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Healthcare-Associated Infections in North Carolina

2016 Annual Report

Product of:
N.C. Surveillance of Healthcare-Associated and Resistant Pathogens Patient Safety (SHARPPS) Program
N.C. Communicable Disease Branch
N.C. Division of Public Health
N.C. Department of Health and Human Services

N.C. SHARPPS Program

Overview of Healthcare-Associated Infections in North Carolina

The U.S. Centers for Disease Control and Prevention estimates that 4 percent of all hospital admissions result in a healthcare-associated infection (HAI), culminating in approximately 721,800 infections[1] and 99,000 deaths each year[2] as well as $28–$33 billion in excess costs.[3] In North Carolina, HAIs result in approximate direct costs to facilities ranging from $124 million to $348 million annually.[4] These numbers likely underestimate the true burden of HAIs because they include only a subset of acute care hospitals and healthcare-associated infections. This report is intended to provide an understanding of the burden of healthcare-associated infections in North Carolina.

HAIs are infections caused by a variety of organisms, including bacteria and fungi, while receiving medical care. Hospitals report specific types of HAIs to the North Carolina Division of Public Health (NC DPH). This report focuses on five important types of HAIs that occurred while patients were hospitalized during January 1, 2016 – December 31, 2016. These infections include:

1. Central line-associated bloodstream infections (CLABSI)
2. Catheter-associated urinary tract infections (CAUTI)
3. Surgical site infections (SSI) occurring after inpatient abdominal hysterectomies or colon surgeries
4. Laboratory-identified bloodstream infections caused by methicillin-resistant *Staphylococcus aureus* (MRSA)
5. Laboratory-identified infections caused by *Clostridium difficile* (CDI)

*Ventilator Associated Events became reportable in long term acute care hospitals in North Carolina in 2016 but these data are not included since this report does not summarize data from this facility type. .

The prevention of healthcare-associated infections is a public health priority in North Carolina and is a collaborative effort among the healthcare and public health communities. This report was a product of this collaboration prepared by the Surveillance for Healthcare-Associated and Resistant Pathogens Patient Safety (SHARPPS) Program located in the Communicable Disease Branch of the Epidemiology Section of NC DPH. The NC SHARPPS Program works to eliminate preventable infections in health care settings by:

1. Conducting statewide surveillance for selected HAIs;
2. Providing useful, unbiased information to health care providers* and consumers through public reports;
3. Promoting and coordinating prevention efforts;
4. Providing guidance, education and training; and
5. Investigating and responding to outbreaks in healthcare settings.

Report definitions are provided (Appendix A). Prevention tips on HAIs are also provided (Appendix C).

We welcome your feedback to improve the usefulness of future reports (nchai@dhhs.nc.gov).

For more information:

- For more information on Healthcare-Associated Infections and the NC SHARPPS Program, please visit http://epi.publichealth.nc.gov/cd/diseases/hai.html.
- To review background information on HAI surveillance in NC and detailed information on common statistics used: http://epi.publichealth.nc.gov/cd/hai/figures/hai_may2016_reference.pdf

Acknowledgements

The North Carolina SHARPPS Program would like to acknowledge and thank hospital infection preventionists across the state who work tirelessly to protect patients from infection. They provided the data used to create this report and worked with their hospital colleagues to identify and reconcile any potential problems with the data. The recent successes in fighting healthcare-associated infections would not have been possible without their continuing efforts, dedication and collaboration.

[1] Magil, SS, Edwards, JR, Bamberg W, et al. Multistate point-prevalence survey of healthcare-associated infections. *N Engl J Med.* 2014;370:1198-1208. Available at http://www.cdc.gov/HAI/surveillance/index.html.

[2] Klevens RM, Edwards JR, Richards CL, Jr., et al. Estimating health care-associated infections and deaths in U.S. hospitals, 2002. *Public Health Rep.* Mar-Apr 2007;122(2):160-166. Available at http://www.cdc.gov/HAI/surveillance/index.html.

[3] Scott R. *The Direct Medical Costs of Healthcare-Associated Infections in U.S. Hospitals and the Benefits of Prevention. Internal Report.* Division of Healthcare Quality Promotion, National Center for Preparedness, Detection, and Control of Infectious Diseases, Coordinating Center for Infectious Diseases, Centers for Disease Control and Prevention; February 2009. Available at http://www.cdc.gov/HAI/surveillance/index.html.

