduce HAI risk in health care facilities. A recently published article by the Centers for Disease Control and Prevention (CDC) provided updated HAI estimates from data collected in 2011. They determined that approximately 722,000 HAIs occurred annually in the United States (Magill, et al., 2014). This is about 4% of hospitalized patients who developed one or more HAIs due to the care received in the hospital and of those, about 75,000 died during their hospital stay (Magill, et al., 2014).

Increased public awareness and understanding that these infections can be prevented has prompted consumers and policy makers to take action. The Patient Safety and Quality Improvement Act of 2005 was passed to improve patient safety by encouraging voluntary reporting of events that adversely affect patient outcomes (Agency for Healthcare Research and Quality, 2008). Such HAI reporting legislation that requires facilities to publically disclose their HAI incidence, works to encourage facilities to implement effective infection prevention measures to reduce their HAI risk. In the years that followed, many state legislatures passed laws that mandated public reporting of HAIs: Texas was among them.

Texas health care facilities began public reporting of specific health care-associated infection (HAI) data in October, 2011. This second annual Texas Health Care Safety report summarizes the HAI reporting activities of Texas health care facilities from January 2013 through December 2013 and is based on data submitted to the National Healthcare Safety Network (NHSN) by April 1, 2014. The information provided in this report is intended to inform patient consumers and health care personnel as well as encourage health care systems to move toward the elimination of HAIs. For those readers who are unfamiliar with health care terminology, a glossary can be found in Appendix A of this report.

Background

As the United States population ages, the number of people in need of health care services will increase. Between 2000 and 2050, the percent of the population aged 85 and over is projected to increase by up to 350% (Wiener, 2002). With increased use of health care services, the risk of developing an HAI becomes greater. These infections, caused by microorganisms that a patient is exposed to while receiving medical care at a health care facility, affect approximately one in every 20 patients during their hospital stay (US Department of Health and Human Services, 2010).

HAIs are a significant cause of morbidity and mortality in the United States. Each year, these infections are responsible for $28 to $33 billion dollars in avoidable health care expenses (US Department of Health and Human Services, 2010). In Texas, an estimated 200,000 HAIs occur annually, causing 8,000-9,000 deaths in the over 23 million residents (The Centers for Disease Control and Prevention, 2009). Fortunately, these infections are preventable and reduction efforts can save lives as well as avoid unnecessary medical costs.

As patient demand for health care transparency increases, more states are publically reporting health care quality information in consumer-directed reports. In an effort to increase health care transparency and accountability in Texas, the Texas Department of State Health Services (DSHS) established an advisory panel in 2005 to study and make recommendations for the collecting and reporting of HAIs. This panel was comprised of health care consumer advocates, infection preventionists, health care facility leaders, physicians and DSHS representatives. The following is a summary of the advisory panel recommendations that were adopted by DSHS.

Advisory Panel Recommendations for Reporting

Using the Centers for Disease Control and Prevention's (CDC) HAI surveillance definitions, the advisory panel recommended that licensed general hospitals (excluding comprehensive medical rehabilitation facilities), state owned or operated hospitals and ambulatory surgery centers report central line-associated primary bloodstream infections occurring in special care inpatient settings and surgical site infections associated with specific high-volume and high-risk surgical procedures. In order to accomplish this, the advisory panel recommended that Texas establish an electronic reporting system to collect HAI data and compile facility-specific HAI reports to be made available on a public web site. This would allow consumers to make informed choices about their own health care, as well as incentivize facilities to reduce their infection rates by improving patient safety and reducing health care costs.

The advisory panel recommended a phased-in approach to reporting. This would expand the types of infections reported over time as the state and its health care facilities built the infrastructure required for a robust and refined reporting system. These recommendations ensure that the best quality data are provided to the public as soon as possible.

In 2007, Texas joined the ranks of states that have created mandatory HAI reporting laws with the passing of Chapter 98 of the Texas Health and Safety Code, (Reporting of Health Care-Associated Infections and Preventable Adverse Events), and 25 Texas Administrative Code, Chapter 200 (Health Care-Associated Infections). In accordance with the advisory panel's recommendations, DSHS is required to 1) establish and implement the Texas HAI Reporting System, 2) provide education and training to stakeholders, 3) verify the accuracy and completeness of data reported, 4) compile and make available to the public a data summary by health care facility at least annually, 5) allow health care facilities to submit concise written comments regarding their HAI reports for public view and 6) enforce reporting mandates. Legislation was also amended to include preventable adverse events (PAE) reporting and required the addition of 4 health care quality improvement professionals to the advisory panel. The summary results of PAE reporting will be discussed in a separate report once PAE reporting is implemented. The advisory panel continues to guide implementation efforts in the state and meets regularly to advise DSHS regarding health care safety matters. For a full list of 2013 Advisory Panel Members, see Appendix B.

Mandated HAI Reporting Schedule

As suggested by the advisory panel, DSHS implemented a phase-in schedule for HAI reporting. Starting in 2012, general hospitals (both pediatric and adult) were required to report central line-associated bloodstream infections (CLABSI) that occurred in special care units. Ambulatory surgery centers (ASCs) and adult general hospitals were also required to report surgical site infections associated with knee prosthesis procedures (KPRO), hip prosthesis procedures (HPRO), and cardiac artery bypass grafts (CBGB and CBGC). Pediatric general hospitals (i.e. children's hospitals) were required to report surgical site infections associated with ventricular shunt procedures (VSHN), cardiac surgeries (CARD) and heart transplants (HTP).

Additional surgical procedures were phased in starting January 1, 2013. These included vaginal hysterectomies (VHYS), abdominal hysterectomies (HYST), colon procedures (COLO), peripheral vascular bypass grafts (PVBY), carotid endarterectomies (CEA), abdominal aortic aneurysm repair (AAA), spinal fusions (FUSN), spinal refusions (RFUSN) and laminectomies (LAM). Catheter associated urinary tract infection (CAUTI) reporting began July 2013 for general hospitals to report from any intensive care unit (ICU) locations (excluding neonatal ICUs). See Table 1 for the complete phase-in reporting schedule.

Table 1. Texas HAI Reporting Schedule			
Phase	**HAI**	**Facility Type/Unit**	**Start Date**
1	CLABSI: Bloodstream infection in patient with central line	All General Hospital ICUs	10/1/11
	KPRO: Arthroplasty of knee	ADULT General Hospitals and ASCs	10/1/11
	VSHN: Ventricular shunt operations, including revision and removal of shunt	PEDIATRIC General Hospitals	10/1/11
2	HPRO: Arthroplasty of hip	ADULT General Hospitals and ASCs	1/1/12
	CBGB: Procedure to perform direct revascularization of the heart; includes obtaining vein from donor site	ADULT General Hospitals and ASCs	1/1/12
	CBGC: Procedure to perform direct vascularization of the heart	ADULT General Hospitals and ASCs	1/1/12
	CARD: Procedures on the heart; includes valves or septum; does not include coronary artery bypass graft, surgery on vessels, heart transplantation, or pacemaker implantation	PEDIATRIC General Hospitals	1/1/12
	HTP: Transplantation of heart	PEDIATRIC General Hospitals	1/1/12
3	VHYS: Removal of uterus via vagina; includes laparoscopic	ADULT General Hospitals and ASCs	1/1/13
	HYST: Removal of uterus through abdominal wall; includes that by laparoscope	ADULT General Hospitals and ASCs	1/1/13
	COLO: Incision, resection, or anastomosis of large intestine; includes large-to-small & small-to-large bowel anastomosis; not rectal operations	ADULT General Hospitals and ASCs	1/1/13
	PVBY: Bypass operations on peripheral arteries	ADULT General Hospitals and ASCs	1/1/13
	CEA: Endarterectomy on vessels of head and neck (includes carotid artery and jugular vein)	ADULT General Hospitals and ASCs	1/1/13
	AAA: Resection of abdominal aorta with anastomosis or replacement	ADULT General Hospitals and ASCs	1/1/13
	FUSN: Immobilization of spinal column	PEDIATRIC General Hospitals	1/1/13
	RFUSN: Refusion of spine	PEDIATRIC General Hospitals	1/1/13
	LAM: Exploration or decompression of spinal cord through excision or incision into vertebral structures	PEDIATRIC General Hospitals	1/1/13
4	CAUTI: Urinary Tract Infections in patients with a urinary catheter.	All general hospital ICUs (excluding NICUs)	7/1/13

Education and Training

DSHS has partnered with various professional organizations to provide wide-spread education and training to as many health care professionals in Texas as possible. Since the beginning of 2010, the DSHS Health Care Safety Program staff have presented at numerous conferences and functions for various stake-holder organizations. Most noteworthy are the local chapter meetings and conferences for the Association for Professionals in Infection Control and Epidemiology (APIC), the Texas Society of Infection Control and Prevention (TSICP), Texas Ambulatory Surgery Center Society (TASCS), Texas Medical Association (TMA), Texas Association for Healthcare Quality (TAHQ), and Texas Medical Foundation Health Quality Institute (TMF).

In 2013, DSHS provided three trainings primarily targeted at infection preventionists and other personnel from long-term care facilities. This included nursing homes and group homes. The primary focus of these trainings was to increase awareness of multi-drug resistant organisms (MDROs) in the long-term care setting. Real-life case studies were discussed and strategies for control and prevention of MDROs were described. Presenters also highlighted the importance of antibiotic stewardship and surveillance to monitor and control MDROs. In addition to MDRO training, attendees also received information regarding the requirements for reporting certain MDROs as Notifiable Conditions to DSHS and instructions for maintaining regulatory compliance for Infection Control. Attendees received copies of the CDC's Inter-Facility Infection Control Transfer Form which could be used to communicate important infection control related information for patients during care transitions.

Texas also sponsored two Infection Prevention courses that were conducted by the Texas Society of Infection Control and Prevention (TSICP) in 2013.These courses provided introductory-level infection prevention education to new and less experienced Infection Preventionists (IPs) in Texas. The objective was to train IPs in the principles of infection prevention and give them the tools to develop an effective infection prevention program in their facilities. There were approximately 200 people who attended these trainings from 146 health care facilities across the state.

Prevention Collaboratives

In addition to the education and training mentioned above, DSHS also initiated significant collaborations with the Texas Hospital Association Foundation (THAF) and University of Texas Health Science Center (UTHSC) to reduce CLABSI and SSI rates in Texas. Table 2 shows a summary of the Texas sponsored prevention collaboratives. These collaborations represent the cornerstones for future HAI program development and implementation.

Table 2. HAI Prevention Collaboratives

Organization	Term	Purpose
Texas Hospital Association Foundation (THAF)	8/1/12 - 7/31/13	Continuation of previous collaborative to reduce central line-associated bloodstream infections (CLABSIs) and surgical site infections (SSIs) associated with knee and hip arthroplasties, cardiac artery bypass graft surgeries.

Methods

This report contains self-reported HAI data from 378 Texas health care facilities and contains information about infections that occurred from January 2013 through December 2013. These data were downloaded from NHSN on April 1st, 2013.Therefore, any changes or updates to the data after this date will not be reflected in this report.

National Healthcare Safety Network (NHSN)

In order to collect large amounts of data from health care facilities and implement Texas HAI reporting, a database management system with a secure electronic interface was required. The most widely used HAI reporting database is the National Healthcare Safety Network (NHSN), maintained by the Division of Healthcare Quality Promotion (DHQP) at the CDC. NHSN is a voluntary, secure, internet-based surveillance system that integrates patient safety and health care worker safety surveillance and has been utilized extensively by many states for HAI reporting. As of December 2012, 30 states and the District of Columbia used NHSN for mandatory HAI reporting (Malapiedi PJ, 2013), and as of December, 2013 a total of 12,404 health care facilities were enrolled in NHSN (The Centers for Disease Control and Prevention, 2013). These enrolled health care facilities include acute care hospitals, long-term acute care hospitals, psychiatric hospitals, rehabilitation hospitals, outpatient dialysis centers, ambulatory surgery centers, and long term care facilities.

NHSN is designed to accommodate the routine transfer of large amounts of health care data from the thousands of facilities reporting into the system. In order to assist in this process, many software vendors have developed compatible software systems for uploading the large facility data files into NHSN. This is especially helpful for large facilities that perform a high volume of surgeries on a regular basis.

Another important feature of the NHSN reporting system is that participating facilities are required to use standardized CDC definitions for identifying HAIs. These definitions have been in place since 2008 for CLABSI and SSI and continue to be revised as HAI understanding increases (The Centers for Disease Control and Prevention, 2012). These standardized definitions enable facilities' HAI experience to be comparable to health care facilities, nationally. To aid in the use of these standardized definitions, CDC provides extensive online training and educational materials that facilities can use to educate themselves on the use of surveillance protocols and data entry.

In 2011, NHSN was designated as the web-based electronic reporting system for Texas HAI reporting. In addition to state reporting, the Center for Medicare and Medicaid Services (CMS) also requires hospitals in the Hospital Inpatient Quality Reporting Program to report to NHSN all CLABSIs in adult, pediatric and neonatal ICUs and SSIs related to colon surgeries and abdominal hysterectomies in order to receive full reimbursement for services. These data are also posted for public reporting on the Department of Health and Human Services (DHHS) Hospital Compare website (Centers for Medicare and Medicaid Services, 2012). However, it is important to note that the CMS NHSN data reports will differ from Texas NHSN data reports. This is due to differences in reporting requirements, data submission deadlines, and how the standardized infection ratio (SIR) is calculated.

Data Quality Assurance

It is the responsibility of each facility to ensure data have been accurately collected and reported in accordance with NHSN protocols. However, to aid facilities, NHSN and DSHS have instituted routine data checks to identify data quality issues that require facility attention. Between the DSHS notifications and the internal logic checks built into NHSN, health care facilities are given several opportunities to review and correct data inconsistencies prior to publication of their data summaries.

NHSN

Within the NHSN system there are internal data logic checks and rules built into the web interface that help reduce the occurrence of common data entry error. These checks are designed to reduce keystroke errors and provide a mechanism for assuring the validity of data entered into NHSN. For example, the following are some of the logic checks NHSN performs on date data entered into the system:

- Date procedure was performed must be the same date or before the date the patient's infection occurred
- Date procedure was performed must be the same date or after the patient's date of birth
- Patient's date of birth must be the same date or after 01/01/1890 and the same date or before the current date
- Patient's date of birth must be the same date or before the date the patient's infection occurred
- Patient's date of birth must be the same date or before the date the patient was admitted to the hospital
- Date the patient's infection occurred must be the same date or after the date the patient was admitted to the hospital

Another data accuracy tool built into the reporting system is the NHSN Action List. This list contains various data error alerts that are displayed upon logging into NHSN. This list shows users whether a facility has any missing or incomplete records entered into NHSN and requires user action in order to resolve these data issues. See Appendix C: Missing/Incomplete Alerts list for a detailed description of these NHSN data quality alerts.

DSHS

Along with the NHSN data checks, DSHS also performs several checks for data consistency. Every quarter, DSHS provides facilities with a facility-specific Internal Data Review Report showing the number of CAUTI, CLABSI, SSI and Procedure records that were downloaded from NHSN for a given reporting time period. Facilities can then compare the DSHS HAI record numbers to their internal HAI record numbers to determine if all records were entered into NHSN. In addition, DSHS also creates reports to identify facilities with data quality issues. Some of these issues include incomplete records, and inconsistent reporting plans. When this occurs, facility contacts are notified and follow-up is provided to ensure facilities are aware of their data errors and given the opportunity to verify and correct their data prior to data publication.

DSHS has also performed data verification to review HAIs reported from facilities with significantly high SIRs. These facilities were identified for each half year (i.e. January – June 2013 and July – December 2013) and a DSHS staff member performed a site visit to review the reported HAIs and surveillance practices. This process was used to identify false positives and to determine if there were any areas for improvement in the infection prevention practices of the facility. If areas for improvement were identified or the facility was found to have significantly high SIRs in the following round of data verification, the HAI Epidemiologists were consulted to review appropriate infection prevention practices with the facilities, as needed.

In 2013, 55 facilities were identified as having a statistically significantly high SIR. Due to a shortage of DSHS auditors, DSHS contracted with Infection Prevention and Management Associates (IPMA) to help complete the audits. Less than 10% of the records reviewed were over-reported and those that were misclassified represented the more complex cases. Table 3 below shows a preliminary summary of the audit results for 2013.

Table 3. Preliminary Audit Results Summary for 2013*

	January – June	July - December	Total
Total Records Reported as HAIs	150	233	383
Total Records Verified as HAIs	130	225	355
% Reported Correctly	**87%**	**97%**	**93%**

*Note: These data are preliminary and are current as of August 2014.

Facilities that were identified as having statistically significant high SIRs for any of the reportable HAIs during consecutive reporting periods were flagged for follow-up. Additional site visits were performed as necessary by the investigating epidemiologist. In 2013, there were 15 facilities that were identified as having a statistically significantly high SIR for at least one HAI type in two or more subsequent time periods. However, many of these facilities had improved the HAI type that they previously had high a SIR in but were flagged because of a high SIR in a different HAI type in the consecutive time period. For example, one facility may have been flagged initially because of a high number of CLABSIs, and in the next reporting time period, they may have reduced their CLABSI but now have a significantly high SIR for colon SSIs. This situation would have caused the facility to end up on the report.

The investigations have helped facilities identify some areas for improvement in their infection prevention programs. One facility, in particular, did not have an Infection Preventionist for almost 6 months and several of the reported surgical site infections were misclassified. Additional education was provided and after preliminary review of their subsequent data, it appears that they are back on track.

Contact Management System (TxHSN)

Data downloaded from NHSN are uploaded into the Texas Health Care Safety Network (TxHSN) where HAI data are saved and used to populate the published facility specific HAI reports. In addition to being a data warehouse, the TxHSN system is also designed to keep track of health care facilities' reporting status and contact information. Annually, letters are sent to all Texas HAI reporting-eligible health care facilities (i.e. general hospitals and ASCs) requesting them to inform DSHS of any changes in their reporting status or whether they are still required to report. Changes in reporting status may occur due to the opening/closing of ICUs or changes to surgical services provided. Facilities are also given an opportunity to submit contact information for up to two staff members who will be contacted by DSHS for questions or notifications regarding HAI reporting. Designated facility contacts are responsible for maintaining communications with DSHS and updating any facility or contact changes.

Reporting Schedule and Data Deadlines

NHSN data downloads occur 8 times per year—twice a quarter—and follow a strict timeline. The reporting timeline breaks town each calendar year into 4 reporting time periods: the first quarter of the year (January through March) or Q1, the first half of the year (January through June) or H1, the third quarter (July through September) or Q3, and the second half of the year (July through December) or H2 (see Table 3).

In order to aid facilities in the reporting process, TxHSN has an email notification system that enables DSHS staff to send and track emails to the facilities' designated contacts. This enables DSHS to send reporting deadline reminders to facility contacts throughout the year and helps synchronize the reporting schedule. For each of the reporting time periods, facility contacts are notified and given an opportunity to check and correct data in NHSN.

In accordance with NHSN Rules of Behavior, facilities must enter their HAI data into NHSN within 30 days of the end of the reporting month. For example, facilities must enter all April data by the end of May. DSHS will download a preliminary set of NHSN data approximately 60 days after the end of the calendar quarter to perform Data Reconciliation. The dates for the first data download of the reporting time period are June 1, Sept 1, December 1 and March 1. Preliminary data are reviewed and compiled in facility-specific reports called Internal Data Review Reports which include record counts for SSIs, CLABSIs and Procedures. Fifteen days after the DSHS Data Reconciliation, the facility contacts receive an email notification from TxHSN. This email informs contacts that their Internal Data Review Report is ready to be reviewed in TxHSN and they should review their NHSN Action Items list. They will have 15 days to correct any errors before the final data pull occurs. The second and final data pull for the reporting time period is scheduled for July 1, October 1, January 1 and April 1. After this date, the data for the given time period cannot be changed. This ends the reporting process for Q1 and Q3 reporting time periods.

However, twice a year—for each half year—DSHS creates facility-specific HAI Reports that are published on the public website. When this happens, 15 days after the second and final data pull of the reporting time period, TxHSN facility users receive a second email to notify them that their Facility HAI Reports are ready to preview in TxHSN.