[4] Anderson DJ, Pyatt DG, Weber DJ, Rutala WA; North Carolina Department of Public Health HAI Advisory Group. Statewide costs of health care-associated infections: Estimates for acute care hospitals in North Carolina. *Am J Infect Control.* 2013;41:764-8. doi: 10.1016/j.ajic.2012.11.022.

The SHARPPS Program would also like to recognize the contributions of the Healthcare-Associated Infections Advisory Group members listed in Appendix D. In particular, the Program is grateful for their ongoing guidance and feedback on the presentation and content of NC DPH HAI reports.

Finally, the Program would like to acknowledge our partners who have been important leaders and strong supporters of surveillance and prevention programs for healthcare-associated infections in North Carolina. These include the North Carolina Hospital Association, the North Carolina Statewide Program for Infection Control and Epidemiology, the North Carolina Chapter of the Association for Professionals in Infection Control and Epidemiology, Alliant Quality, the quality improvement Network-Quality Improvement Organization for North Carolina and Georgia, and the Adult Care Licensure and Nursing Home Licensure and Certification sections of the North Carolina Division of Health Service Regulation.

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I. Highlights of Healthcare-Associated Infections Activities in 2016

A. NC Surveillance for Healthcare Associated and Resistant Pathogens Patient Safety (SHARPPS) Program

Key accomplishments and activities of the SHARPPS Program in 2016 include:

- ***Investigation and Outbreak Response:*** In 2016, the SHARPPS Program assisted or consulted in 119 outbreaks in healthcare settings.

- ***One & Only Safe Injection Practices Campaign****:* NC SHARPPS worked to improve safe injection practices through the One & Only injection safety campaign. In 2016 because of increased demand, NC SHARPPS held two train-the-trainer injection safety educational sessions for licensed healthcare professionals, with 35 license healthcare professionals trained. Collectively, the Safe Injection Connection trainers conducted 14 injection safety educational sessions to over 180 healthcare professionals. Presentations and campaign exhibits were held at 14 professional conferences, and 21,900 campaign materials were distributed.

- ***Drug Diversion:*** The SHARPPS Program continues work with medical, law enforcement, and other partners to increase awareness about healthcare worker drug diversion and assist health care facilities prevent, detect, and respond to drug diversion. A table top exercise has been developed and piloted, with plans to fully implement it in 2017.

- ***Get Smart: Know When Antibiotics Work:*** This campaign supports public and provider awareness about the dangers of unnecessary use of antibiotics. This year, NC SHARPPS developed an Antibiotic Ally Initiative in 16 healthcare organizations/facilities and created awareness information for the public. This initiative increased provider commitment to antimicrobial stewardship. Facilities registered to display posters of provider commitment to antimicrobial stewardship and provide patient educational materials and education. Through this initiative we have provided resources for the general public and health care providers, disseminating over 2,200 Get Smart materials. To highlight Get Smart week, NC SHARPPS established its' first Get Smart Kids' Artwork Competition, with over 80 children from across the state submitting original artwork depicting appropriate antibiotic use and general healthy activities, including hand washing. Six (6) winners were selected and NC SHARPPS transformed the artwork into official NC Get Smart campaign posters to be distributed statewide. We conducted 4 educational sessions and 3 exhibits detailing Antimicrobial Stewardship to professional groups in addition to distributing CDC-developed educational materials to federally qualified health centers (FQHCs) and local health departments (LHDs) across the state.

- ***Carbapenem Resistant Enterobacteriaceae (CRE) Surveillance:*** In September 2016 NC SHARPPS concluded 18 months of sentinel surveillance and analyzed these data to better understand the burden of CRE in NC. As part of the surveillance system, PHEs reviewed laboratory results, submitted case report forms, and coordinated the submission of isolates for molecular phenotyping at the State Laboratory for Public Health. Results from surveillance and an evaluation of the surveillance system are being used to guide recommendations for continued surveillance and reporting in NC, as well as antimicrobial resistance prevention activities.