After facility contacts review the reports in TxHSN, they may wish to further explain what their data mean and may do so by submitting a comment in TxHSN. They will have 15 days to review the report and submit a public comment for review by DSHS. Once submitted, DSHS program staff can either approve or not approve the submitted comment. Approved comments are appended to the facility's HAI reports that are posted in December (for H1 data) and June (H2 data of the previous year). Comments may not be approved for any of the following reasons:

- Inappropriate language
- Refers to another health care facility
- Refers to another reporting time period
- Comment is submitted after the deadline for comments has passed
- Comment does not appear to be meant for display on the public report

Those comments that are not approved by DSHS are indicated as such in TxHSN and the facility may resubmit a second comment for review if the comment deadline has not passed. All approved comments will be displayed on the facility's HAI reports for the public to view.

Each facility will have two final facility-specific HAI Reports generated for each half year. One version of the report is a brief, simple report that shows the Standardized Infection Ratio (SIR) and a statistical interpretation. This report is meant to be viewed by the general public who may not be familiar with basic statistics. For those who are more familiar with statistical processes, there is a detailed version that will also be published. This detailed report shows the numerator (the number of infections), the denominator (for CLABSI, central line days; for CAUTI, urinary catheter days; for SSI, number of surgical procedures performed), the expected/predicted number of infections (based on national rates), along with the SIR and statistical interpretation (Appendix D).

Table 4. Texas HAI Reporting Deadlines

Reporting Quarter	Q1: Jan 1 – Mar 31	H1: Jan 1 – June 30	Q3: July 1 – Sept 30	H2: July 1 – Dec 31
Data submission deadline (data entry into NHSN)	**According to NHSN rules: ~within 30 days of end of reporting month**			
Departmental data reconciliation (Data from NHSN –emails facility contacts ~15th)	1-Jun	1-Sep	1-Dec	1-Mar
Facility data corrections due (in NHSN)	30-Jun	30-Sep	31-Dec	31-Mar
DSHS data summary to facilities (DSHS sends email to contacts)	NA	15-Oct	NA	15-Apr
Facility comment period (Facility enters comments into TxHSN)	NA	30-Oct	NA	30-Apr
DSHS review of comments	NA	15-Nov	NA	15-May
Public posting of summary (with approved comments)	NA	1-Dec	NA	1-Jun

Facility HAI Reports Website

Once comments are approved, Facility-Specific HAI Reports are published on a public website that can be accessed at www.haitexas.org. From here, there is a link to the HAI Data where consumers can search for HAI data by facility name, county or city and run facility-specific HAI reports.

Standardized Infection Ratio (SIR) Calculation

In the past, HAI data have been presented using infection incidence rates. This rate was calculated as the number of HAIs divided by the appropriate denominator. For CLABSIs, the denominator was central line days, for CAUTIs the denominator was urinary catheter days and for SSIs the denominator was the total number of surgical procedures performed. However, these rates did not take into consideration the differences between health care settings and therefore, made it difficult to accurately compare facilities' HAI experience.

On the other hand, the standardized infection ratio (SIR) can be used as a standardization method for summarizing HAI experience across any number of health care facilities or unit types. It can assess HAIs at a national, state, or local level and adjusts for patients of varying risk within each facility. Because of this, the SIR has become the new standard for comparing HAI incidence since 2009 (The Centers for Disease Control and Prevention, 2012). Simply put, the SIR compares the facility's actual HAI incidence to the baseline national HAI data—obtained from January 2006 through December 2008 for CLABSI and SSI and 2009 for CAUTI—and adjusts for several risk factors that are significantly associated with differences in infection incidence (Edwards J, 2009).

Having risk adjusted data means that different health care facilities can be accurately compared by adjusting for differences in severity of illness and other factors that may affect HAI risk. For example, one would expect a health care facility that performs complex procedures on very sick patients to have a higher infection rate than a hospital that performs less complex surgeries on healthier patients. Because of this, it is important to adjust for the number and proportion of high and low risk patients before comparing the infection rates of these facilities. The HAIs presented in this report are all risk adjusted and use the SIR as the standard of measurement. However, it is important to note that the methods of risk adjustment differ between the three types of infection described in this report: CLABSIs, CAUTIs and SSIs.

Central Line Associated Bloodstream Infections (CLABSIs) and Catheter Associated Urinary Tract Infections (CAUTIs)

For adult and pediatric ICU patients, CLABSI and CAUTI risk adjustment uses the type of patient care location, bed size of the patient care location and hospital affiliation with a medical school to determine the patient's risk for acquiring an infection (Malapiedi PJ, 2013). However, additional criteria may be used in certain settings. For example, the patient's birth weight is also used for CLABSI risk adjustment in neonatal intensive care units (NICUs). A complete list of NHSN patient care locations including location descriptions can be found on the NHSN website at: http://www.cdc.gov/nhsn/PDFs/pscManual/15LocationsDescriptions_current.pdf.

To illustrate the way the CLABSI and CAUTI SIRs are calculated and to show how it can be used as an HAI comparison metric, the following example data are displayed below:

	Observed Hospital CLABSI		National CLABSI
Location Type	**#CLABSI**	**#Central line-days**	**CLABSI rate***
Neurosurgical ICU	1	712	2.0
**defined as the number of CLABSIs per 1000 central line-days*			

This SIR is calculated by dividing the total number of observed CLABSI events by a "predicted" number of CLABSI events based on the national CLABSI rates. This "predicted" number is calculated by multiplying the National CLABSI rate with the number of central line days that occurred in the hospital unit and divide by 1000 (remember that the CLABSI rate is per 1000 central line days). The formula for calculating the predicted number of CLABSI for this unit is:

$$\frac{\text{(Observed central line days) * (National rate)}}{1000} = \frac{(712) * (2.0)}{1000} = 1.42$$

1.42 is the number of expected/predicted CLABSIs for this location at this hospital.

Therefore the SIR calculation is:

$$\text{SIR} = \frac{\text{(Observed \# CLABSIs)}}{\text{(Predicted \# CLABSIs)}} = \frac{1}{1.42} = 0.70$$

If the SIR is larger than 1, it means the health care facility reported more HAIs than predicted based on the national baseline and therefore, is doing worse than the national experience. If the SIR is less than 1, it means the health care facility reported fewer HAIs than expected and therefore, is doing better than the national experience. If the SIR is equal to 1, then the facility reported the same number of HAIs as expected and is doing about as well as the national experience. For the example shown above, a SIR of 0.70 means that the facility had 30% fewer CLABSIs than what was predicted and is therefore, 30% better than the national experience.

Although a SIR may indicate a facility is doing better or worse than the national experience, the statistical significance of that difference is important to note. Confidence intervals and p-values are used to determine this statistical significance. They determine whether the SIR is a result of chance or if the SIR indicates a true distinction from the national experience. A SIR that has a confidence interval (CI) that contains 1.0 or a p-value that is ≥ 0.05 should be interpreted as indicating there is no difference from the national HAI experience, regardless of whether the SIR is greater to or less than 1. Many times, a CI or p-value that does not indicate significance is due to not enough data available for a given time period.

Surgical Site Infections (SSIs)

The SSI SIR is calculated in a different way. For patients undergoing surgery, risk adjustment is calculated using logistic regression models. In 2013, the NHSN baseline data from 2006 – 2008 were used to determine the risk factors and the weight of each risk factor. The logistic regression model looks at several different risk factors that are specific to each type of surgical procedure. Each risk factor's contribution to the overall infection risk varies, depending on its effect. For example, risk factors for cardiac surgery include patient's age, the American Society of Anesthesiologists (ASA) score and the duration of the procedure. The risk factors for knee prosthesis procedures include the same as those for cardiac surgeries, but they are weighted differently. Knee prosthesis procedures also include additional risk factors such as the patient's gender, whether the procedure was a revision, and the number of hospital beds, among others. Risk factors for the different procedure categories are shown in Appendix E.

The risk of each individual surgery is then added up for each procedure category and is used to determine the predicted number of SSIs. The SIR is the number of observed SSIs divided by the number of expected SSIs. For a more detailed explanation of the SIR calculation, please see the National Healthcare Safety Network (NHSN) October 2010 newsletter at http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf.

Eligible Data

This report presents HAI surveillance data for calendar year 2013 that was reported to NHSN from eligible general hospitals and ambulatory surgery centers across Texas. These data were downloaded from NHSN on April 1st, 2014.

Due to unavailable national baseline data, SIRs are not provided in this report for ASCs and Long Term Acute Care hospitals (LTAC). Secondary SSIs, or those infections that did not develop in the primary incision site of the surgical procedure are not included in the SIR calculation. In addition, months with missing or incomplete data are also excluded from the SIR calculation.

Results

The HAIs described in these analyses were identified using the January 2013 NHSN surveillance definitions and were collected on April 1st, 2014 for the time period of January 1st, 2013 through December 31st, 2013. Please note that these data are self-reported from each health care facility and have not been formally validated by DSHS apart from the data review processes described previously.

Facility Summary Tables

Only 413 of the 847 eligible general hospitals and ASCs were required to report HAIs to Texas in 2013. The other 434 facilities did not have ICUs nor did they perform any of the Texas reportable procedures; therefore, they did not have anything to report.

Of the 413 health care facilities that were required to report, 378 reported HAI data to Texas (via NHSN) in 2013. A summary of these health care facilities is shown in Table 5. Those facilities that did not report were referred to DSHS Regulatory Department for follow-up.

Table 5. Facility Type Summary

Facility Type	N	Percent of Facility Type Reporting HAI
General Hospital	285	75.4
Surgical Hospital	36	9.5
Ambulatory Surgery Center	24	6.3
Critical Access Hospital	16	4.2
Children's Hospital	12	3.2
Orthopedic Hospital	3	<1%
Oncology Hospital	1	<1%
Women's Hospital	1	<1%
All Facilities	**378**	100%

The majority of Texas health care facilities reporting HAI data to Texas in 2013 were general hospitals, making up 75% of the facilities that reported HAI data to DSHS. Tables 6 – 8 summarize the characteristics of the 378 health facilities that reported HAI data to Texas.

Table 6 shows the minimum and maximum total number of hospital beds that were set up and staffed in the 337 hospitals (the ASC does not have staffed beds), as well as the mean number of beds for each facility type. These hospitals had a total of 57,057 staffed beds in Texas in 2013.

The number of staffed beds in Texas hospitals ranged from 4 in a surgical hospital to 968 in a general hospital, with a mean bed size of 164.

Table 6. Hospital Bed Summary Table				
Hospital Type	**Min # Beds**	**Max # Beds**	**Mean # Beds**	**Total Beds**
General Hospital	6	968	189.6	51,945
Surgical Hospital	4	230	30.9	1,176
Critical Access Hospital	21	25	24.6	442
Children's Hospital	15	598	184.9	2,404
Orthopedic Hospital	6	27	16.5	33
Oncology Hospital	660	660	660	660
Women's Hospital	397	397	397	397
All Hospitals	4	968	164.4	57,057

Table 7 lists facilities (both hospitals and ASCs) with and without medical school affiliation. This table shows that there were 69 (18%) facilities that were affiliated with a medical school and 278 (74%) that did not have medical school affiliation.

Table 7. Facility Frequency by Medical School Affiliation		
Medical School Affiliation	**No. Facilities**	**Percent of Total**
Medical School Affiliation	**69**	**18%**
Undergraduate	8	2%
Major	30	8%
Graduate	31	8%
No Medical School Affiliation	**278**	**74%**
*****Missing*****	**31**	**8%**

Table 8 summarizes the type of facility ownership. There were about the same number of not-for-profit health care facilities as there were for profit facilities. Only 9% were physician owned and 5% were government run (this excludes veteran's hospitals and other federal government-run health care facilities).

Table 8. Facility Frequency by Hospital Ownership		
Facility Ownership	**No. Hospitals**	**Percent of Total**
Not for Profit	158	42%
For Profit	157	42%
Physician Owned	33	9%
Government	20	5%
Missing	10	2%

Table 9 displays the number of ICUs reporting CLABSI and CAUTI by hospital type and ICU type. Because general hospitals accounted for 75% of the facilities that reported HAI in Texas, it is not surprising that a majority of the ICUs that reported CLABSI were from general hospitals. Also, of the 506 ICUs that reported CLABSI, almost half (206) were defined as Medical/Surgical ICUs.

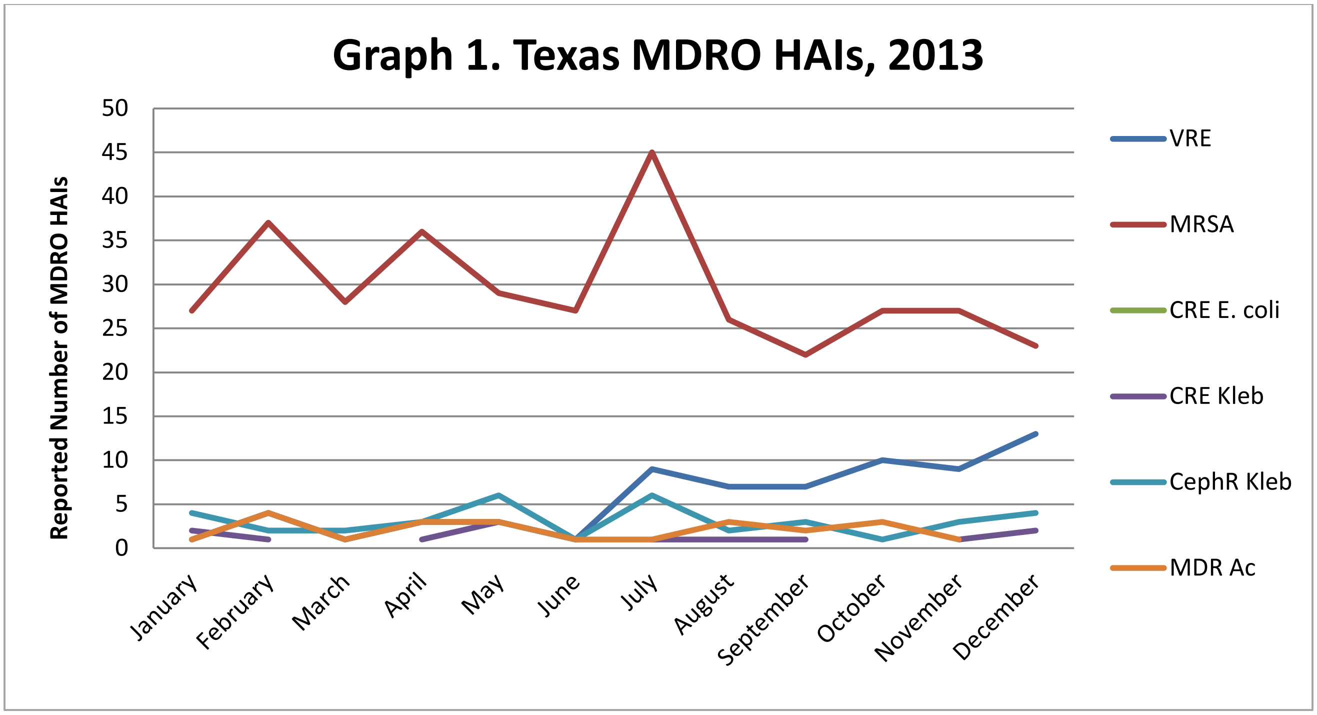
Table 9. Number of Hospitals Reporting CLABSI and CAUTI by ICU Type						
ICU Type	**Critical Access**	**Children**	**General**	**Surgical**	**Women's**	**Total**
Burn		1	4			5
Cardiac			20			20
Cardiothoracic			24	1		25
Pediatric Cardiothoracic		3	1			4
Medical	1		47			48
Pediatric Medical			1			1
Medical/Surgical	7		195	3	1	206
Pediatric Medical/Surgical		10	15			25
Neurologic			2			2
Neurosurgical			16			16
NICU Level III		5	47	1		53
Surgical			28	1		29
Trauma			8			8
Pediatric Trauma		1				1
NICU Level II/III		6	61	1	1	69

Table 10 shows the number of facilities reporting SSIs by type of health care facility and surgical procedure category. As expected, a majority of the facilities that reported SSI data were general hospitals. Of the non-children's hospitals, abdominal hysterectomies (HYST) were reported the most, followed by colon surgeries (COLO), knee prosthesis procedures (KPRO) and hip prosthesis procedures (HPRO). For children's hospitals, only 2 reported heart transplants (HTP). The ASCs reported primarily abdominal and vaginal hysterectomies (HYST and VHYS).

Table 10. Number of Facilities Reporting SSI data by Procedure Category									
Procedure Type	**Surgery Centers**	**Critical Access**	**Children's Hospital**	**General Hospital**	**Cancer Hospital**	**Ortho Hospital**	**Surgical Hospital**	**Women's Hospitals**	**Total**
AAA				105			2		107
CARD			7						7
CBGB				133			3		136
CBGC				100			3		103
CEA				160			3		163
COLO	1	10		254	1	1	11	1	279
FUSN			9	3			3		15
HPRO		3		240	1	3	31		278
HTP			2						2
HYST	11	10		254	1		19	1	296
KPRO	2	5		235	1	3	33		279
LAM			8	3			1		12
PVBY				157			4		161
RFUSN			8	2					10
VHYS	13	3		216	1		15	1	249
VSHN			9						9

Texas Pathogen Summary Tables

The number of HAIs that were caused by Multi-drug Resistant Organisms (MDROs) in 2013 is shown in Graph 1 below. It shows the number of MDROs reported to DSHS as HAIs in 2013. These MDROs include Vancomycin Resistant Enterococcus (VRE), Methicillin Resistant *Staphylococcus aureus* (MRSA), Carbapenem Resistant *Escherichia coli* (CRE E.coli), Carbapenem Resistant Klebsiella, Cephalosporin Resistant Klebsiella and Multi-drug Resistant Acinetobacter (MDR Ac). MRSA was reported the most often and with the most reported in July 2013.



Antibiograms are tables that show the overall profile of an organism's antibiotic susceptibility. They can be used to monitor trends in resistance and aid clinicians in selecting empiric antimicrobial therapies in a given geographical area.

Using the HAI pathogen data submitted to NHSN for 2013, Texas has developed a series of antibiograms to help evaluate trends in antibiotic susceptibility and resistance across the state.

Table 11 and Table 12 show the 2013 Overall Texas HAI Antibiogram for gram-positive organisms/fungi and gram-negative organisms, respectively. These antibiograms contain data about the SSI, CLABSI and CAUTI pathogens reported to NHSN for 2013. The antibiotics are grouped by drug class. Please note that the percent shown in each cell represents the percent susceptible. Also, organisms with less than 10 isolates reported were excluded from these tables.

There were 199 different pathogens reported in 2013. A majority of the pathogens reported were identified as *S. aureus*. This pathogen accounted for 832 of the 5,032 isolates reported in 2013. The next most commonly reported pathogen was *E. coli* with 614 reported, followed by E. *faecalis (*434), *P. aeruginosa* (303) and *C. albicans* (275).

Regional antibiograms for the state of Texas are also provided in Appendix F of this report. The following map shows the 11 different regions in Texas. These regions are referred to as Health Service Regions (HSRs). HSRs 2/3, 4/5N, 6/5S and 9/10 are usually grouped together in analyses and are therefore grouped as such in the tables shown in Appendix F.

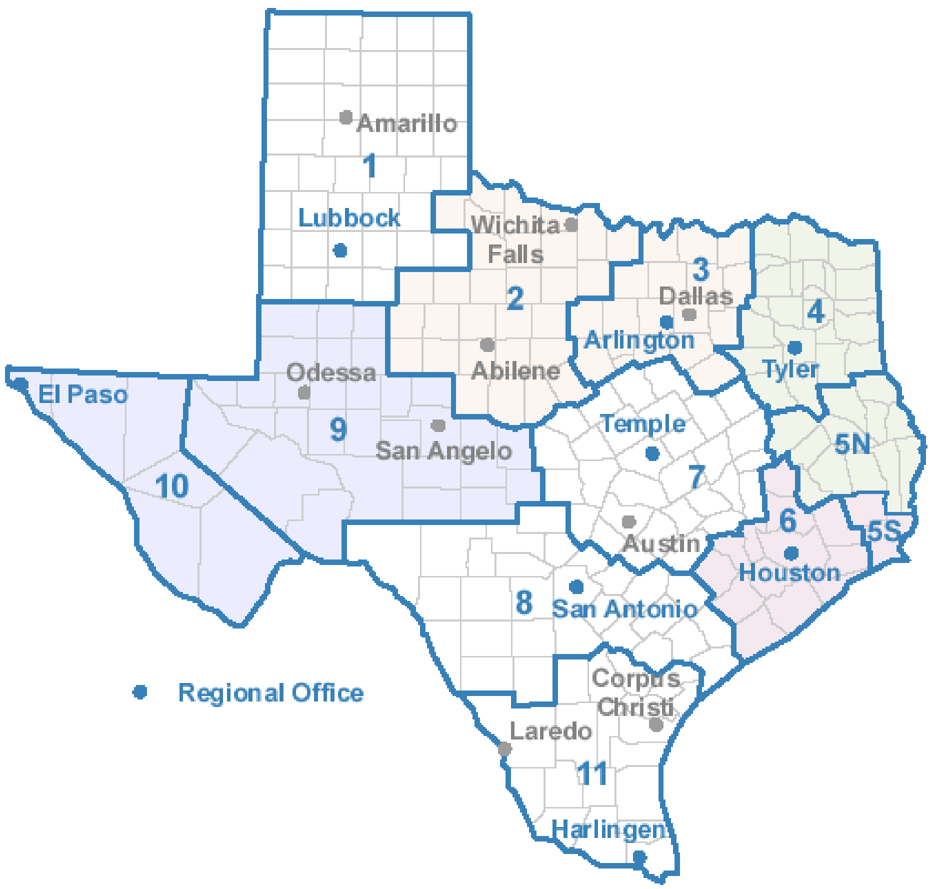


Table 13 shows the 2013 Overall Texas Antibiogram for CAUTIs. This antibiogram compiles CAUTI pathogen data from all ICU locations, except neonatal ICUs (NICUs). The most common pathogen associated with CAUTI infections was *E. coli*. It was identified in 187 of the infections reported. The next most common pathogen was *C. albicans* (140 infections) followed by yeast (104 infections) and *K. pneumoniae* (91 infections).