- ***Data Validation:*** In 2016, validation of data reported through NHSN to ensure completeness and accuracy remained a priority. The SHARPPS program conducted external validation of catheter associated urinary tract infection (CAUTI) data to assess performance characteristics and identify common reasons for misreporting. Four trained validators visited 11 facilities throughout the state. Validation visits continued into 2017.

- ***ICAR:*** **Infection Control Assessment and Response (ICAR) Update:** NC SHARPPS in partnership with NC SPICE continues working to identify gaps in infection control across North Carolina in Acute Care Hospitals, Long Term Care Facilities, Outpatient and Dialysis facilities. We have conducted 185 visits, and are on track to meet our goal of reaching 250 facilities this fiscal year. In addition to infection control assessments, NC SHARPPS has established goals to identify common infection control gaps across North Carolina, and to increase staff and facility knowledge of NC Administrative code 15A NCAC 19A.0206 (.0206). To work toward meeting these goals, facility assessments have been initiated. Educational materials have been developed to address identified infection control gaps. Educational offerings will include a webinar on antimicrobial stewardship, live classroom modules, and online modules for an outpatient course. All modules are based on gaps identified during onsite assessments. To learn more about the ICAR Assessments visit: http://spice.unc.edu/icar/

- ***Data for action:*** In an effort to make HAI data in NC more actionable, in 2016 NC SHARPPS began providing additional information to facilities identified as having a higher number of observed healthcare-associated infections than predicted by the national baseline. In addition to the monthly reconciliation reports and the public quarterly reports, facilities with elevated SIRS receive additional outreach twice a year. This follow-up includes summary data from the NHSN Targeted Assessment for Prevention (TAP) reports when available and also a de-identified comparison of the facility's SIR with the SIRs of other facilities in the same hospital size group to give the facility an idea of how their performance looks within the state HAI landscape. We also conduct individual follow up calls with these facilities to discuss their data and how we may assist HAI prevention goals. We use these calls as an opportunity to learn more about current challenges and successes, provide resources, learn more about unmet needs, and receive program feedback.

B. Stories of Success in Eliminating and/or Reducing Healthcare-Associated Infections in North Carolina

Reducing the number of healthcare facility onset *Clostridium difficile* (C. diff) infections
During 2015, Vidant Roanoke Chowan Hospital (VROA) experienced an increase in healthcare-onset *Clostridium difficile* CDI event (CDI-HO)* rates; this upward trend prompted efforts to investigate current processes to decrease infection rates.

The following goals were established:

- Reduce the number of healthcare facility onset C. *difficile* infections
- Reduce the CDI SIR (Standardized Infection Ratio)

VROA educated healthcare providers, environmental services staff, and ancillary staff about C. *difficile* infections, including signs and symptoms, and provided posters on the units to remind staff to recognize C .*difficile* symptoms and initiate testing as soon as possible. Additional educational topics included testing methodology, colonization vs infection, hand washing, and NHSN LabID definitions and reporting guidelines. In addition, VROA partnered with local facilities (i.e., nursing homes) when trends or issues were identified.

For those patients who developed signs or symptoms of C. *difficile*, VROA increased the use of bleach for daily cleaning in the Emergency Department and inpatient units. VROA environmental services were instructed to clean with bleach in the ED after providers saw any patient with diarrhea, nausea or vomiting (regardless of *C. difficile* status). Environmental health services also used bleach for daily and terminal cleaning in rooms of patients with C. difficile. The Environmental Service carts were stocked with appropriate bleach products.

Additionally, a specimen rejection criteria was adopted by Microbiology to reject formed stools that may result in "false positive" tests on asymptomatic patients. Pharmacy utilized antibiotic use specialists to monitor for appropriate use of antibiotics and make recommendations in the medical chart to de-escalate, change, or discontinue antibiotics. VROA leadership monitors provider acceptance of antibiotic stewardship recommendations.

Patients who meet criteria for C. *difficile* testing are now discussed in the daily multidisciplinary huddle and all CDI-HO infections are reported in the daily safety huddle. Leaders audit for compliance with PPE use and hand hygiene and assess staff knowledge regarding disinfectants and the correct contact time for rooms of C. *difficile* patients.