Table 14 shows the 2013 Overall Texas Antibiogram for CLABSIs. This antibiogram compiles CLABSI pathogen data from all ICU locations. *S. aureus* was the most common pathogen responsible for CLABSI infections in Texas, accounting for 146 of the infections reported. The next most common pathogen was *S. epidermidis* (115 infections), followed by *E. faecalis* (94) and *C. albicans* (75).

Table 15 shows the 2013 Overall Texas Antibiogram for SSIs. This is an aggregate of all pathogens identified as SSIs related to any of the reportable surgical procedures. The most common pathogen reported for SSIs was *S. aureus*, with 832 infections, followed by *E. coli*, which caused 614 infections. The next most common pathogens reported were *P. aeruginosa* (303) and *C. albicans* (275).

Table 11. Texas Health Care Associated Infections (HAI) Gram Positive Organisms and Fungi Antibiogram, 2013

Antimicrobial Class				Antifungals			Beta-lactam penicillins		Penicillins				Cephalosporins			Chloramphenicol	Echinocandin Antifungal	Fluroquinolones			Glycopeptide	Glycylcycline	Lincosamide	Lipopeptides	Macrolide	Microlides	Oxazolidinone	Streptogramins	Tetracyclines			TMP/SMX
Antimicrobial	**Gentamicin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Fluconazole**	**Itraconazole**	**Voriconazole**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Ampicillin**	**Oxacillin**	**Penicillin G**	**Methicillin**	**Cefazolin**	**Cefoxitin**	**Ceftriaxone**	**Chloramphenicol**	**Caspofungin**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Vancomycin**	**Tigecycline**	**Clindamycin**	**Daptomycin**	**Rifampin**	**Erythromycin**	**Linezolid**	**Quinupristin/ Dalfopristin**	**Tetracycline**	**Doxycycline**	**Minocycline**	**Trimethoprim/ Sulfamethoxazole**
Fungi																																
C. albicans				29 **97%**	11 **100%**	17 **100%**											9 **78%**															
C. glabrata				30 **70%**	3 **67%**	14 **86%**											7 **100%**															
C. parapsilosis																	4 **100%**															
Gram Positive																																
E. avium		10 **90%**							15 **100%**												15 **100%**											
E. faecalis		271 **71%**	215						397 **96%**		54 **96%**							125 **78%**	168 **80%**	49 **86%**	416 **96%**	24 **100%**		103 **99%**	16 **56%**	40 **23%**	206 **97%**		434 **12%**		10 **40%**	
E. faecium		85 **80%**	60 **60%**						121 **26%**									35 **11%**	37 **24%**		134 **29%**			52 **96%**			105 **97%**		141 **11%**			
Enterococcus spp.		35 **83%**	31 **84%**						84 **79%**									15 **60%**	24 **63%**		94 **72%**			13 **92%**			35 **89%**		124 **5%**			
S. aureus	537 **96%**						35 **60%**	44 **50%**	41 **10%**	785 **55%**	59 **10%**	67 **45%**	34 **53%**	96 **60%**	25 **60%**	37 **84%**		258 **59%**	442 **59%**	146 **73%**	763 **100%**	72 **100%**	742 **68%**	196 **98%**	537 **99%**	753 **46%**	405 **100%**	64 **91%**	832 **76%**	34 **94%**	49 **96%**	682 **98%**
Staphylococcus, coag neg									11 **0%**	22 **23%**	24 **8%**		13 **23%**								120 **100%**		21 **57%**		15 **100%**	28 **43%**			181 **9%**			16 **63%**
S. epidermidis	37 **68%**						13 **23%**	18 **17%**		65 **14%**	19 **11%**		15 **20%**		10 **20%**			23 **48%**	41 **41%**		218 **100%**		55 **38%**			47 **19%**	35 **100%**	13 **100%**	228 **14%**			42 **45%**
S. hominis																					18 **100%**											
S. lugdunensis																					10 **100%**											
Staphylococcus spp.										14 **57%**									13 **31%**		19 **100%**		14 **29%**			14 **21%**			40 **28%**			
Streptococcus group B																					10 **100%**		12 **67%**									

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Table 12. Texas Health Care Associated Infections (HAI) Gram Negative Organisms Antibiogram, 2013

Antimicrobial Class	Aminoglycosides			Beta-lactam penicillins				Penicillins	Carbapenems			
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Doripenem**
Gram Negative												
A. baumannii	21 **62%**	34 **53%**	30 **63%**	23 **48%**			18 **28%**			18 **39%**	16 **50%**	
B. fragilis												
C. freundii	16 **100%**	15 **87%**	14 **79%**				14 **57%**				11 **91%**	
C. koseri		13 **100%**	11 **100%**				10 **100%**					
E. aerogenes	32 **100%**	59 **97%**	44 **98%**	30 **30%**	9 **22%**		52 **77%**	28 **18%**	21 **100%**	29 **86%**	35 **94%**	
E. cloacae	79 **100%**	118 **93%**	103 **92%**	59 **19%**	22 **5%**		106 **78%**	69 **10%**	35 **94%**	46 **98%**	76 **97%**	
E. cloacae complex	13 **100%**	18 **100%**	13 **100%**	7 **0%**	5 **0%**		13 **62%**				10 **100%**	
E. coli	396 **97%**	588 **86%**	483 **83%**	430 **47%**	189 **71%**		536 **90%**	566 **39%**	215 **100%**	219 **99%**	340 **99%**	57 **98%**
K. oxytoca	26 **100%**	35 **97%**	30 **97%**	31 **58%**	12 **75%**		30 **90%**	29 **3%**	11 **100%**	15 **100%**	26 **100%**	7 **100%**
K. pneumoniae	153 **93%**	256 **95%**	196 **91%**	206 **72%**	85 **88%**		230 **86%**	220 **6%**	100 **97%**	87 **94%**	151 **94%**	20 **100%**
K. pneumoniae ss. Pneumoniae	11 **100%**	12 **83%**	11 **82%**	9 **67%**	5 **100%**		11 **82%**	12 **0%**				
M. morganii	12 **100%**	15 **93%**	11 **100%**	10 **0%**			13 **100%**				11 **100%**	
P. mirabilis	40 **100%**	72 **90%**	49 **88%**	53 **83%**	21 **95%**		64 **100%**	71 **70%**	28 **96%**	14 **86%**	25 **100%**	
P. aeruginosa	186 **93%**	280 **85%**	252 **94%**			56 **79%**	258 **84%**			129 **86%**	205 **89%**	18 **100%**
S. marcescens	43 **98%**	66 **97%**	55 **85%**	29 **0%**	17 **0%**		50 **74%**	36 **3%**	19 **100%**	25 **96%**	31 **94%**	
S. maltophilia												

Antimicrobial Class	Cephalosporins								Fluroquinolones			Glycylcycline	Lincosamide	Monobactams	Tetracyclines			TMP/SMX
Antimicrobial	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotetan**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Tigecycline**	**Clindamycin**	**Aztreonam**	**Tetracycline**	**Doxycycline**	**Minocycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																		
A. baumannii						25 **28%**		33 **30%**	33 **36%**	22 **36%**				4 **0%**	37 **11%**			27 **52%**
B. fragilis		12 **33%**											12 **17%**					
C. freundii	11 **0%**					12 **50%**	16 **50%**	14 **100%**	10 **100%**	13 **85%**				12 **58%**				14 **86%**
C. koseri							10 **100%**											
E. aerogenes	30 **17%**	24 **13%**	22 **41%**		27 **74%**	29 **72%**	50 **72%**	44 **95%**	44 **86%**	39 **92%**				23 **74%**	61 **31%**			47 **96%**
E. cloacae	63 **8%**	37 **16%**	50 **26%**	19 **42%**	54 **67%**	64 **81%**	96 **63%**	97 **92%**	82 **88%**	93 **92%**	15 **93%**			47 **70%**	120 **33%**			97 **87%**
E. cloacae complex						12 **50%**	18 **67%**	14 **100%**		15 **100%**				9 **67%**				11 **82%**
E. coli	454 **75%**	252 **87%**	285 **78%**	76 **92%**	247 **86%**	331 **88%**	538 **88%**	452 **90%**	438 **65%**	463 **65%**	75 **63%**	60 **100%**		264 **85%**	614 **22%**	23 **78%**	20 **75%**	532 **67%**
K. oxytoca	30 **67%**	10 **90%**	22 **73%**		17 **100%**	22 **95%**	31 **97%**	32 **94%**	24 **92%**	26 **88%**				18 **100%**	36 **36%**			29 **93%**
K. pneumoniae	182 **82%**	97 **80%**	103 **78%**	29 **93%**	98 **87%**	123 **88%**	235 **89%**	207 **88%**	185 **88%**	193 **91%**	33 **94%**	31 **94%**		103 **88%**	267 **29%**			227 **87%**
K. pneumoniae ss. Pneumoniae							12 **83%**	12 **83%**		11 **91%**				7 **86%**				
M. morganii						12 **92%**	13 **100%**	13 **92%**		12 **75%**								10 **80%**
P. mirabilis	49 **78%**	22 **91%**			19 **100%**	34 **97%**	59 **95%**	57 **98%**	50 **84%**	51 **90%**				31 **94%**	144 **1%**			56 **84%**
P. aeruginosa						212 **79%**	12 **0%**	273 **84%**	254 **85%**	190 **84%**				128 **70%**				
S. marcescens	41 **2%**	27 **26%**	21 **5%**		31 **65%**	34 **74%**	55 **76%**	52 **96%**	48 **94%**	50 **94%**				29 **79%**	68 **3%**			55 **93%**
S. maltophilia										17 **88%**								19 **100%**

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Table 13. Texas Catheter Related Urinary Tract Infection (CAUTI) Antibiogram, 2013

Antimicrobial Class	Aminoglycosides					Beta-lactam penicillins			Carbapenems			Cephalosporins							Fluroquinolones			Glycopeptide	Glycylcycline	Monobactams	Oxazolidinone	Penicillins	Tetracyclines	TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin/ Tazobactam**	**Ertapenem**	**Imipenem**	**Meropenem**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Vancomycin**	**Tigecycline**	**Aztreonam**	**Linezolid**	**Ampicillin**	**Tetracycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																												
E. aerogenes		20 **100%**	15 **100%**			10 **10%**		18 **83%**	11 **100%**	10 **80%**	11 **91%**						18 **72%**	15 **93%**	14 **64%**	12 **83%**							10 **80%**	17 **94%**
E. cloacae	12 **100%**	24 **88%**	19 **84%**					23 **61%**			13 **92%**	10 **0%**					20 **65%**	19 **79%**	14 **71%**	15 **80%**						13 **0%**	12 **67%**	20 **70%**
E. coli	112 **97%**	183 **87%**	132 **84%**			133 **49%**	81 **75%**	156 **90%**	72 **100%**	50 **100%**	85 **99%**	127 **73%**	74 **86%**	84 **83%**	55 **87%**	88 **86%**	172 **90%**	116 **91%**	131 **63%**	138 **63%**	17 **41%**		18 **100%**	80 **84%**		173 **35%**	84 **67%**	171 **61%**
K. pneumoniae	46 **87%**	86 **97%**	55 **93%**			69 **74%**	38 **95%**	76 **87%**	37 **100%**	19 **89%**	43 **93%**	53 **89%**	34 **82%**	23 **91%**	25 **96%**	30 **93%**	82 **94%**	61 **90%**	58 **86%**	62 **92%**				31 **90%**		72 **3%**	37 **84%**	77 **90%**
P. mirabilis	10 **100%**	21 **81%**	12 **75%**			14 **71%**		19 **100%**				17 **76%**				10 **90%**	16 **88%**	13 **92%**	16 **69%**	16 **75%**						21 **67%**		16 **69%**
P. aeruginosa	42 **88%**	65 **75%**	55 **93%**					66 **83%**		30 **77%**	48 **83%**					42 **86%**		67 **81%**	60 **77%**	41 **78%**				27 **78%**				
Gram Positive																												
E. faecalis				30 **87%**	24 **92%**														30 **87%**	46 **83%**	14 **86%**	65 **97%**				65 **95%**	44 **23%**	
E. faecium																						12 **8%**			30 **100%**	10 **10%**	10 **20%**	
Enterococcus spp.																						18 **78%**			11 **100%**	15 **87%**	12 **8%**	
S. aureus																						12 **100%**						14 **100%**
S. epidermidis																						12 **100%**						

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Table 14. Texas Central Line Associated Bloodstream Infection (CLABSI) Antibiogram, 2013

Antimicrobial Class	Aminoglycosides					Antifungals		Beta-lactam penicillins			Penicillins			Carbapenems			Cephalosporins								Fluroquinolones			Glycopeptide	Glycylcycline	Lincosamide	Lipopeptides	Macrolide	Microlides	Monobactams	Oxazolidinone	Tetracyclines	TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Fluconazole**	**Voriconazole**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Penicillin G**	**Ertapenem**	**Imipenem**	**Meropenem**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotetan**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Vancomycin**	**Tigecycline**	**Clindamycin**	**Daptomycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Tetracycline**	**Trimethoprim/ Sulfamethoxazole**
Fungi																																					
C. albicans						20 **95%**	13 **100%**																														
C. glabrata						18 **67%**																															
Gram Negative																																					
A. baumannii	12 **42%**	21 **52%**	17 **47%**					14 **36%**		11 **27%**						11 **36%**						14 **14%**		19 **26%**	20 **30%**	13 **38%**											14 **36%**
E. cloacae	18 **100%**	24 **92%**	21 **90%**					11 **9%**		24 **88%**	14 **7%**					17 **100%**	10 **10%**				13 **69%**	15 **73%**	18 **61%**	20 **90%**	19 **95%**	18 **100%**							12 **25%**				19 **95%**
E. coli	23 **96%**	39 **85%**	27 **85%**					22 **32%**	13 **69%**	35 **91%**	41 **27%**			14 **100%**	16 **94%**	21 **100%**	32 **69%**	15 **93%**	20 **60%**	12 **92%**	23 **83%**	21 **76%**	28 **82%**	32 **84%**	31 **77%**	24 **67%**								16 **75%**		12 **67%**	34 **59%**
K. pneumoniae	25 **92%**	53 **89%**	36 **86%**					43 **63%**	20 **80%**	49 **80%**	41 **12%**			22 **95%**	20 **95%**	28 **96%**	37 **62%**	15 **73%**	22 **59%**		16 **88%**	24 **88%**	43 **81%**	41 **90%**	40 **85%**	34 **88%**								14 **93%**		20 **75%**	47 **85%**
P. aeruginosa	29 **90%**	43 **74%**	36 **86%**							37 **81%**					23 **83%**	33 **88%**	15 **0%**				15 **87%**	30 **63%**		41 **78%**	38 **84%**	26 **77%**								20 **70%**			
S. marcescens	20 **95%**	28 **100%**	24 **75%**					12 **0%**		23 **74%**	16 **6%**					16 **94%**		12 **33%**				13 **92%**	21 **76%**	18 **94%**	19 **95%**	18 **94%**								10 **90%**		106 **92%**	22 **100%**
Gram Positive																																					
E. faecalis				70 **63%**	58 **81%**						83 **94%**														25 **76%**	23 **78%**	10 **90%**	91 **95%**			28 **100%**				49 **96%**	26 **31%**	
E. faecium				41 **80%**	23 **57%**						51 **12%**														13 **0%**			60 **17%**			26 **96%**				48 **96%**	16 **19%**	
Enterococcus spp.				11 **91%**	10 **70%**						11 **36%**																	17 **24%**							10 **100%**		
S. aureus		95 **91%**										136 **57%**	15 **13%**					18 **50%**							45 **64%**	68 **63%**	32 **69%**	131 **100%**	11 **100%**	131 **63%**	44 **98%**	99 **100%**	129 **45%**		69 **100%**		131 **97%**
Staphylococcus, coag neg													11 **18%**															61 **100%**					12 **42%**				
S. epidermidis												38 **13%**	12 **8%**												11 **64%**	23 **48%**		109 **100%**		36 **39%**		19 **100%**	24 **21%**		16 **100%**	21 **81%**	26 **46%**
S. hominis																												12 **100%**									

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Table 15. Texas Surgical Site Infection (SSI) Antibiogram, 2013

Antimicrobial Class	Aminoglycosides					Beta-lactam penicillins				Penicillins			
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Penicillin G**	**Methicillin**
Gram Negative													
B. fragilis													
C. freundii	11 **100%**	12 **92%**	11 **82%**						12 **50%**				
E. aerogenes	21 **100%**	35 **97%**	27 **96%**			18 **39%**			31 **77%**	18 **6%**			
E. cloacae	49 **100%**	70 **96%**	63 **95%**			39 **26%**	15 **7%**		59 **81%**	42 **14%**			
E. coli	115 **96%**	366 **86%**	324 **83%**			275 **48%**	95 **67%**		345 **89%**	352 **43%**			
K. oxytoca	18 **100%**	22 **95%**	18 **94%**			20 **55%**			19 **89%**	19 **5%**			
K. pneumoniae		117 **96%**	105 **91%**			94 **74%**	27 **85%**		105 **89%**	107 **6%**			
P. mirabilis		46 **93%**	33 **91%**			36 **86%**	10 **90%**		42 **100%**	47 **70%**			
P. aeruginosa		172 **91%**	161 **96%**					29 **83%**	155 **85%**				
S. marcescens		31 **97%**	25 **96%**			12 **0%**			21 **81%**	14 **0%**			
Gram Positive													
E. avium	261 **97%**			10 **90%**						14 **100%**			
E. faecalis	18 **100%**			171 **72%**	133 **79%**					249 **98%**		36 **97%**	
E. faecium	82 **96%**			36 **86%**	31 **61%**					60 **40%**			
Enterococcus spp.	28 **100%**			20 **80%**	18 **89%**					58 **84%**			
S. aureus		433 **97%**				30 **63%**	37 **51%**			35 **9%**	636 **55%**	43 **9%**	55 **44%**
Staphylococcus, coag neg											14 **21%**	11 **0%**	
S. epidermidis		17 **82%**									23 **13%**		
Staphylococcus spp.											11 **55%**		

Antimicrobial Class	Carbapenems				Chloramphenicol	Cephalosporins								Fluroquinolones		
Antimicrobial	**Ertapenem**	**Imipenem**	**Meropenem**	**Doripenem**	**Chloramphenicol**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotetan**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**
Gram Negative																
B. fragilis							10 **30%**									
C. freundii												12 **42%**	12 **100%**		11 **82%**	
E. aerogenes	10 **100%**	17 **88%**	24 **96%**			22 **9%**	16 **13%**	14 **43%**		19 **74%**	22 **73%**	30 **73%**	29 **97%**	27 **96%**	25 **96%**	
E. cloacae	25 **96%**	29 **100%**	46 **98%**			43 **9%**	30 **20%**	33 **21%**	11 **36%**	32 **69%**	41 **85%**	58 **62%**	58 **97%**	49 **90%**	60 **93%**	
E. coli	129 **100%**	153 **99%**	234 **99%**	40 **98%**		295 **76%**	163 **87%**	181 **78%**	54 **93%**	169 **86%**	222 **90%**	338 **88%**	304 **90%**	276 **64%**	301 **66%**	50 **66%**
K. oxytoca			17 **100%**			18 **61%**		11 **82%**			10 **90%**	19 **95%**	21 **90%**	15 **93%**	15 **87%**	
K. pneumoniae	41 **95%**	48 **96%**	80 **94%**			92 **86%**	48 **81%**	58 **79%**	15 **100%**	57 **82%**	69 **86%**	110 **87%**	105 **87%**	87 **91%**	97 **91%**	19 **89%**
P. mirabilis	17 **94%**		23 **100%**			31 **77%**	15 **93%**	15 **87%**		13 **100%**	22 **100%**	40 **98%**	41 **100%**	31 **90%**	30 **97%**	
P. aeruginosa		76 **91%**	124 **91%**	12 **100%**							140 **81%**	11 **0%**	165 **87%**	156 **88%**	123 **87%**	
S. marcescens	12 **100%**	12 **92%**	11 **91%**			20 **5%**	10 **30%**			10 **60%**	15 **67%**	27 **81%**	29 **97%**	22 **95%**	25 **96%**	
Gram Positive																
E. avium																
E. faecalis														70 **76%**	99 **79%**	25 **84%**
E. faecium														15 **20%**	20 **35%**	
Enterococcus spp.															13 **69%**	
S. aureus					32 **84%**	31 **52%**	77 **62%**					22 **59%**		208 **58%**	365 **59%**	111 **75%**
Staphylococcus, coag neg						10 **20%**										
S. epidermidis															15 **33%**	
Staphylococcus spp.															10 **30%**	

Antimicrobial Class	Glycopeptide	Glycylcycline	Lincosamide	Lipopeptides	Macrolide	Microlides	Monobactams	Oxazolidinone	Streptogramins	Tetracyclines			TMP/SMX
Antimicrobial	**Vancomycin**	**Tigecycline**	**Clindamycin**	**Daptomycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Quinupristin/ Dalfopristin**	**Tetracycline**	**Doxycycline**	**Minocycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative													
B. fragilis			10 **20%**										
C. freundii							10 **50%**						11 **91%**
E. aerogenes							16 **75%**			11 **100%**			28 **96%**
E. cloacae							31 **71%**			26 **100%**			58 **90%**
E. coli		41 **100%**					168 **87%**			127 **57%**	13 **85%**	13 **77%**	327 **71%**
K. oxytoca							12 **100%**						18 **89%**
K. pneumoniae		21 **90%**					58 **86%**			42 **74%**			103 **86%**
P. mirabilis							23 **91%**			21 **5%**			36 **89%**
P. aeruginosa							81 **67%**						
S. marcescens							13 **69%**			10 **0%**			27 **89%**
Gram Positive													
E. avium	14 **100%**												
E. faecalis	260 **97%**	15 **100%**		65 **98%**	12 **50%**	26 **19%**		127 **97%**		115 **29%**			
E. faecium	62 **45%**			22 **95%**				46 **98%**		24 **46%**			
Enterococcus spp.	59 **85%**							19 **79%**		13 **31%**			
S. aureus	620 **100%**	63 **97%**	608 **69%**	148 **99%**	428 **99%**	621 **47%**		328 **100%**	56 **89%**	561 **93%**	27 **93%**	45 **93%**	537 **99%**
Staphylococcus, coag neg	54 **100%**		13 **62%**		10 **100%**	14 **43%**				11 **82%**			
S. epidermidis	97 **100%**		18 **39%**		13 **100%**	22 **18%**		15 **100%**		13 **77%**			13 **38%**
Staphylococcus spp.	10 **100%**		10 **30%**			10 **20%**				10 **90%**			

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

CLABSI SIR Summary Tables

State-wide metrics summarizing the HAI experience across Texas are displayed in Table 15. The overall CLABSI SIR uses data from all ICU patient care locations including ICUs and NICUs.

Texas ICUs reported 921,101 central line days and 982 CLABSIs in 2013 compared to the 1837.8 CLABSIs that were predicted based on the national experience. The resulting overall Texas CLABSI SIR for ICUs was calculated at 0.534 (p-value = 0; 95% CI 0.502 – 0.569) and was statistically significant. This indicates that the Texas reported approximately 47% fewer infections than were predicted based on the national baseline.

Table 16 shows the CLABSI SIR data by ICU unit type, broken down by age group (adult, pediatric and neonatal). All three groupings showed statistically significantly lower SIRs which indicate a better CLABSI experience, the lowest SIR was found in pediatric ICUs (SIR = 0.457), followed by neonatal ICUs (SIR = 0.496) and then adult ICUs (SIR = 0.554).

Table 16. Overall 2013 Texas CLABSI SIR by Unit Age Group

Unit Type	Central Line Days	# CLABSIs	Predicted # Infections	SIR	SIR p-value	95% Confidence Interval
Texas	921,101	982	1,837.8	0.534	<0.0001	0.502, 0.569
Adult ICUs	712,336	731	1,319	0.554	<0.0001	0.515, 0.596
Pediatric ICUs (≤ 18)	51,062	72	157.59	0.457	<0.0001	0.360, 0.572
Neonatal ICUs (infants and newborns)	157,703	179	361.22	0.496	<0.0001	0.427, 0.572

Table 17 shows the CLABSI SIR by ICU type. The Pediatric Medical ICU did not have a SIR calculated because the predicted number of infections was less than 1. All other units showed a statistically significantly better experience than the national referent population except the Neurological ICU. The adult Burn (SIR = 0.304), Thoracic (SIR = 0.387) and Neurosurgical ICUs (SIR = 0.391) had the lowest SIRs, while the Neurological (SIR = 0.711), Medical/Surgical (SIR = 0.634) and Medical ICUs (SIR = 0.605) had the highest CLABSI SIRs.

Table 17. Overall 2013 Texas CLABSI SIR by ICU Type						
Intensive Care Unit Type	**Central Line Days**	**# CLABSIs**	**Predicted # Infections**	**SIR**	**SIR p-value**	**95% Confidence Interval**
Burn	6580	11	36.19	0.304	<0.0001	0.160, 0.528
Cardiac	30258	29	60.516	0.479	<0.0001	0.327, 0.679
Cardiothoracic	64557	39	90.3798	0.432	<0.0001	0.311, 0.584
Medical	104546	135	223.2032	0.605	<0.0001	0.509, 0.714
Medical/Surgical	394406	394	621.7638	0.634	<0.0001	0.573, 0.699
Neurological	4017	4	5.6238	0.711	0.527	0.226, 1.716
Neurosurgical	23518	23	58.795	0.391	<0.0001	0.254, 0.578
Surgical	57228	59	131.6244	0.448	<0.0001	0.344, 0.574
Trauma	22996	32	82.7856	0.387	<0.0001	0.269, 0.539
Pediatric Cardiothoracic	14320	21	47.256	0.444	<0.0001	0.282, 0.668
Pediatric Medical	2	0	0.0026	-	-	-
Pediatric Medical/Surgical	36136	51	108.408	0.47	<0.0001	0.354, 0.614
NICU (Level II/III)	82179	104	186.0377	0.559	<0.0001	0.459, 0.675
NICU (Level III)	74883	72	173.6234	0.415	<0.0001	0.327, 0.519

Table 18 shows the 2013 CLABSI SIR by Health Service Region. All of the regions' SIRs indicate that they were significantly better than the national experience with the exception of HSR 11. In HSR 11, the SIR, p-value (not significant) and 95% confidence interval (not significant) indicate that the CLABSI experience in HSR 11 is about the same as that of the national referent population. HSR 9/10 had the lowest SIR of 0.321, followed by region 6/5S (SIR = 0.419) and region 1 (SIR = 0.516).

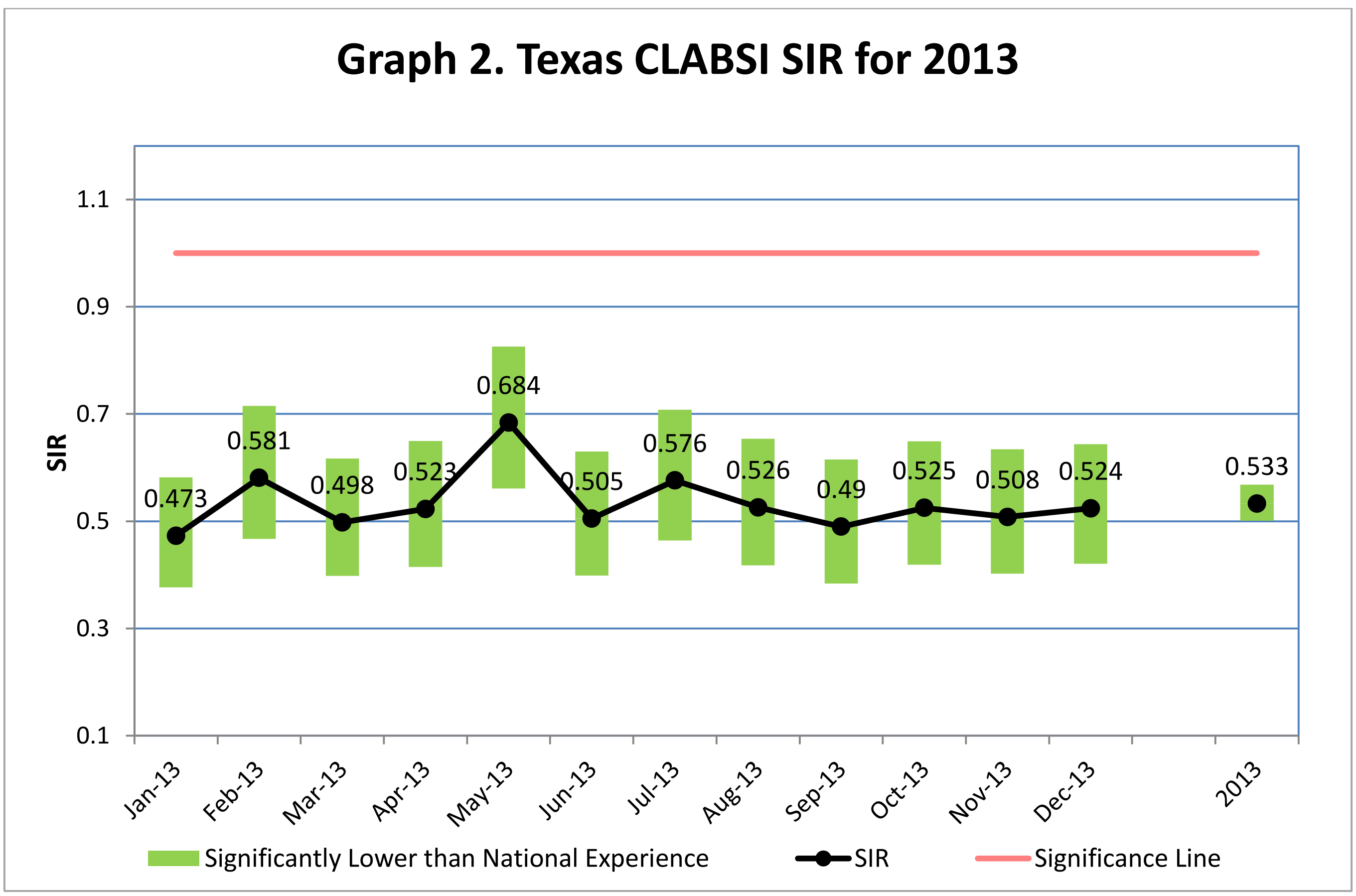
Table 18. Overall 2013 Texas CLABSI SIR by Health Service Region						
Health Service Region	**Central Line Days**	**# CLABSIs**	**Predicted # Infections**	**SIR**	**SIR p-value**	**95% Confidence Interval**
HSR 1	39339	43	83.38	0.516	<0.0001	0.378, 0.688
HSR 2/3	261717	293	530.78	0.552	<0.0001	0.491, 0.618
HSR 4/5N	31602	32	53.813	0.595	0.002	0.414, 0.829
HSR 6/5S	288437	248	592.35	0.419	<0.0001	0.369, 0.473
HSR 7	82609	88	155.87	0.565	<0.0001	0.455, 0.692
HSR 8	48970	59	94.690	0.623	<0.0001	0.479, 0.798
HSR 9/10	44118	27	83.99	0.321	<0.0001	0.216, 0.461
HSR 11	72109	120	139.11	0.863	0.1095	0.718, 1.028

In addition to these spatial analyses, DSHS also compiled overall monthly SIR data in order to identify temporal trends. Graph 2 shows the overall Texas CLABSI SIR by month. Here we can see that the CLABSI SIR for all months is significantly better than the national experience.

Each month is represented by a vertical bar that specifies the 95% confidence interval and a black circle which indicates the SIR value for that month. The overall CLABSI SIR for all of 2013 is shown on the far right.

A red line is drawn horizontally at 1.0 and is used to indicate whether the SIR is significant or not. If the vertical bar crosses the red line, it will be grey and means the SIR is not significant. If the vertical bar is completely above the red significance line then the bar will be colored red to show that the SIR is significantly higher/worse than the national experience. The bar is green when it is completely below the red significance line, showing that the SIR value is significantly lower and indicates it is better than the national experience.

The graph below (Graph 2) shows that for each month in 2013, the SIR was significantly lower/better than the national experience. And as noted previously, the overall 2013 CLABSI SIR was 0.533 and was statistically significant.



CAUTI SIR Summary Tables

CAUTI reporting began halfway through the 2013 reporting year, therefore, CAUTI data in this report only represent 6 months of data reported from Texas hospitals.

Texas ICUs reported 435,471 urinary catheter days and 895 CAUTIs in 2013 compared to the 818 CAUTIs that were predicted based on the national experience. The resulting overall Texas CAUTI SIR was calculated at 1.093 (p-value = 0.0089) and was statistically significantly high. This indicates that the Texas reported approximately 9% more infections than were predicted based on the national experience.

Table 19 shows the CAUTI SIR data by ICU unit type for each age group (adult or pediatric). Patients aged 18 or younger are placed in Pediatric ICUs. These ICUs had statistically significantly fewer infections (45% fewer) than predicted, based on the national experience. However, adult ICUs had approximately 12% more infections than were predicted.

Table 19. Overall 2013 Texas CAUTI SIR by Unit Age Group

Unit Type	Urinary Catheter Days	# CAUTIs	Predicted # Infections	SIR	SIR p-value	95% Confidence Interval
Texas	435,471	895	818	1.093	0.0089	1.023 1.167
Pediatric ICUs (≤ 18)	11,675	18	32.47	0.554	0.0064	0.339, 0.859
Adult ICUs	423,796	877	789.2	1.115	0.0015	1.043, 1.191

Table 20 shows the CAUTI SIR by ICU type. The Pediatric Cardiothoracic ICU had a statistically significantly low SIR of 0 because no CAUTI were reported in this unit. However, The Trauma ICU had the highest SIR (statistically significant) of 1.441. This means that there were approximately 44% more CAUTIs that were reporting in this unit type than were predicted, based on the national experience. However, because patients in this type of unit tend to require prolonged immobilization due to traumatic injury, urinary catheter use is indicated and therefore, these patients are inherently at higher risk for acquiring a CAUTI than those in other ICUs. Other ICUs that had significantly high SIRs were the Medical (SIR = 1.194) and Medical/Surgical (SIR = 1.169) ICUs.

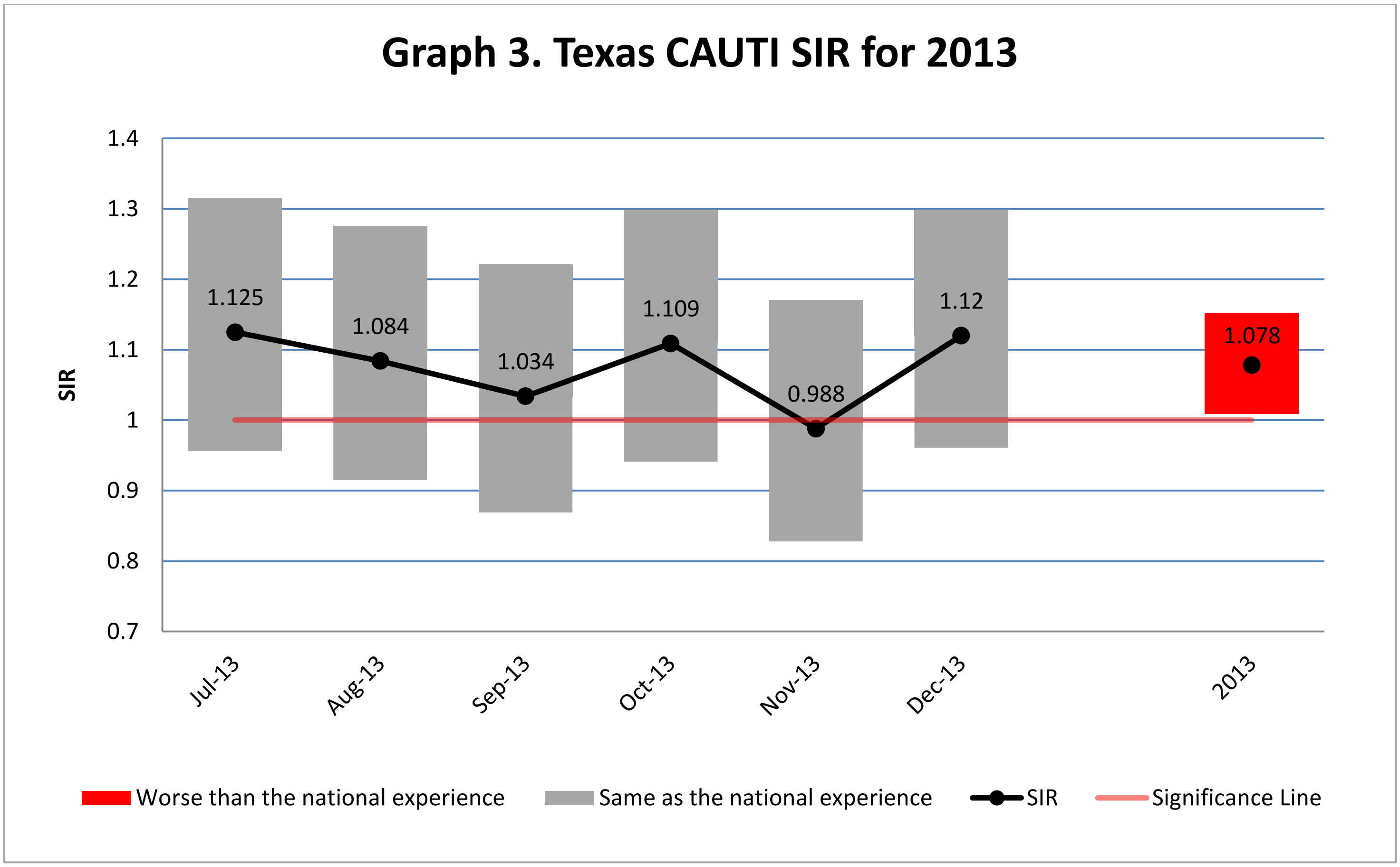
Table 20. Overall 2013 Texas CAUTI SIR by ICU Type						
Intensive Care Unit Type	Urinary Catheter Days	# CAUTIs	Predicted # Infections	SIR	SIR p-value	95% Confidence Interval
Burn	2,592	7	11.405	0.614	0.1824	0.268, 1.214
Cardiac	1,205	31	34.41	0.901	0.5752	0.623, 1.263
Cardiothoracic	30,188	55	51.32	1.072	0.5965	0.815, 1.385
Pediatric Cardiothoracic	2,195	0	5.927	0	0.0027	, 0.505
Medical	62,936	157	131.53	1.194	0.0334	1.018, 1.392
Medical/Surgical	237,882	371	317.31	1.169	0.0035	1.055, 1.293
Pediatric Medical/Surgical	9,480	18	26.544	0.678	0.0859	0.415, 1.051
Neurological	3,042	10	11.56	0.865	0.678	0.439, 1.542
Neurosurgical	19,105	90	84.062	1.071	0.511	0.866, 1.310
Surgical	35,331	80	91.861	0.871	0.2127	0.695, 1.078
Trauma	15,515	76	52.751	1.441	0.0026	1.143, 1.793

Table 21 shows the 2013 CAUTI SIR by Health Service Region (HSR). The HSRs with the lowest SIR was Region 9/10 with a SIR of 0.368. This indicates that there were 63% fewer CAUTIs reported than were predicted for this region in 2013. HSR 1 and 4/5N also had statistically significantly low SIRs of 0.410 and 0.636, respectively. However, there were several HSRs with statistically significantly high SIRs. The highest CAUTI SIR occurred in HSR 11 (1.652), followed by HSR 7 (1.412), 8 (1.378) then 2/3 (1.181).