Implementation of these strategies have resulted in a 53% reduction in C. *difficile* healthcare facility-onset events and a corresponding decrease in SIR from 2.39 to 0.78 for the time period 2015 to 2016.

*LabID Event with specimen collected > 3 days after admission to the facility (i.e., on or after hospital day 4) are classified as healthcare facility-onset events (HO).

C. Healthcare-Associated Infections Partner Updates

North Carolina Statewide Program for Infection Control and Epidemiology (NC SPICE)

NC SPICE promotes prevention and control of healthcare-associated infections in North Carolina by providing evidence-based education and consultation across the healthcare spectrum.

Classroom Courses:

- In 2016, SPICE held four classroom courses targeting new infection preventionists (IPs) in acute and long-term care settings, training 385 healthcare professionals.

In-services/presentations:

- One infection prevention training session was held for DHSR Surveyors, training 100 surveyors.

Enhanced Education of Infection Prevention in Nursing Homes:

- Free modules (DVD and on-line) covering Antibiotic Resistant Bacteria, Isolation Precautions, Injection Safety, Environment, *Clostridium difficile,* and UTIs were viewed 959 times.
- Coursera also houses these modules as a course. In 2016, 371 learners completed the on-line course.

NC Curriculum for Infection Control

- Outpatient, Dental and Home Health/Hospice Settings sessions continued to be taught via classroom, webinar and on-line formats. Because of these courses, 1259 healthcare personnel were trained.

Phone and email consultations

- SPICE provided 809 infection control consultations by phone or email in 2016.

Infection Control, Assessment, and Response (ICAR) Project

- Three nurse consultants conducted on-site infection control assessments in 185 healthcare facilities. Work continues on 1) development of a database to collect comprehensive information from facilities about database management, 2) comprehensive revision of the .0206 outpatient course, 3) infection control in healthcare facilities marketing campaign, and 4) transition to a new website.

North Carolina Division of Health Service Regulation (DHSR)

In 2016, DHSR conducted or participated in the following:

1. Annual training to all nursing home and acute care surveyors in conjunction with NC SPICE and NC SHARPPS;
2. Dissemination of NC SPICE and NC SHARPPS newsletters and routine NC SHARPPS updates to Long Term Care (LTC) and Acute Home Care Surveyors and nursing home administrators;
3. Centers for Medicaid and Medicare Services (CMS) mandatory training for all Long Term Care (LTC) surveyors;
4. A series of three CMS Infection Control webinars mandatory for all Nursing Home surveyors. These webinars addressed Contact Precautions, multi-drug resistant organism's (MDRO's), environmental hazards and other Infection Control issues.
5. Dissemination of CDC updates and other alerts from the Nursing Home Licensure Section (NHLCS) Regional Office to surveyors and nursing home administrators.

North Carolina Quality Center (NCQC)

The NC Quality Center (NCQC) is committed to partnering with healthcare providers and communities to provide safe, quality healthcare and to prevent HAIs. Towards this mission, the NCQC has engaged in the following HAI prevention activities:

Partnership with Alliant Quality, the Quality Innovation Network – Quality Improvement Organization for Georgia and North Carolina in "Reducing Healthcare Associated Infections"

The NCQC, along with the Georgia Hospital Association, partnered with Alliant Quality to facilitate the Reducing Healthcare-Associated Infections in Hospitals Quality Improvement project through a Learning & Action Network to address HAI reduction and prevention focused on CAUTI, CLABSI and CDI. The project was completed in September 2016.

North Carolina Hospital Association (NCHA) Board of Trustees Goal – CAUTI Reduction

The NCHA Board of Trustees adopted a 2015 Patient Safety Goal that 100% of NCHA member hospitals commit to reduce Catheter Associated Urinary Tract Infections (CAUTI) by putting a nurse driven protocol for Foley catheter removal in place hospital wide, and submitting a copy of the protocol to the NCQC. In addition, the Board committed to reduce the state CAUTI Standardized Infection Ratio to less than 0.5. To date, 95 hospitals have submitted protocols.

The Joint Commission Center for Transforming Healthcare *C. difficile* Pilot

The NCQC is partnering with the Joint Commission Center for Transforming Healthcare to test and validate targeted solutions to reduce *C. difficile* infections through a 12-month pilot with eight North Carolina hospitals. At the end of the pilot, a Targeted Solutions Tool for reducing *C. difficile* infections will be developed and spread to other health care organizations.

NC Get Smart: Know When Antibiotics Work Antimicrobial Stewardship Campaign

The NC Quality Center, in conjunction with the NC Department of Public Health and other key stakeholders focused on continued awareness of antibiotic stewardship programs as a strategy for reducing HAIs.

A follow up survey was issued in 2016 to compare to the baseline results of the CDC checklist that was distributed to hospitals statewide during 2014. Results and comparative reports are being developed and will be shared during 2017. Preliminary reviews reflect there is still opportunity for health care organizations to adopt better antimicrobial stewardship practices, which reduce the resulting dangers of unnecessary antibiotics use. Special areas of interest included developing and strengthening protocols for the treatment of urinary tract infections, skin and soft tissue infection, empiric treatment of MRSA, non-C.difficile antibiotics in new cases of *Clostridium difficile* Infection (CDI), and culture proven invasive infections.

The partnership with Capitol Broadcasting Company Inc. continued in 2016 with the airing of public service announcements about antibiotic misuse. The NC SHARPPS Get Smart website with resources for the general public and health care providers was maintained. This website continues to house talking points that can be used for media and health professional communications about antibiotic resistance during peak flu and cold seasons.

II. Explanation of Statewide Healthcare-Associated Infections Data

The SHARPPS 2016 Annual Report includes data that have been combined from all reporting acute care hospitals in North Carolina. Other types of facilities also report HAI data to North Carolina, including long term acute care facilities, inpatient rehabilitation facilities, critical access hospitals and specialty hospitals such as psychiatric facilities. Data for these additional facility types are provided in Quarterly Reports, available here: http://epi.publichealth.nc.gov/cd/hai/figures.html. Please note that in previous versions of this report, Critical Access Hospital data were inadvertently included.

A. WHAT IS THE PURPOSE OF THIS REPORT?

This report is meant to help patients who need inpatient medical treatment decide whether they should be concerned about healthcare-associated infections (HAIs) at the hospital they may choose. HAIs are infections patients can get while receiving medical treatment in a healthcare facility. Patients should know that these infections are unintended. Ideally, HAIs should never happen, but sometimes they do. Hospitals track and report HAIs for many reasons. In some cases they are required to do so—either by state public health authorities or by federal health agencies. In most cases, hospitals report numbers (data) about certain HAIs because they want to know how well they are doing in preventing them, and how they compare with other hospitals of similar size and with similar kinds of patients.

This report looks at five HAIs:

1. Central line-associated bloodstream infections (CLABSI)
2. Catheter-associated urinary tract infections (CAUTI)
3. Surgical site infections (SSI) following abdominal hysterectomies and colon surgeries
4. Positive laboratory results with methicillin-resistant *Staphylococcus aureus* (MRSA) bacteria found in the bloodstream
5. Positive laboratory results with *Clostridium difficile* (*C. difficile,* CDI) bacteria found in a stool (fecal) sample

Click here for "Fast Facts" about central lines, urinary catheters, and the HAIs discussed in this report.

Hospitals are required by law to report these five HAIs to the North Carolina Division of Public Health. More information about North Carolina's mandatory reporting can be found here: http://epi.publichealth.nc.gov/cd/hai/prevention/laws.html.

These measures do not represent all possible infections, but were selected because they provide a good overview of how a hospital or state is doing in preventing healthcare-associated infections. These infections are largely preventable when healthcare providers use infection prevention steps recommended by the Centers for Disease Control and Prevention (CDC).

B. WHERE DO THE NUMBERS COME FROM?

Hospitals self-report their HAI data to the CDC and the North Carolina Division of Public Health using a free, web-based software system called the National Healthcare Safety Network (NHSN). CDC and the North Carolina SHARPPS Program provide training to hospital staff on the appropriate use of this system and provide guidance on how to track infections in a standard way.

More information about NHSN can be found here: http://www.cdc.gov/nhsn/.

C. HOW DO I READ THE REPORT?

This report looks at how hospitals in this state performed in terms of infection prevention by displaying how many HAIs they reported during January 1, 2016 – December 31, 2016. There is one key measure used to determine HAI progress in North Carolina as well as nationally; this is referred to as the standardized infection ratios (SIR).