Table 21. Overall 2013 Texas CAUTI SIR by Health Service Region						
Health Service Region	**Urinary Catheter Days**	**# CAUTIs**	**Predicted # Infections**	**SIR**	**SIR p-value**	**95% Confidence Interval**
HSR 1	21,373	19	46.380	0.410	<0.0001	0.254, 0.628
HSR 2/3	117,804	279	239.19	1.181	0.0072	1.049, 1.326
HSR 4/5N	27,869	31	48.745	0.636	0.0071	0.440, 0.892
HSR 6/5S	125,358	247	248.01	0.996	0.9828	0.877, 1.126
HSR 7	37,507	86	60.886	1.412	0.0023	1.137, 1.736
HSR 8	48,771	122	88.548	1.378	0.0009	1.149, 1.639
HSR 9/10	19,665	11	29.885	0.368	0.0001	0.194, 0.640
HSR 11	37,036	99	59.921	1.652	<0.0001	1.350, 2.003

Graph 3 shows the overall Texas CAUTI SIR by month. Here we can see that the CAUTI SIR for each month shows slightly more infections occurred in Texas in 2013 than were predicted, but this was not statistically different than the national experience. However, the overall 2013

CAUTI SIR of 1.078 was statistically significantly higher and indicates that Texas had 7.8% more infections than predicted based on the national baseline in 2013.



SSI SIR Summary Tables

In 2013, Texas health care facilities reported 171,015 surgical procedures and 2,585 SSIs compared to the 3,651.47 SSIs that were predicted to occur during that time frame. The overall Texas SSI SIR was calculated at 0.708 (p-value = 0; 95% CI 0.681 – 0.736) and was statistically significant. Therefore, the Texas SSI experience was approximately 29% lower than the national experience.

Table 22 shows the overall state SSI SIR and the SIRs by procedure category. Generally, all procedures showed a significantly better experience than the national experience, except for CEA, LAM, RFUSN, and VHYS that did not show a significant difference from the national referent population. The SIR was calculated for HTP because there were not enough procedures performed in Texas to accurately make a comparison to the national baseline.

The lowest SIRs were found in the procedures solely reported by pediatric facilities. The lowest statistically significant SIRs being in AAA procedures (SIR = 0.297), followed by FUSNs (SIR = 0.429).

Table 22. 2013 Texas SSI SIR by Procedure Category						
Procedure Type	**Procedure Count**	**# of SSIs**	**Predicted # Infections**	**SIR**	**SIR p-value**	**95% Confidence Interval**
Texas	171,015	2,585	3,651.468	0.708	<0.0001	0.681, 0.736
AAA	882	10	33.63	0.297	<0.0001	0.151, 0.530
CARD	1,252	13	27.77	0.468	0.0021	0.260, 0.780
CBGB	14,441	193	313.105	0.616	<0.0001	0.534, 0.708
CBGC	1,208	14	24.917	0.562	0.0197	0.320, 0.920
CEA	6,656	16	21.965	0.728	0.1964	0.431, 1.158
COLO	20,851	909	1,248.279	0.728	<0.0001	0.682, 0.777
FUSN	1,094	12	27.949	0.429	0.0008	0.233, 0.730
HPRO	27,141	378	426.591	0.886	0.018	0.800, 0.979
HTP	21	0	0.693	-	-	-
HYST	32,897	431	601.414	0.717	<0.0001	0.651, 0.787
KPRO	46,206	350	466.562	0.75	<0.0001	0.675, 0.832
LAM	427	1	4.594	0.218	0.0667	0.011, 1.074
PVBY	4,275	153	310.681	0.492	<0.0001	0.419, 0.575
RFUSN	67	2	2.204	0.907	0.9752	0.152, 2.998
VHYS	12,425	78	95.839	0.814	0.0624	0.648, 1.010
VSHN	1,172	25	45.276	0.552	0.0011	0.365, 0.803

There were 338 facilities that reported SSI data in 2013. However, 53 of these did not have SSI SIRs calculated due to low volume of procedures performed.

A majority of the facilities had SIRs that indicated the same or better SSI experience. There were 57 facilities that had an SSI SIR that was greater than one and of those 8 (14% of facilities with calculated SSI SIRs) had SIRs that were significantly higher than 1. These facilities had worse SSI experiences than the national referent population. Of the 227 facilities with a SIR less than 1, 149 (66% of facilities with calculated SSI SIRs) were statistically significantly lower, indicating that they had better SSI experiences than that experienced by the national referent population. There were 39 facilities that did not report any SSIs for 2013 and were given an SSI SIR of 0.

Table 23 shows the SSI SIRs by procedure category for procedures performed as an inpatient.

Table 23. 2013 Texas SSI SIR by Procedure Category – Inpatient Procedures Only						
Procedure Type	**Procedure Count**	**# of SSIs**	**Predicted # Infections**	**SIR**	**SIR p-value**	**95% Confidence Interval**
Texas	165,711	2623	3,591.196	0.73	0	0.703, 0.759
AAA	884	11	33.694	0.326	0	0.172, 0.567
CARD	1,252	13	27.77	0.468	0.0021	0.260, 0.780
CBGB	14,605	200	316.79	0.631	0	0.548, 0.724
CBGC	1,215	14	25.043	0.559	0.0185	0.318, 0.916
CEA	6,654	16	21.958	0.729	0.1968	0.431, 1.158
COLO	20,842	939	1,248.866	0.752	0	0.705, 0.801
FUSN	1,395	14	30.563	0.458	0.001	0.261, 0.750
HPRO	27,464	383	431.553	0.887	0.0188	0.802, 0.980
HTP	21	0	0.693	-	-	-
HYST	28,038	412	534.478	0.771	0	0.699, 0.848
KPRO	46,684	358	472.122	0.758	0	0.683, 0.840
LAM	679	1	6.421	0.156	0.0137	0.008, 0.768
PVBY	4,297	162	311.907	0.519	0	0.444, 0.604
RFUSN	67	2	2.204	0.907	0.9751	0.152, 2.998
VHYS	10,441	74	81.796	0.905	0.3919	0.715, 1.129
VSHN	1,173	24	45.339	0.529	0.0006	0.347, 0.776

Table 24 shows the SSI SIRs by procedure category for outpatient procedures performed in a hospital. Note that these numbers do not include any ASC data. NHSN does not calculate SIRs for ASCs because national baseline data for these settings is not available.

Table 24. 2013 Texas SSI SIR by Procedure Category – Outpatient Hospital Procedures Only						
Procedure Type	**Procedure Count**	**# of SSIs**	**Predicted # Infections**	**SIR**	**SIR p-value**	**95% Confidence Interval**
Texas	8381	31	111.501	0.278	0	0.192, 0.390
CEA	50	0	0.165	-	-	-
COLO	188	1	10.012	0.1	0.0005	0.005, 0.493
HPRO	66	0	1.256	0	0.2849	, 2.386
HYST	5296	22	74.222	0.296	0	0.190, 0.441
KPRO	491	1	4.824	0.207	0.0548	0.010, 1.022
PVBY	56	0	3.952	0	0.0192	, 0.758
VHYS	2221	6	16.967	0.354	0.0028	0.143, 0.736
VSHN	13	1	0.103	-	-	-

Table 25 shows the reported SSI severity by how the SSI was detected. A majority (56%) of the SSIs of all severity levels were identified during a patient readmission to the facility where the operation was performed. There was a higher proportion of SSIs identified in this detection category for deep and organ/space infections than for superficial infections.

The table also shows that 39% of the SSIs reported were superficial, followed by organ/space (31%) and deep SSIs (30%). The most common organ space infections were intra-abdominal infections (416). Please note that secondary SSIs were not used to calculate SIRs.

Table 25. 2013 SSI Severity by When Detected

SSI Severity	A	P	RF	RO	Total
Total Superficial Incisional Infections	**211**	**328**	**459**	**58**	**1057**
SIP - Superficial Incisional Primary	203	321	431	53	1008
SIS - Superficial Incisional Secondary	9	7	28	5	49
Total Deep Incisional Infections	**140**	**98**	**517**	**55**	**810**
DIP - Deep Incisional Primary	138	96	495	53	782
DIS - Deep Incisional Secondary	2	2	22	2	28
Total Organ/Space Infections	**186**	**58**	**522**	**53**	**819**
BONE - Osteomyelitis	1	1	8	1	11
CARD - Myocarditis or pericarditis	2		4		6
ENDO - Endocarditis		1	1		2
GIT - Gastrointestinal tract	17	1	14	3	35
IAB – Intra-abdominal	146	30	223	17	416
JNT - Joint or bursa	3	5	163	19	190
MED - Mediastinitis	8	2	15	1	26
MEN - Meningitis or ventriculitis	5		15	2	22
OREP - Other infections of reproductive tract	2	8	38	5	53
VASC - Arterial or venous infection	2	1	8	1	12
VCUF - Vaginal cuff		9	33	4	46
Total	**538**	**484**	**1498**	**166**	**2686**

A: SSI was identified before the patient was discharged from the facility following the operation.
P: SSI was identified only as part of post-discharge surveillance.
RF: SSI was identified due to patient readmission to the facility where the operation was performed.
RO: SSI was identified due to readmission to facility other than where the operation was performed.

Table 26 shows the SSI SIR for 2013 by Health Service Region. All Health Service Regions show statistically significantly better experiences than the national with the lowest SSI SIR in region 11 (showing a 53% fewer SSIs than predicted).

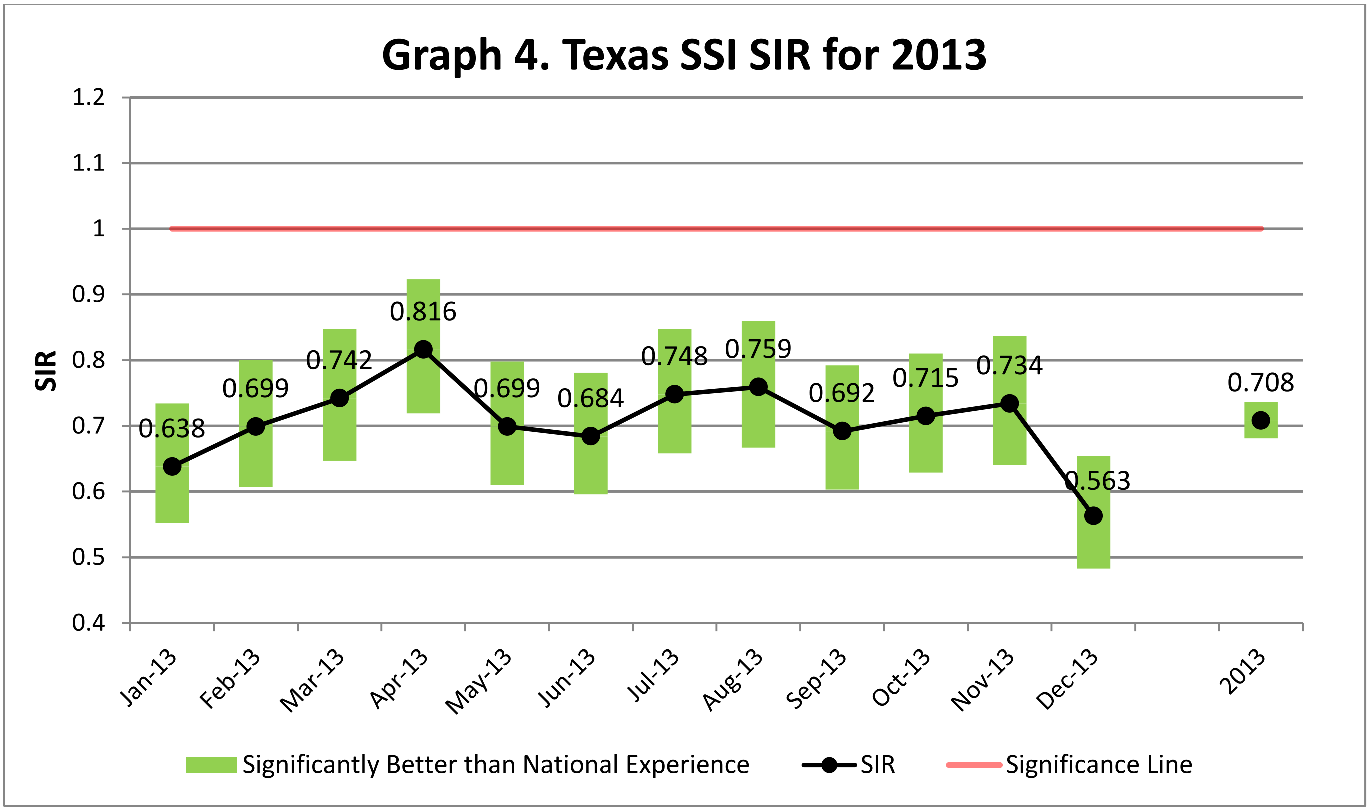
Table 26. Overall 2013 Surgical Site Infection SIR by Health Service Region						
Health Service Region	**Procedure Count**	**# of SSIs**	**Predicted # Infections**	**SIR**	**SIR p-value**	**95% Confidence Interval**
HSR 1	9,179	104	159.42	0.652	<0.0001	0.536, 0.787
HSR 2/3	51,298	771	1065.6	0.724	<0.0001	0.674, 0.776
HSR 4/5N	12,531	143	235.61	0.607	<0.0001	0.513, 0.713
HSR 6/5S	42,514	734	1045.9	0.702	<0.0001	0.652, 0.754
HSR 7	18,298	321	361.43	0.888	<0.0001	0.795, 0.989
HSR 8	17,206	292	373.36	0.782	<0.0001	0.696, 0.876
HSR 9/10	8,546	105	156.23	0.672	<0.0001	0.552, 0.810
HSR 11	11,687	121	257.53	0.470	<0.0001	0.392, 0.559

As was done with the CLABSI and CAUTI SIR data, DSHS compiled overall monthly SIR data for SSIs in order to identify data trends occurring over time. Graph 4 shows the overall Texas SSI SIR by month and overall for the 2013 reporting year.

As for the CLABSI SIR graph, this SSI SIR graph shows each month is represented by a vertical bar that indicates the 95% confidence interval (CI) and a black circle that indicates the SIR value for a given month. The overall SSI SIR for all of 2013 is shown on the far right.

A red line is drawn horizontally at 1 and indicates whether the SIR is significant. If the vertical 95% CI bar crosses the red line, the SIR is not significant and the bar is colored gray. If the vertical bar is completely above the red significance line, the bar is colored red to show that the SIR is significantly higher/worse than the national experience. If the bar is completely below the red significance line, the SIR value is significantly lower and indicates it is better than the national experience. The vertical bars are shown in green if this is the case.

Graph 4 shows that the SSI experience in Texas for each month in 2013 was statistically significantly better than the national experience. The overall 2013 SSI SIR was 0.708 and indicates that Texas had 29% fewer infections than were predicted based on the national baseline.



Infection Preventionist Summary Tables

Infection Preventionists (IPs) lead programs in health care settings that protect patients, visitors, volunteers, and health care providers from acquiring health care associated infections (HAIs). The quality and effectiveness of a facility's infection prevention program often depends on the facility's available resources, such as personnel. The number of IPs in a facility varies widely and is often dependent on the size of the facility or the complexity of the services provided by that facility. For example, small critical access hospitals that generally have less than 25 beds, will usually have only one person designated to run the infection prevention program. Often times, this same person wears multiple hats and manages the quality department, employee health and may even perform clinical duties. On the other hand, a large teaching hospital with 750 beds may have a team of 5 IPs dedicated only to infection prevention activities. CDC recommends a ratio of 0.8 to 1.0 IPs per 100 acute care beds as the optimal staffing for infection prevention programs.

In addition to the number of IPs in a facility, the qualifications of the IPs may also affect the quality of a facility's infection prevention program. IPs can obtain a Certification in Infection Prevention and Control (CIC®) (demonstrating a mastery of knowledge) by passing a comprehensive examination developed by the Certification Board of Infection Control & Epidemiology (CBIC). The assumption is that those who are certified are more likely to be aware of evidence based practices and are more effective at preventing infection transmission in health care settings, when compared to their non-certified peers. A list of CIC® certified IPs can be found on the CBIC website.

Table 27 shows a summary of the number of IPs throughout Texas.

Table 27. Infection Preventionist (IP) Summary							
Health Service Region	Facility Info		IP Info			Ratios	
	# Facilities	# Beds	# CIC	# All IPs	% CIC IPs	Bed to IP ratio	Bed to CIC ratio
1	17	2,225	8	25	32%	89	278
2	11	1,320	4	12	33%	110	330
3	98	15,059	93	140	66%	107	162
4	21	3,016	13	28	46%	110	232
5	15	1,739	7	17	41%	102	248
6	74	13,581	98	124	79%	110	139
7	43	5,628	39	53	74%	106	144
8	41	6,088	45	52	87%	117	135
9	10	1,511	7	15	47%	99	216
10	12	1,839	4	14	29%	131	460
11	26	5,051	17	35	49%	144	297
Texas	**368***	**57,057**	**335**	**515**	**65%**	**111**	**170**

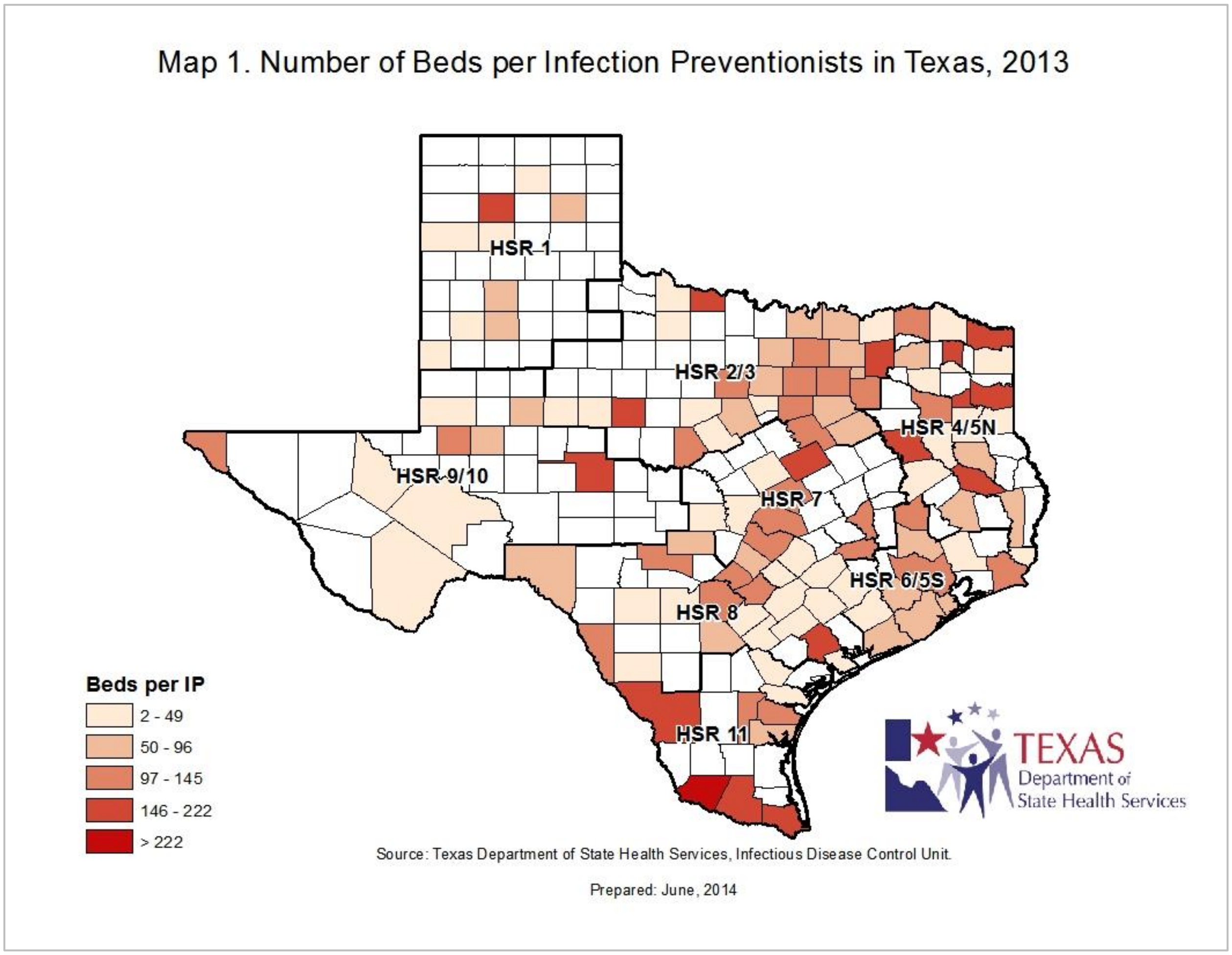
**10 facilities did not provide bed size or IP information and, therefore, were not included in this analysis.*

In 2013, there were a total of 335 (65%) CIC® certified IPs out of the 515 IPs reported. Based on the number of beds for reporting facilities (57,057), this corresponds to approximately 170 beds per CIC® certified IP and 111 beds per IP.

On average and for each of the HSRs, the CDC recommended 100 beds per 0.8 – 1.0 IPs is not met in all regions except region 1. This indicates a need to provide general infection prevention training on a regular basis throughout the state as well as education to health care facility administrators emphasizing the need for adequate staffing in light of the increased regulatory demands (CMS and state reporting mandates) on infection prevention departments.

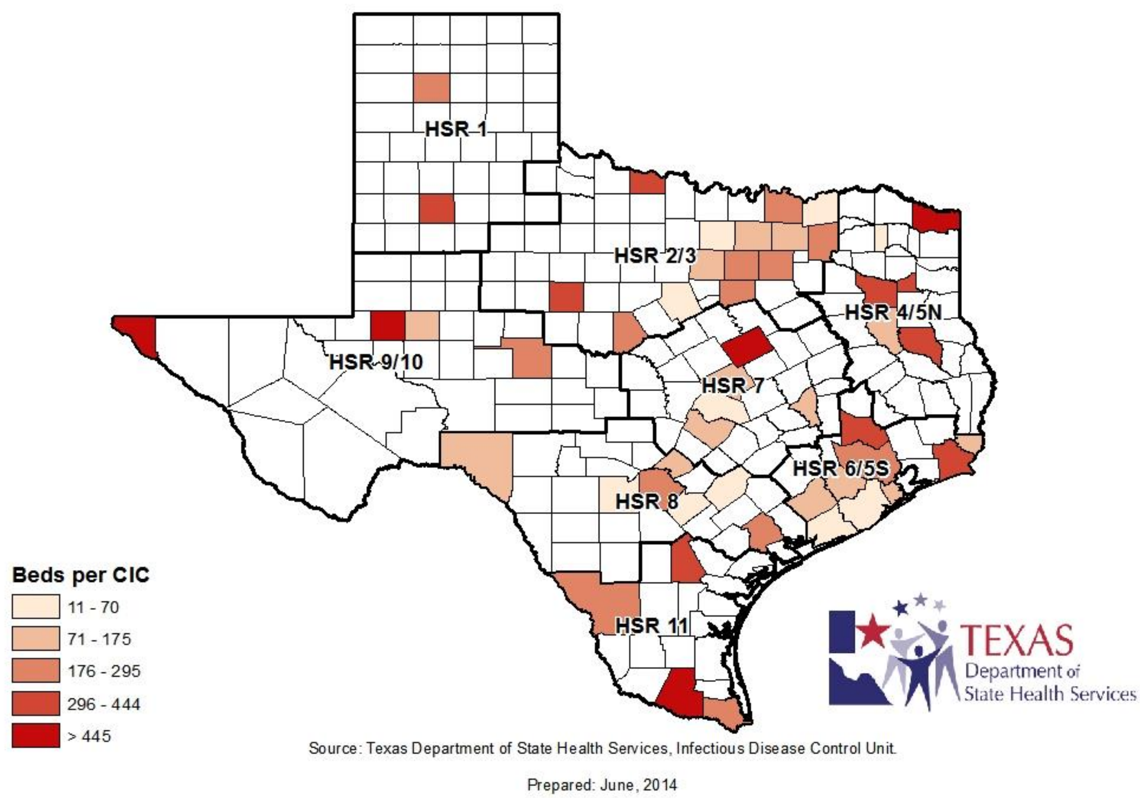
The HSRs with the lowest percent of CIC® certified IPs were HSR 10, followed by 1 and 2. Therefore, these health service regions should be targeted for future DSHS sponsored infection prevention training and CIC® certification courses.

Map 1 illustrates the ratio of beds per IP in each county in Texas. Counties colored in dark red indicate the highest need for trained IPs. These are counties in which the bed to IP ratio greatly exceeds the CDC recommendations. In the darkest red counties, IPs are responsible for over twice as many beds as is recommended.



Map 2 shows the bed to CIC® certified IP ratio in Texas for 2013. The dark red indicates counties that have the largest ratio and therefore the greatest need for Certification training. Counties displayed in white do not have any facilities reporting HAIs through NHSN for Texas.

Map 2. Number of Beds per Certified Infection Preventionists in Texas, 2013



Conclusions

The 2013 calendar year was the final phase in period for reporting HAIs. It was the first year Texas facilities reported all HAIs mandated for reporting. Facility-specific HAI Reports for January to June 2013 and July to December 2013 were published on a public website on December 2013 and June 2014, respectively.

Data Trends

The DHHS National Action Plan to Prevent Healthcare-Associated Infections called for a 50% reduction in CLABSI occurrence in ICUs or a SIR of 0.5 and a 25% reduction in admission and readmission SSI or 0.75 SIR by the end of 2013 (Agency for Healthcare Research and Quality, 2008). Texas was very close to meeting the 2013 goal of 0.5. The Texas CLABSI SIR for 2013 was 0.534 (p-value = < 0.0001, 95% CI 0.502 – 0.569) which showed a slight improvement from the 2012 SIR of 0.55. The SSI SIR also improved from 0.87 in 2012 to 0.71 in 2013 (p-value < 0.0001; 95% CI 0.681 – 0.736), meeting the 2013 goal for SSI. However, the 20% reduction in CAUTI was not achieved for Texas based on the last 6 months of ICU data. For Texas, there were 9% more CAUTIs reported than the national baseline. However, this trend is consistent with that of the national trend showing a 3% increase in CAUTI incidence from the baseline (The Centers for Disease Control and Prevention, 2014).

In the coming year, DSHS will need to focus efforts to reduce CAUTI in Texas. Based on the findings in this report, it appears that regions with the greatest need for training are HSR 11, followed by 7, 8 and 2/3, specifically in adult ICU settings.

DSHS has learned many lessons that will help guide the program into the next year of HAI reporting.

Use of NHSN

As the most widely used online HAI surveillance system in the United States, NHSN provides facilities with a secure and confidential data repository that enables facilities to view their data and share information with clinicians and administrators to improve health care quality. NHSN also provides the public with credible HAI data from over 12,400 health care facilities in all 50 states. Participating health care facilities include acute care hospitals, long-term acute care hospitals, rehabilitation hospitals, outpatient dialysis centers, ambulatory surgery centers, and nursing homes.

Advantages

NHSN provides a useful tool for reporting HAI data from a large number of facilities and has been an integral part of successfully implementing mandatory HAI reporting in Texas. In addition to the advantages detailed previously in this report, other benefits of using NHSN for HAI surveillance are the analytic tools that enable facilities to baseline the progress of their infection prevention efforts. The data analysis tools also enable facilities to identify opportunities to improve patient outcomes and eliminate HAIs. These data can also be analyzed on a national, state and local level to identify emerging infection trends and to measure progress toward HAI elimination.

However, along with the advantages of using NHSN, there are also some caveats to its use.

Caveats

The NHSN calculated SIR provides a means for accurately comparing health care facilities to the national experience by taking into account variations in types of facilities and patient populations. CDC conducts continuous analyses of potential risk factors to determine which factors affect HAI occurrence and adjusts risks as needed. However, these risk adjustment methods may not account for all differences between health care facilities and populations. Therefore, it is important for the public to understand this shortcoming when reviewing the facility-specific HAI data reports and the data presented in this and future annual Texas summary reports. The SIR is only one tool that can be used to make informed health care decisions. It is also important to note that health care facilities with higher SIRs do not necessarily have better performance than those with lower SIRs. The SIR only provides an accurate comparison of a health care entity's HAI experience to that of the national HAI experience, and not to other facilities.

Also important to note is that because the referent data for the SIR calculations was collected before many state's implementation of HAI reporting, many of the facility types and infection types do not have sufficient baseline data to use for comparison. Because of this, Texas is unable to obtain SIR data for (1) SSIs related to heart transplants, (2) any SSI data from ASCs and (3) SIR data from Oncology ICUs. This will only be remedied when NHSN chooses a new referent period that contains enough baseline data for these HAIs.

Updates to the NHSN system occur frequently. Occasionally, these changes require modifications to the TxHSN data upload process or even the application's structure. While most of these modifications are minor, others are critical changes and adversely affect Texas' reporting process. One such critical change will affect future trending of HAI data. The standardized HAI surveillance definitions were revised for 2013 and will likely cause artificial fluctuations in case counts for HAIs and therefore, to the SIR calculations. This change and any subsequent changes to the NHSN HAI surveillance definitions must be taken into account when tracking HAI temporal variation over several years.

Next Steps

Here are a few goals we hope to accomplish in the coming years.

Training

DSHS will continue to partner with various professional organizations to provide education and training to health care professionals throughout the state. In the coming years, DSHS plans to provide continuing education for health care facilities via regular webinars and conference calls. The purpose of which will be to provide reporting updates to facilities and review HAI definitions via case study discussion. This will also allow DSHS staff to field questions from health care professionals.

As discussed previously, targeted CAUTI prevention training needs to be performed for the health service regions with the highest CAUTI SIRs. These regions, in order of priority, are 11, 7, 8 and 2/3.

In addition to targeted CAUTI training, there is also a need to train and hire more Infection Preventionists as well as encouraging existing Infection Preventionists to obtain their CIC® certifications. In most of the regions in Texas, the bed to IP ratio far exceeds the CDC recommended ratio. This indicates a need to provide general infection prevention training on a regular basis throughout the state as well as education to health care facility administrators emphasizing the need for adequate staffing in light of the increased regulatory demands (CMS and state reporting mandates) on infection prevention departments.

DSHS is conducting a C*lostridium difficile* associated disease (CDAD) prevention collaboratives in the 2014-2015 fiscal years. These collaboratives include research activities to evaluate interventions as well as provide education/training to infection preventionists in acute care and long term care settings.

Reporting

In 2014, DSHS will continue to track the same indicators that were reported in 2013. However, in 2015, the first phase of Preventable Adverse Event (PAE) data will be reported from all general hospitals and ambulatory surgery centers in Texas. More information on PAE reporting can be found at www.PAETexas.org.

The Council for State and Territorial Epidemiologists (CSTE) has partnered with several states, including Texas and the CDC to develop a toolkit with public reporting standards for displaying HAI data. The workgroup is compiling recommendations regarding the data display and drafting templates for use among states for public reporting. These recommendations are slated for release in early 2015. Texas does plan on aligning with the recommendations outlined in the CSTE toolkit.

Data Quality

DSHS will continue to monitor HAI data for unusual pathogen clusters and perform any necessary follow-up activities to determine the cause of such occurrences. Site visits to facilities with significantly high SIRs will continue in order to ensure accurate use of NHSN case definitions. In 2015, DSHS plans to utilize the NHSN CLABSI validation protocol to select facilities for data validation. In doing this, DSHS will be able to identify facilities that may be under-reporting CLABSI data and perform any necessary follow-up and education.

The Department is committed to providing useful HAI data for the health care community and the public. DSHS will continue to work with the Health Care Safety Advisory Panel, Infection Preventionists and health care professional organizations to collect quality data from health care facilities around the state and will work together to enhance data accuracy and promote HAI reduction measures.

Appendices

Appendix A: Glossary of Terms and Abbreviations

Acute Care Facility: Defined by Texas Administrative Code Chapter 353 as a facility/hospital that provides acute care services such as medical, surgical, and/or psychological services.

American Society of Anesthesiologists (ASA) Score: A system for assessing the physical health of patients before surgery. These are:

1. A normal healthy patient.
2. A patient with mild systemic disease.
3. A patient with severe systemic disease.
4. A patient with severe systemic disease that is a constant threat to life.
5. A moribund patient who is not expected to survive without the operation.

Ambulatory Surgical Centers (ASCs): Defined by the Texas Health and Safety Code Chapter 243 as a facility that operates primarily to provide surgical services to patients who do not require overnight hospital care.

Catheter-Associated Urinary Tract Infection (CAUTI): Infection involving any part of the urinary system, including urethra, bladder, ureters, and kidney that is caused by the insertion of a urinary catheter.

Central line-associated blood stream infection (CLABSI): The National Healthcare Safety Network (NHSN) defines a CLABSI as a blood stream infection in a patient that had a central line in place at the time of or within 48-hours before the development of the bloodstream infection.

Central line catheter: A long flexible tube that is inserted near a patient's heart or into one of the large blood vessel near the heart. A central line can be used to administer fluids, antibiotics, or medical treatments such as chemotherapy. Central lines are also sometimes called central venous lines, central venous catheters and C-lines.

Central line days: A daily count of the number of patients with a central line in a patient care location during a specific time period. For each day of the month, the number of patients who have a central line is recorded. At the end of the month the sum of the daily counts is used as the central line days for the given month.

Central Line Utilization Ratio: This ratio comes from dividing the number of central line-days by the number of patient days. It is sometimes used to monitor appropriate use of central lines.

CLABSI Infection Rate: This is the total number of central line-associated bloodstream infections divided by the number of central line days. That result is then multiplied by 1,000.

***Clostridium difficile* associated disease (CDAD)/*Clostridium difficile* Infections (CDI):** *Clostridium difficile (C. difficile)* is responsible for a spectrum of *C. difficile* infections (CDI) or *C. difficile* associated disease (CDAD), including uncomplicated diarrhea, pseudomembranous colitis, and toxic megacolon which can, in some instances, lead to sepsis and even death.

Confidence Interval (CI): This is a statistical measure that determines statistical significance. If the CI contains the value 1.0, then there is no significance and the null hypothesis (which indicates there is no difference between test and control populations) can be accepted. If the CI does not contain the value 1.0, then the difference between the test and control populations is statistically significant. Example: (CI 0.02 – 1.2) is not significant and (CI 0.02 – 0.08) is significant

Contamination: To make impure, infected, corrupt, etc, by contact with or addition of something; to pollute something. This occurs when foreign material invades another material either intentionally, by accident, or as a consequence of another set of actions. Cross contamination is where someone or something that is already contaminated transfers the contamination to another person or object.

Critical Access Hospital (CAH): A small, generally geographically remote facility that provides outpatient and inpatient hospital services to people in rural areas. The designation was established by law, for special payments under the Medicare program. To be designated as a CAH, a hospital must be located in a rural area, provide 24-hour emergency services; have an average length-of-stay for its patients of 96 hours or less; be located more than 35 miles (or more than 15 miles in areas with mountainous terrain) from the nearest hospital or be designated by its State as a "necessary provider". Hospitals may have no more than 25 beds.

Denominator: This is the number of people (population) who are potentially capable of experiencing the event or outcome of interest. The denominator, along with the numerator, is used to calculate rates. The denominator is the bottom half of a fraction.

Dialysis facility: An outpatient facility where dialysis is given to people with end stage kidney disease.

Health care-associated infection (HAI): Health care-associated infections are infections that patients acquire during the course of receiving treatment for other conditions within a health care setting. For an infection to qualify as an HAI, there must be no evidence that it was present or incubating at the time of hospital admission.

HAI Prevention Collaborative: A group of facilities that are engaged in an effort to improve an outcome, in this case to reduce HAIs. The group members discuss progress regularly and share lessons learned in real time so that others in the group can benefit from the experience of each facility.

ICD-9-CM: ICD-9-CM (sometimes referred to as just ICD-9) stands for the "International Classification of Diseases - 9th revision - Clinical Modification." All diagnoses (or conditions) and all procedures that patients receive in the hospital are assigned an ICD-9-CM code. The coding and terminology provide a uniform language that permits consistent communication on claim forms.

Intensive Care Unit (ICU): A nursing care area that provides intensive observation, diagnosis, and therapeutic procedures for adults and/or children who are critically ill.

Infection: An infection occurs when a pathogen (e.g. viruses, bacteria, parasites, etc.) enters the body and causes harm.

Infection control/prevention: This is how infection preventionists prevent health care associated infections and other adverse outcomes in the health care setting. Examples include the use of hand washing, gown, gloves, masks, special cleaning products and isolation of people with contagious diseases in order to prevent another patient from contracting the disease and becoming sicker.

Infection Preventionist (IP): Previously known as an Infection Control Practitioner (ICP). This is a health care professional who is responsible for preventing infection transmission within health care facilities.

Infection Rate: An infection rate is the number of infections reported in a specified period of time (the numerator) divided by the number of exposures to an infection during the same specified period of time (the denominator).

Knee Replacements, Total or Partial: Knee replacement surgery (arthroplasty) is an elective procedure for people with severe knee damage and pain related to osteoarthritis, rheumatoid arthritis, and traumatic arthritis. A total knee replacement involves removing the damaged cartilage and bone from the surface of the knee joint and replacing them with a man-made surface of metal and plastic. A partial knee replacement involves replacing only part of the knee joint.

Mandate: A law or rule issued by a state or federal government agency about the way a public issue is to be carried out. (e.g., A facility must report health care-associated infections to NHSN).

Methicillin-resistant *Staphylococcus Aureus* (MRSA): MRSA causes an infection that is resistant to several common antibiotics. There are two types of infection. Hospital-associated MRSA happens to people in health care settings. Community-associated MRSA can occur to people who have close skin-to-skin contact with others, such as athletes involved in football and wrestling.

National Healthcare Safety Network (NHSN): The data reporting system that Texas health care facilities must use to send HAI reports to DSHS. NHSN is a secure, internet-based surveillance (monitoring and reporting) system.

Neonatal Intensive Care Unit (NICU): An intensive care unit designed with special equipment to care for premature or seriously ill newborns.

Nosocomial: Originating or taking place in a hospital.

Numerator: The number of individuals who actually experience the event or outcome of interest. The numerator, along with the denominator, is used to calculate rates. The numerator is the top half of a fraction.

P-value: This is a statistical measure that determines statistical significance. If the p-value is ≥ 0.05, then there is no significance and the null hypothesis (which indicates there is no difference between test and control populations) can be accepted. If the p-value is < 0.05, then the difference between the test and control populations is statistically significant.

Pathogens: Bacteria, viruses, parasites, or fungi that can cause disease; a specific organism that causes a disease, such as bacterium or a virus.

Preventable Adverse Event (PAE): A preventable adverse event or PAE is defined as an adverse health care-associated condition or event for which the Medicare program will not provide additional payment to the facility under a policy adopted by the federal Centers for Medicare and Medicaid Services; or an event included in the list of adverse events identified by the National Quality Forum.

Protocol: A written set of rules to follow.

Standardized Infection Ratio (SIR) Statistical Method: The SIR is a number that compares the number of HAIs that occur in a facility to a predicted number of infections based on historical data and risk adjusted. A SIR is the number of observed infections divided by the number of expected infections. A SIR of 1.0 means the observed number of infections is equal to the number of expected infections. SIRs above 1.0 mean that the infection rate is higher than that found in the "standard population.” SIRs below 1.0 mean that the infection rate is lower than that found in the "standard population.” For HAI reports, the standard population comes from data reported by the hundreds of U.S. hospitals that use the National Healthcare Safety Network (NHSN) system.

Surgical Site Infection (SSI): SSIs are infections that occur as the result of surgical procedures.

Surveillance: A process for ongoing monitoring of information (data) about a specific topic, problem, or disease (such as health care-associated infections) where data are gathered, analyzed, and interpreted. Surveillance data are often used to identify areas for improvement, guide actions to improve the quality of health care delivery, and monitor whether those interventions result in better outcomes.

List of Abbreviations/Acronyms	
Acronym	**Description**
AAA	Abdominal Aortic Aneurism repair surgery
APIC	Association for Professionals in Infection Control and Epidemiology
ASA	American Society of Anesthesiologists
ASC	Ambulatory Surgery Center
CARD	Cardiac Surgery
CAUTI	Catheter associated urinary tract infections
CBGB	Coronary Artery Bypass Graft with both chest and donor site incisions
CBIC	Certification Board of Infection Control and Epidemiology
CBGC	Coronary Artery Bypass Graft with chest incision only
CDAD	*Clostridium difficile* associated disease
CDC	Centers for Disease Control and Prevention
CEA	Carotid Endarterectomy
CI	Confidence Interval
CIC	Certification in Infection Prevention and Control
CLABSI	Central Line-Associated Blood Stream Infection
CMS	Centers for Medicare and Medicaid Services
COLO	Colon Surgery
DSHS	Texas Department of State Health Services
DHHS	Department of Health and Human Services (U.S)
DHQP	Division of Healthcare Quality Promotion at the CDC
FUSN	Spinal Fusion surgery
HAI	Health care-associated infection
HICPAC	Healthcare Infection Control Practices Advisory Committee
HPRO	Hip Prosthesis surgery
HSR	Health Service Region
HTP	Heart Transplant surgery
HYST	Abdominal Hysterectomy
ICD-9	International Classification of Diseases, Ninth Revision
ICU	Intensive Care Unit
IP	Infection Preventionist
KPRO	Knee Prosthesis surgery
LAM	Laminectomy surgery
MDRO	Multidrug-resistant organism
MRSA	Methicillin-Resistant *Staphylococcus aureus*
NHSN	National Healthcare Safety Network
NICU	Neonatal Intensive Care Unit
PAE	Preventable Adverse Event
POA	Present on Admission
PVBY	Peripheral Vascular Bypass Surgery

List of Abbreviations/Acronyms	
Acronym	**Description**
QIO	Quality Improvement Organization
RFUSN	Re-fusion of Spine surgery
SHEA	Society for Healthcare Epidemiologists of America
SSI	Surgical site infection
TAHQ	Texas Association for Healthcare Quality
TASCS	Texas Ambulatory Surgery Center Society
THAF	Texas Hospital Association Foundation
THAQ	Texas Association for Healthcare Quality
TMA	Texas Medical Association
THCIC	Texas Health Care Information Collection
TMF	Texas Medical Foundation
TSICP	Texas Society of Infection Control and Prevention
TXHSN	Texas Healthcare Safety Network
UTHSC	University of Texas Health Science Center
VHYS	Vaginal Hysterectomy surgery
VSHN	Ventricular Shunt surgery

Appendix B: Texas 2013 Advisory Panel Members

Chair:

- Jane Siegel, MD, Professor of Pediatrics, UT Southwestern Medical Center, Dallas

Physicians:

- Edward Septimus, MD, Medical Director, Infection Prevention and Epidemiology, Hospital Corporation of America, Inc., Houston
- Charles Lerner, MD, Medical Director, Infection Control and Hospital Epidemiology, Methodist Healthcare System, San Antonio

Infection control professionals:

- Susan Sebazco RN, MBA, CIC, Infection Prevention Director, Texas Health Arlington Memorial Hospital, Arlington
- Charlotte Wheeler, RN, BSN, CIC, Scott and White Health Care System Infection Prevention Director, Temple, Texas
- Sharon Dorney, BSN, MSN, ADN, MPH, CIC, Infection Preventionist, North Texas Medical Center, Gainesville
- Judith Prescott, RN, BSN,CIC, Infection Prevention and Control Director, Baylor Health Care System, Dallas

Officer of a general hospital:

- Laurence Donovan, MD, Chief Medical Officer, Texas A&M Health Science Center, Round Rock

Officer of an ambulatory surgical center:

- Richard Bays, RN, MBA, Chief Nursing Officer, Memorial Surgical Solutions, Houston

Quality assurance/performance improvement professionals:

- Darlene Adams, MSN, BSN, RN, Director of Quality Management, United Regional Health Care System, Wichita Falls Susan Mellott, PhD, Owner, Mellott Associates, Houston, Associate Professor, Texas Woman's University - Houston
- Victoria Robinson, BSN, RN, Director of Nursing Quality, East Texas Medical Center, Tyler
- Susan Mellott, PhD, Owner, Mellott Associates, Houston
- Steve Q. Quach, MD, Chief Medical Officer, UTMB, Galveston

Members representing the public as consumers:

- John James, PhD, MA, Chief Toxicologist, Federal Agency, Houston
- Linda Carswell, BA, Board member Jerry Carswell Scholarship Foundation, Katy

Public health professionals:

- Bruce Burns, DC, Center for Health Statistics, DSHS, Austin
- Mary L. Smith, RN, Nurse Consultant Facility Licensing Group, Regulatory Services, DSHS, Austin
- Gary Heseltine, MD, MPH, Epidemiologist, Infectious Disease Control Branch, DSHS, Austin

Appendix C: Missing/Incomplete Alerts List

1. **Incomplete Events:** This alert will list any in-plan events with missing required data elements.

2. **Incomplete Procedures:** This alert will list those procedure records that have missing or incomplete data.

3. **Incomplete Summary Data:** This alert will list months of summary data in which a required field is missing. This may occur when a monthly reporting plan is updated to include an additional event(s) for a location after summary data have been entered initially.

4. **Missing Procedures:** This alert will list those months in which NHSN operative procedure categories were listed in your monthly reporting plan and no procedures have been reported to NHSN.

5. **Missing Procedure Associated Events:** This alert will list those months in which NHSN operative procedures were reported in-plan and no in plan procedure associated events have been reported to NHSN.

6. **Missing Events:** This alert will list months in which events from the device-associated modules were entered in the monthly reporting plan and summary data have been reported to NHSN, but no events have been reported.

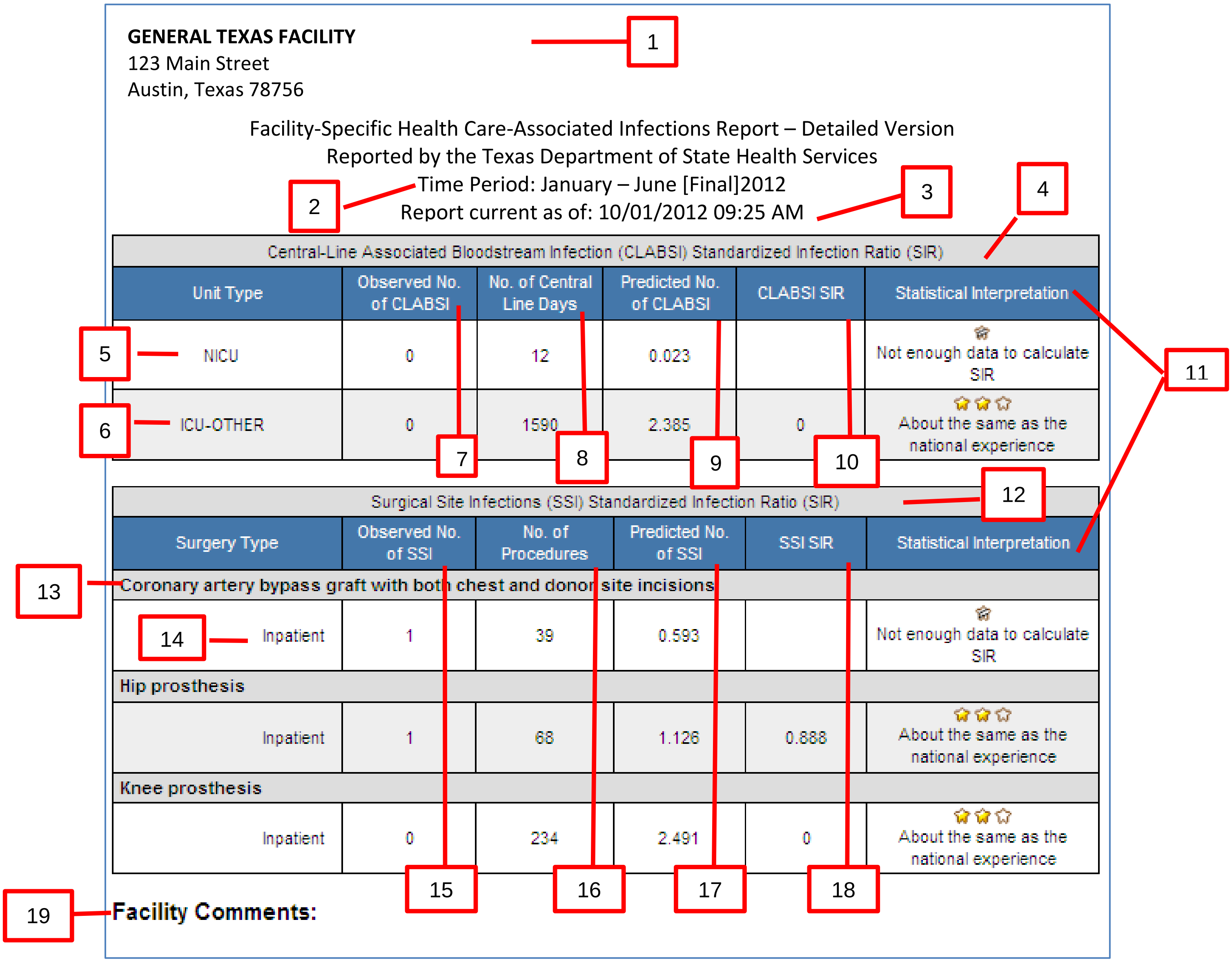
7. **Missing Summary Data:** This alert will list months in which events from the device-associated modules were entered in the monthly reporting plan, but no summary data have been entered.

(The Centers for Disease Control and Prevention, 2011)

Appendix D: Sample Facility-Specific HAI Report

The Facility-Specific HAI Report is created for each healthcare facility on a semi-annual basis. These reports may be lengthy and difficult to understand. In order to understand what the report is telling us, it is important to know what each of the data elements on the report means.

Below is a sample of what a non-existent General Hospital's HAI report would look like. Different parts of the report are numbered. See below for an explanation of each numbered part of the report.



GENERAL TEXAS FACILITY
123 Main Street
Austin, Texas 78756

Facility-Specific Health Care-Associated Infections Report – Detailed Version
Reported by the Texas Department of State Health Services
Time Period: January – June [Final]2012
Report current as of: 10/01/2012 09:25 AM

Central-Line Associated Bloodstream Infection (CLABSI) Standardized Infection Ratio (SIR)					
Unit Type	Observed No. of CLABSI	No. of Central Line Days	Predicted No. of CLABSI	CLABSI SIR	Statistical Interpretation
NICU	0	12	0.023		Not enough data to calculate SIR
ICU-OTHER	0	1590	2.385	0	About the same as the national experience

Surgical Site Infections (SSI) Standardized Infection Ratio (SIR)					
Surgery Type	Observed No. of SSI	No. of Procedures	Predicted No. of SSI	SSI SIR	Statistical Interpretation
Coronary artery bypass graft with both chest and donor site incisions					
Inpatient	1	39	0.593		Not enough data to calculate SIR
Hip prosthesis					
Inpatient	1	68	1.126	0.888	About the same as the national experience
Knee prosthesis					
Inpatient	0	234	2.491	0	About the same as the national experience

Facility Comments:

1. <u>Health care Facility Information</u> – This shows the name of the facility and the physical address.

2. <u>Summary Data</u> – This is the section that shows the time period that these data refer to. In this example, we are looking at Jan – June 2012 data.

3. <u>Report Current As of</u> – This is the date and time that these data were obtained. Any changes to the reported data made after this date will not be reflected in this report. For example, if a facility realized they made a mistake and needed to go back and correct their data, and changes made after this date and time will not show up in this report.

4. <u>Central-Line Associated Bloodstream Infection (CLABSI) Standardized Infection Ratio (SIR)</u> – this is the CLABSI section. All data in this table only refers to CLABSI data for this facility.

5. <u>NICU</u> – This is a composite of all the NICU locations for this facility. If there is only one NICU in this facility, then only that NICU's data are displayed in this row.

6. <u>ICU</u> – This is a composite of all the ICU locations for this facility. If there is only one ICU in this facility, then only that ICU's data are displayed in this row.

7. <u>Observed No. of CLABSI</u> – This is the number of CLABSIs that occurred in the facility for the given time period.

8. <u>No. of Central Line Days</u> – This is the number of days that a central line was in place for each patient that was in this unit. This number is calculated by counting the number of patients with a central line each day. Each day's count is then totaled for the entire reporting time period to get this number.

9. <u>Predicted No. of CLABSI</u> – This is the estimated number of CLABSI that is predicted to occur if the facility has the same infection rate as the national baseline.
    - If the Observed number of infections > Predicted number of infections, then the facility has a higher rate of infection than the national baseline
    - If the Observed number of infections < Predicted number of infections, then the facility has a lower rate of infection than the national baseline
    - If the Observed number of infections = Predicted number of infections, then the facility has the same rate of infection as the national baseline.

    NOTE: If the Predicted number of infections is less than 1, then there is not enough data to calculate a SIR.

10. CLABSI SIR – This is a ratio of the Observed number of infections to the Predicted number of infections.
    - If the CLABSI SIR > 1, then the facility has a higher rate of infection than the national baseline
    - If the CLABSI SIR < 1, then the facility has a lower rate of infection than the national baseline
    - If the CLABSI SIR = 1, then the facility has the same rate of infection as the national baseline.

    NOTE: If the Predicted number of infections is less than 1, then there is not enough data to calculate a SIR.

11. Statistical Interpretation: This interpretation takes into account whether the difference between the facility and the national experience is significantly different. If it is not statistically significant, then the facility is considered to have about the same experience as that of the nation.
    - (3 stars) Better than the national experience: this means that the facility has a lower rate of infection than the average healthcare facility.
    - (2 stars) About the same as the national experience: this means that the facility about the same rate of infection than the average healthcare facility.
    - (1 star) Worse than the national experience: this means that the facility has a higher rate of infection than the average healthcare facility.
    - Not enough data to calculate SIR: this means that the facility doesn't have enough patients with central lines in their ICU/NICU to be able to reliably determine whether they are doing better, worse or the same as the nation.

12. Surgical Site Infections (SSI) Standardized Infection Ratio (SIR) – this is the SSI section. All data in this table only refers to SSI data for this facility.

13. Surgery Type – This is the type of surgical procedure.

14. Inpatient or Outpatient – This indicates whether they are Inpatient procedures (meaning the patient was admitted and discharged on different dates) or if they were performed as an outpatient procedure (meaning the patient went to an Ambulatory Surgery Center or the operation was performed on the same day they were admitted and discharged from a hospital).

15. Observed No. of SSI – This is the number of SSIs that occurred for this facility during the reporting time period.

16. No. of Procedures – This is the number of surgical procedures performed at this facility for the given time period.

17. Predicted No. of SSI – This is the estimated number of SSI that is predicted to occur if the facility has the same infection rate as the national baseline.
    - If the Observed number of infections > Predicted number of infections, then the facility has a higher rate of infection than the national baseline
    - If the Observed number of infections < Predicted number of infections, then the facility has a lower rate of infection than the national baseline
    - If the Observed number of infections = Predicted number of infections, then the facility has the same rate of infection as the national baseline.

    NOTE: If the Predicted number of infections is less than 1, then there is not enough data to calculate a SIR.

18. SSI SIR – This is a ratio of the Observed number of infections to the Predicted number of infections.
    - If the SSI SIR > 1, then the facility has a higher rate of infection than the national baseline
    - If the SSI SIR < 1, then the facility has a lower rate of infection than the national baseline
    - If the SSI SIR = 1, then the facility has the same rate of infection as the national baseline.

    NOTE: If the Predicted number of infections is less than 1, then there is not enough data to calculate a SIR.

19. Facility Comments: Each facility is given an opportunity to explain their data in this section. Please be sure to read this section of the report if comments are provided.

Appendix E: Predictive Risk Factors from the All SSI Logistic Regression Models	
NHSN Operative Procedure‡	**Risk Factor(s) – ALL SSIs**
AAA	duration
CBGB/C	age, asa, duration, gender, number of beds*
CARD	age, asa, duration
CEA	There were insufficient data for the following procedures in order to detect significant differences in risk, thus overall incidence will be used in the SIR calculations.
COLO	age, anesthesia, asa, duration, endoscope, medical school affiliation*, number of beds*, wound class
FUSN	approach, asa, diabetes, duration, medical school affiliation*, spinal level, trauma, wound class
HPRO	age, anesthesia, asa, duration, HPRO type, number of beds*, trauma
HTP	There were insufficient data for the following procedures in order to detect significant differences in risk, thus overall incidence will be used in the SIR calculations.
HYST	age, anesthesia, asa, duration, endoscope, number of beds*
KPRO	age, anesthesia, asa, duration, gender, KPRO type, number of beds*, trauma
LAM	anesthesia, asa, duration, endoscope
PVBY	age, asa, duration, gender, medical school affiliation*
RFUSN	approach, diabetes, duration
VHYS	age, asa, duration, medical school affiliation*
VSHN	age, medical school affiliation*, number of beds*, wound class

*These risk factors originate from the Patient Safety Annual Facility Survey

†All SSI = superficial incision, deep incisional, and organ/space SSI detected during admission, readmission, or post-discharge

(The Centers for Disease Control and Prevention, 2010)

Appendix F: HAI Antibiograms

Texas Health Service Region 1 Antibiogram, 2013

Antimicrobial Class	Aminoglycosides					Beta-lactam penicillins		Penicillins		Carbapenems	Cephalosporins						Fluroquinolones		Glycopeptide	Lincosamide	Macrolide	Microlides	Monobactams	Oxazolidinone	Tetracyclines	TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Ampicillin/ Sulbactam**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Imipenem**	**Cefazolin**	**Cefuroxime**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Vancomycin**	**Clindamycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Tetracycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																										
E. coli	14 **93%**	17 **88%**	13 **85%**			13 **23%**	14 **93%**	17 **24%**		11 **100%**	14 **64%**	14 **71%**	13 **77%**	13 **77%**	15 **73%**	12 **92%**	13 **54%**	17 **59%**					12 **67%**		10 **70%**	15 **73%**
Gram Positive																										
E. faecalis				10 **70%**	11 **55%**			21 **95%**										10 **90%**	21 **95%**					19 **100%**	15 **27%**	
S. aureus		27 **100%**							29 **34%**								10 **30%**	20 **35%**	28 **100%**	28 **61%**	17 **94%**	28 **32%**		19 **100%**	29 **97%**	21 **100%**
S. epidermidis																			14 **100%**							

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Texas Health Service Region 2/3 Antibiogram, 2013

Antimicrobial Class	Aminoglycosides					Beta-lactam penicillins				Penicillins				Carbapenems				Cephalosporins								Fluroquinolones			Glycopeptide	Glycylcycline	Lincosamide	Lipopeptides	Macrolide	Microlides	Monobactams	Oxazolidinone	Streptogramins	Tetracyclines		TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Penicillin G**	**Methicillin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Doripenem**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotetan**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Vancomycin**	**Tigecycline**	**Clindamycin**	**Daptomycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Quinupristin /Dalfopristin**	**Tetracycline**	**Minocycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																																								
E. aerogenes		22 **91%**	17 **94%**			12 **25%**			17 **82%**					13 **100%**	14 **79%**	11 **91%**				12 **42%**				17 **71%**	12 **92%**	17 **82%**	14 **93%**													18 **94%**
E. cloacae	13 **100%**	34 **91%**	30 **87%**			16 **19%**			28 **75%**	22 **18%**				16 **88%**	17 **94%**	19 **95%**		11 **27%**		18 **39%**		14 **43%**	20 **80%**	26 **77%**	25 **84%**	24 **79%**	22 **86%**								16 **56%**					26 **77%**
E. coli	115 **97%**	172 **86%**	152 **85%**			116 **48%**	75 **68%**		158 **94%**	167 **45%**				93 **100%**	77 **99%**	92 **99%**	20 **95%**	112 **80%**	77 **88%**	103 **83%**	26 **96%**	75 **89%**	96 **91%**	160 **90%**	108 **92%**	119 **68%**	136 **65%**	23 **70%**		14 **100%**					80 **90%**			58 **57%**		157 **68%**
K. oxytoca		12 **100%**	10 **100%**			11 **73%**																		10 **100%**																
K. pneumoniae	30 **100%**	59 **97%**	43 **98%**			53 **83%**	26 **100%**		49 **98%**	40 **20%**				30 **97%**	20 **100%**	31 **100%**		28 **93%**	18 **100%**	39 **90%**		24 **100%**	26 **96%**	54 **100%**	37 **100%**	39 **90%**	41 **95%**								28 **100%**			16 **88%**		52 **92%**
P. mirabilis	12 **100%**	12 **83%**							10 **100%**	13 **62%**														10 **90%**			10 **90%**													10 **80%**
P. aeruginosa	44 **91%**	85 **84%**	70 **91%**					12 **75%**	69 **71%**						39 **79%**	62 **87%**							65 **68%**		73 **78%**	62 **85%**	62 **84%**								39 **59%**					
S.marcescens		12 **83%**	12 **83%**																					11 **73%**			12 **83%**													
Gram Positive																																								
E. faecalis				83 **67%**	83 **84%**					126 **98%**		16 **94%**														34 **82%**	47 **83%**	18 **78%**	120 **98%**			27 **100%**				50 **96%**		40 **38%**		
E. faecium				30 **90%**	28 **61%**					47 **23%**																	11 **18%**		48 **29%**			25 **100%**				40 **98%**		11 **18%**		
S. aureus		171 **95%**					10 **60%**				229 **58%**		17 **59%**						34 **65%**							71 **68%**	115 **68%**	53 **83%**	221 **100%**	20 **100%**	207 **68%**	92 **99%**	165 **99%**	212 **47%**		112 **100%**	16 **88%**	197 **92%**	18 **100%**	212 **97%**
Staphylococcus, coag neg																													14 **100%**											
S. epidermidis		11 **73%**									23 **22%**																		70 **100%**		20 **25%**		11 **100%**	11 **18%**		10 **100%**		13 **77%**		19 **37%**

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Texas Health Service Region 4/5N Antibiogram, 2013

Antimicrobial Class	Aminoglycosides					Beta-lactam penicillins			Penicillins			Carbapenams				Cephalosporins							Fluroquinolones			Glycopeptide	Glycylcycline	Lincosamide	Lipopeptides	Macrolide	Microlides	Monobactams	Oxazolidinone	Tetracyclines		TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Methicillin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Doripenem**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Vancomycin**	**Tigecycline**	**Clindamycin**	**Daptomycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Tetracycline**	**Doxycycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																																				
E. coli	21 **100%**	38 **89%**	28 **82%**			26 **62%**	22 **68%**	37 **84%**	36 **36%**			15 **100%**	28 **100%**	19 **100%**	15 **100%**	36 **83%**	12 **92%**	20 **90%**	24 **88%**	27 **96%**	37 **95%**	35 **97%**	37 **76%**	34 **71%**	11 **73%**		10 **100%**					15 **100%**		21 **57%**	11 **73%**	36 **78%**
K. pneumoniae	12 **92%**	16 **100%**	14 **100%**			11 **100%**	11 **100%**	17 **88%**	18 **6%**			11 **100%**	13 **100%**	11 **100%**		18 **83%**	10 **80%**		11 **91%**	14 **93%**	18 **89%**	17 **82%**	17 **100%**	17 **100%**			10 **100%**					10 **80%**		10 **100%**		18 **89%**
P. mirabilis									10 **70%**																											
P. aeruginosa		21 **90%**	12 **100%**					20 **100%**					14 **93%**							18 **100%**		21 **86%**	20 **90%**	21 **86%**												
Gram Positive																																				
E. faecalis				23 **78%**	18 **83%**				42 **98%**														15 **67%**	17 **76%**		44 **100%**							39 **97%**	20 **10%**		
S. aureus		61 **95%**								68 **43%**	67 **45%**						17 **41%**						35 **57%**	47 **57%**	19 **63%**	66 **100%**		64 **56%**	15 **100%**	48 **98%**	67 **37%**		51 **100%**	63 **97%**		57 **100%**
S. epidermidis		11 **64%**								11 **9%**														13 **15%**		24 **100%**					11 **18%**		10 **100%**	13 **85%**		

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Texas Health Service Region 6/5S Antibiogram, 2013

Anti-microbial Class	Aminoglycosides					Antifungals		Beta-lactam penicillins				Penicillins				Carbapenems			Chloramphenicol	Cephalosporins							Fluroquinolones			Glycopeptide	Glycylcycline	Lincosamide	Lipopeptides	Macrolide	Microlides	Monobactams	Oxazolidinone	Streptogramins	Tetracyclines		TMP/SMX
Anti-microbial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Fluconazole**	**Voriconazole**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Penicillin G**	**Methicillin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Chloramphenicol**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Vancomycin**	**Tigecycline**	**Clindamycin**	**Daptomycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Quinupristin/ Dalfopristin**	**Tetracycline**	**Minocycline**	**Trimethoprim/ Sulfamethoxazole**
Fungi																																									
C. albicans						15 **93%**	12 **100%**																																		
Gram Negative																																									
A. baumannii											18 **28%**																														
C. freundii											14 **57%**																														
C. koseri											10 **100%**																														
E. aerogenes	18 **100%**	19 **100%**	16 **100%**								52 **77%**	10 **20%**						13 **92%**		10 **10%**	11 **9%**				17 **82%**	17 **94%**	12 **75%**	14 **86%**											12 **83%**		14 **93%**
E. cloacae	33 **100%**	36 **97%**	34 **97%**					19 **21%**			106 **78%**	23 **0%**						23 **96%**		19 **0%**	12 **25%**	10 **20%**	15 **73%**	14 **71%**	29 **48%**	29 **93%**	16 **100%**	30 **93%**											24 **88%**		29 **93%**
E. cloacae complex											13 **62%**																														
E. coli	139 **97%**	152 **87%**	145 **82%**					110 **48%**	23 **70%**		536 **90%**	142 **39%**				45 **100%**	47 **100%**	100 **98%**		116 **78%**	82 **89%**	59 **71%**	74 **82%**	94 **87%**	133 **89%**	139 **87%**	91 **58%**	124 **61%**	10 **50%**		23 **100%**					54 **81%**			84 **61%**		126 **64%**
K. oxytoca											30 **90%**																														
K. pneumoniae	76 **91%**	83 **92%**	80 **88%**					65 **65%**	12 **83%**		230 **86%**	71 **1%**				31 **94%**	28 **89%**	64 **89%**		62 **77%**	44 **68%**	21 **62%**	39 **74%**	49 **78%**	77 **79%**	80 **78%**	48 **83%**	70 **84%**			22 **86%**					37 **73%**			52 **69%**		67 **84%**
K. pneumoniae ss. pneumoniae											11 **82%**																														
M. morganii											13 **100%**																														
P. mirabilis	17 **100%**	22 **95%**	17 **94%**					14 **64%**			64 **100%**	19 **68%**				12 **92%**		10 **100%**		15 **93%**	11 **91%**			11 **91%**	18 **94%**	19 **95%**	10 **100%**	18 **83%**								12 **100%**			15 **0%**		14 **93%**
P. aeruginosa	85 **94%**	80 **85%**	89 **93%**							17 **82%**	258 **84%**						42 **90%**	70 **91%**						61 **93%**		88 **85%**	84 **85%**	46 **85%**								39 **82%**					
S. marcescens	22 **95%**	24 **100%**	22 **91%**					10 **0%**			50 **74%**	15 **7%**						12 **100%**		16 **0%**	14 **21%**		12 **92%**	11 **91%**	17 **76%**	17 **100%**	14 **100%**	15 **100%**								11 **100%**			11 **0%**		19 **100%**
Gram Positive																																									
E. faecalis				66 **67%**	45 **78%**							99 **93%**															16 **56%**	38 **66%**		98 **91%**			26 **100%**		11 **0%**		37 **97%**		50 **18%**		
E. faecium				18 **72%**	12 **42%**							25 **16%**																		25 **16%**			14 **100%**				23 **91%**	27 **7%**	15 **20%**		
E. spp.				19 **74%**	17 **88%**							54 **85%**																12 **92%**		57 **77%**							21 **90%**		17 **24%**		
S. aureus		109 **96%**							11 **73%**			19 **11%**	199 **58%**	19 **16%**	12 **50%**				14 **93%**	13 **69%**	11 **82%**						53 **62%**	137 **59%**	27 **67%**	204 **100%**	20 **100%**	198 **67%**	31 **97%**	169 **99%**	203 **44%**		115 **99%**	206 **4%**	198 **92%**	29 **93%**	159 **97%**
Staphylococcus, coag neg													10 **10%**	10 **0%**														10 **50%**		62 **100%**					10 **50%**				10 **70%**		
S. epidermidis													12 **17%**															12 **33%**		43 **100%**					10 **20%**				12 **92%**		
Staphylococcus spp.													13 **54%**															12 **25%**		15 **100%**		12 **25%**			12 **17%**				12 **83%**		

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Texas Health Service Region 7 Antibiogram, 2013

Antimicrobial Class	Aminoglycosides					Beta-lactam penicillins			Penicillins			Carbapenems				Cephalosporins								Fluroquinolones			Glycopeptide	Lincosamide	Lipopeptides	Macrolide	Microlides	Monobactams	Oxazolidinone	Streptogramins	Tetracyclines	TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Methicillin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Doripenem**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotetan**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Vancomycin**	**Clindamycin**	**Daptomycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Quinupristin/ Dalfopristin**	**Tetracycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																																				
E. cloacae	12 **100%**	18 **94%**	17 **94%**					16 **75%**						15 **100%**		12 **17%**					13 **77%**	13 **54%**	16 **94%**	17 **88%**	15 **100%**							11 **82%**				18 **100%**
E. coli	53 **98%**	85 **86%**	83 **86%**			73 **49%**	17 **71%**	31 **90%**	86 **45%**			29 **100%**	38 **97%**	66 **98%**	10 **100%**	83 **78%**	31 **84%**	61 **77%**	26 **88%**	30 **80%**	57 **91%**	81 **86%**	74 **89%**	79 **65%**	68 **65%**	32 **59%**						47 **85%**			13 **54%**	85 **69%**
K. pneumoniae	20 **100%**	38 **97%**	38 **97%**			33 **76%**		12 **83%**	35 **0%**			15 **100%**	15 **100%**	30 **100%**		37 **92%**	14 **93%**	24 **71%**	11 **100%**	13 **92%**	25 **100%**	34 **94%**	35 **97%**	34 **91%**	33 **94%**	14 **93%**						18 **100%**				37 **97%**
P. aeruginosa	21 **95%**	35 **83%**	35 **100%**										10 **100%**	26 **88%**							25 **92%**		35 **83%**	33 **85%**	30 **83%**							25 **80%**				
S. marcescens		12 **100%**	12 **92%**														19 **79%**					11 **55%**	12 **92%**	12 **100%**												12 **92%**
Gram Positive																																				
E. faecalis				48 **77%**	41 **83%**			82 **94%**	58 **100%**															24 **88%**	31 **87%**	21 **95%**	57 **98%**		24 **96%**				36 **94%**		35 **29%**	
E. faecium								38 **92%**	13 **54%**																		13 **54%**									
S. aureus		69 **99%**								106 **53%**	12 **67%**													41 **54%**	60 **50%**	22 **73%**	105 **100%**	102 **82%**	33 **97%**	59 **100%**	105 **46%**		53 **100%**	10 **100%**	105 **91%**	100 **100%**
Staphylococcus, coag neg																											16 **100%**									
S. epidermidis																											29 **100%**									

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Texas Health Service Region 8 Antibiogram, 2013

Antimicrobial Class	Aminoglycosides				Beta-lactam penicillins			Penicillins				Carbapenams		Cephalosporins								Fluroquinolones		Glycopeptide	Glycylcycline	Lincosamide	Macrolide	Microlides	Monobactams	Oxazolidinone	Tetracyclines		TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Penicillin G**	**Methicillin**	**Imipenem**	**Meropenem**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotetan**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Vancomycin**	**Tigecycline**	**Clindamycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Tetracycline**	**Doxycycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																																	
E. cloacae		10 **90%**																															
E. coli	26 **96%**	69 **87%**	29 **90%**		44 **55%**	26 **77%**	50 **86%**	62 **40%**				12 **100%**	20 **100%**	50 **58%**	16 **81%**	14 **86%**	11 **100%**	19 **95%**	19 **95%**	69 **91%**	44 **98%**	59 **64%**	50 **62%**						28 **82%**		29 **72%**		66 **68%**
K. pneumoniae		24 **100%**			15 **67%**	10 **100%**	17 **76%**	24 **0%**						19 **79%**						23 **100%**	16 **100%**	23 **100%**	14 **100%**								11 **82%**		21 **90%**
P. mirabilis		18 **89%**	10 **90%**		14 **93%**		16 **100%**	19 **79%**						14 **57%**						17 **94%**	16 **100%**	12 **92%**	16 **94%**										17 **94%**
P. aeruginosa	12 **83%**	29 **90%**	16 **88%**				27 **81%**					11 **91%**	13 **77%**						16 **69%**			30 **90%**	12 **92%**										
S. marcescens		12 **100%**																		12 **92%**	11 **100%**												12 **100%**
Gram Positive																																	
E. faecalis				12 **75%**				31 **97%**															16 **75%**	43 **100%**							18 **22%**		
E. faecium								13 **54%**																14 **57%**									
E. spp.								13 **69%**																18 **56%**									
S. aureus		48 **94%**				10 **50%**			97 **56%**	18 **0%**	67 **45%**										29 **90%**	25 **44%**	29 **55%**	85 **100%**	18 **100%**	90 **68%**	25 **100%**	85 **54%**		19 **100%**	33 **94%**	16 **100%**	86 **100%**
Staphylococcus, coag neg																								13 **100%**									
S. epidermidis									13 **8%**															24 **100%**		11 **55%**		13 **23%**					

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Texas Health Service Region 9/10 Antibiogram, 2013

Antimicrobial Class	Aminoglycosides			Beta-lactam penicillins		Penicillins		Carbapenems			Cephalosporins							Fluroquinolones			Glycopeptide	Lincosamide	Lipopeptides	Macrolide	Microlides	Monobactams	Oxazolidinone	Tetracyclines	TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Ampicillin/ Sulbactam**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Cefazolin**	**Cefoxitin**	**Cefuroxime**	**Cefotaxime**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Moxifloxacin**	**Vancomycin**	**Clindamycin**	**Daptomycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Tetracycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																													
E. coli	15 **100%**	19 **84%**	18 **83%**	11 **55%**	19	22 **32%**		12 **100%**	13 **100%**	13 **100%**	21 **71%**	19 **89%**	12 **83%**	11 **91%**	20 **70%**	20 **80%**	20 **80%**	17 **88%**	21 **90%**							12 **83%**		11 **64%**	14 **64%**
P. aeruginosa		11 **73%**													11 **55%**		11 **82%**												
Gram Positive																													
E. faecalis						13 **92%**															13 **92%**								
S. aureus		34 **97%**					34 **68%**											31 **71%**	31 **71%**	17 **82%**	34 **100%**	33 **70%**	12 **100%**	32 **100%**	34 **62%**		23 **100%**	34 **94%**	24 **96%**

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

Texas Health Service Region 11 Antibiogram, 2013

Antimicrobial Class	Aminoglycosides					Beta-lactam penicillins			Penicillins		Carbapenams			Cephalosporins					Fluroquinolones		Glycopeptide	Lincosamide	Macrolide	Microlides	Monobactams	Oxazolidinone	Tetracyclines	TMP/SMX
Antimicrobial	**Amikacin**	**Gentamicin**	**Tobramycin**	**Gentamicin-High Level Test**	**Streptomycin-High Level Test**	**Ampicillin/ Sulbactam**	**Amoxicillin/ Clavulanic Acid**	**Piperacillin/ Tazobactam**	**Ampicillin**	**Oxacillin**	**Ertapenem**	**Imipenem**	**Meropenem**	**Cefazolin**	**Cefoxitin**	**Ceftazidime**	**Ceftriaxone**	**Cefepime**	**Ciprofloxacin**	**Levofloxacin**	**Vancomycin**	**Clindamycin**	**Rifampin**	**Erythromycin**	**Aztreonam**	**Linezolid**	**Tetracycline**	**Trimethoprim/ Sulfamethoxazole**
Gram Negative																												
E. coli	20 **95%**	52 **83%**	27 **70%**			46 **37%**	24 **79%**	48 **94%**	49 **24%**		23 **100%**		22 **100%**	37 **68%**	17 **82%**	15 **80%**	39 **87%**	35 **86%**	39 **64%**	29 **79%**					21 **86%**			48 **54%**
K. pneumoniae		31 **87%**	11 **55%**			29 **59%**	21 **71%**	31 **77%**	28 **14%**		15 **100%**			17 **47%**			25 **68%**	21 **81%**	25 **76%**	14 **79%**								30 **73%**
P. aeruginosa		20 **75%**	19 **100%**					18 **78%**				11 **73%**	14 **93%**			15		17 **82%**	20 **80%**	11 **82%**								
Gram Positive																												
E. faecalis				32 **75%**	11 **91%**				24 **96%**										17 **76%**		37 **95%**						12 **42%**	
E. faecium				15 **53%**															10 **0%**		16 **19%**					13 **100%**		
S. aureus		38 **95%**								43 **65%**										20 **70%**	39 **100%**	37 **70%**	36 **100%**	38 **45%**		13 **100%**	37 **92%**	41 **100%**
S. epidermidis																					14 **100%**							

Note: Pathogens with less than 10 isolates were excluded from this antibiogram. The number on top indicates the total number of isolates and the percent susceptible is shown in bold.

References

Agency for Healthcare Research and Quality. (2008, June). *The Patient Safety and Quality Improvement Act of 2005.* Retrieved from http://www.ahrq.gov/qual/psoact.htm

Centers for Medicare and Medicaid Services. (2012, December 4). *QualityNet.* Retrieved from http://www.qualitynet.org/dcs/ContentServer?c=Page&pagename=QnetPublic%2FPage%2FQnetTier2&cid=1228760487021

Edwards J, P. K.-B. (2009, December). National Healthcare Safety Network (NHSN) report: data summary for 2006 through 2008. *Am J Infect Control, 37*(10), 783-805.

Institute of Medicine. (2000). *To err is human: building a safer health system.* Washington, DC: National Academies Press.

Klevens RM, E. J. (2007). Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep*, 160-166.

Magill, S., Edwards, J., Bamberg, W., Beldavs, Z., Dumyati, G., Kainer, M., . . . Fridkin, S. (2014). Multistate point-prevalence survey of health care-associated infections. *N Engl J Med*, 1198-208.

Malapiedi PJ, P. K. (2013, February 11). *2011 National and State Healthcare-Associated Infection Standardized Infection Ratio Report.* Retrieved from www.cdc.gov/hai/pdfs/SIR/SIR-Report_02_07_2013.pdf.

The Centers for Disease Control and Prevention. (2009, December 29). *Template Document for Texas Healthcare-Associated Infections (HAI) Plan.* Retrieved from www.cdc.gov/HAI/pdfs/stateplans/tx.pdf

The Centers for Disease Control and Prevention. (2010, October). *National Healthcare Safety Network eNews: Special Edition.* Retrieved from http://www.cdc.gov/nhsn/PDFs/Newsletters/NHSN_NL_OCT_2010SE_final.pdf

The Centers for Disease Control and Prevention. (2011, October). *NHSN Alerts Version 6.5.* Retrieved from http://www.cdc.gov/nhsn/PDFs/pscManual/NHSN-Alerts_6_5.pdf

The Centers for Disease Control and Prevention. (2012, March). *2010 National and State Healthcare-Associated Infections Standardized Infection Ratio Report. January - December 2010.* Retrieved from www.cdc.gov/hai/pdfs/SIR/national-SIR-Report_03_29_2012.pdf

The Centers for Disease Control and Prevention. (2012, January). *Protocol for Reporting Central Line-Associated Bloodstream Infections to the National Healthcare Safety Network.* Retrieved December 20, 2012, from http://www.cdc.gov/hai/pdfs/NHSN/4PSC_CLABS-SAMPLE.pdf

The Centers for Disease Control and Prevention. (2012, January). *Protocol for reporting Surgical Site Infections to the National Healthcare Safety Network.* Retrieved from http://www.cdc.gov/hai/pdfs/NHSN/9pscSSI-SAMPLE.pdf

The Centers for Disease Control and Prevention. (2013, December). *National Healthcare Safety Network eNews, 8*(4). Retrieved from http://www.cdc.gov/nhsn/PDFs/Newsletters/Newsletter-Dec2013.pdf

The Centers for Disease Control and Prevention. (2014, March 26). *2012 National and State Healthcare-Associated Infections Progress Report.* Retrieved from National Healthcare Safety Network: www.cdc.gov/hai/progress-report/index.html

US Department of Health and Human Services. (2010). *National action plan to reduce healthcare-associated infections.* Retrieved from http://www.hhs.gov/ash/initiatives/hai/actionplan/index.html

Wiener, J. a. (2002). Population ageing in the United States of America: implications for public programmes. *Int. J. Epidemiol., 31*, 776-781.