The number that is used to represent how a hospital did compared to the national average is called a standardized infection ratio (SIR). When presenting SIRs, the report data tables and figures show whether a hospital had more ("worse") HAIs, fewer ("better") HAIs, or about the same ("same") number of HAIs compared to the national average (i.e., national experience) based on previous years of reported data. This comparison takes into account differences between hospitals such as types of patients and procedures, as well as other factors such as the hospital's size and whether it is affiliated with a medical school. The predicted value of the national experience for each HAI is also called the "baseline".

Each HAI may use data from a different year or years to come up with this predicted baseline value: CLABSIs and SSIs use data from 2006-2008; CAUTIs use data from 2009; MRSA and CDI LabID events use data from 2010-2011. Because the data used for this HAI report tend to be different for each hospital, the SIR is considered a "best guess" or estimate of observed infections compared to those predicted based on the NHSN baseline experience.

SIRs are presented for the state overall and for each hospital size group; SIRs are also presented by location type (i.e., adult/pediatric units v. neonatal locations). The hospital groups were categorized by total hospital bed counts: less than 100 beds, 100-199 beds, 200-399 beds, and 400+ beds. Hospitals that served as the primary location for medical schools were included in a separate category (primary medical school affiliation). A list of the reporting hospitals in each size category can be found in Appendix E.

Starting in 2017, NC SHARPPS will present SIRs calculated on a new NHSN baseline. All HAIs will use data from 2015 to come up with their predicted baseline values. The 2015 baseline will serve as a new reference point for assessing progress. SIRs calculated under this new baseline cannot be compared to SIRs calculated using the original baselines. The SHARPPS team will provide additional information on the new 2015 baseline in future communications.

Click here for a "Reading Guide" that explains each element of the data tables and figures.

D. WHAT DO THE NUMBERS MEAN?

It's important to understand that numbers alone won't show how well a hospital or North Carolina is doing in preventing HAIs. This report shows how the state performed during a single year (2016), and compares each year's performance to the national average or baseline experience.

In addition to presenting numbers, there are some more complicated calculations performed on the data. These calculations help ensure that any data guesses or estimates (i.e., for the SIR) are as accurate as possible. A larger number of data records will provide more accurate estimates than a smaller number. One of these calculations gives a lower and higher range of values that we use when comparing the number of observed infections to the number of predicted infections; this range tells us whether the difference between the observed and predicted infections is statistically significant or not.

Click here for a "Numbers Guide" that explains any calculations for numbers in the data tables and figures.

E. ORGANISMS IDENTIFIED FROM HAIs

In NHSN, hospitals may report up to three organisms identified from one HAI. These organisms were categorized into one of ten groups, *Candida* & other yeasts/fungi, *Enterobacter*, *Enterococcus*, *Escherichia coli* (*E. coli*), K*lebsiella*, *Pseudomonas*, *Staphylococcus aureus*, *Coagulase negative Staphylococci*, and two "other" categories – Other Gram-Positive Bacteria and Other Gram-Negative Bacteria. The first eight categories or organisms listed represent the leading

causes of HAIs. Many of these organisms are part of the normal flora contained within the human body, found on the skin, or in the gastrointestinal and/or urinary tract. Introduction of these organisms into other areas of the body can lead to infection.

F. THINGS TO CONSIDER WHEN LOOKING AT THE REPORT

A total of 111 North Carolina hospitals reported HAIs in 2016, including 90 short-term acute-care hospitals, nine (9) long-term acute-care hospitals, seven (7) inpatient rehabilitation facilities, and five (5) specialty hospitals. This report includes data from the 90 short-term acute-care hospitals and five (5) specialty hospitals. Facility specific data for all of these hospital types can be found here: http://epi.publichealth.nc.gov/cd/hai/figures.html.

These reports cover data from January 1, 2016 - December 31, 2016. Data were downloaded from the National Healthcare Safety Network (NHSN) on March 24, 2017; any changes made to the data after this date are not reflected in this report. Before reviewing this report, a few clarifications about the data need to be made:

1. **The data within this report are preliminary.** Although efforts were made by hospitals and the North Carolina SHARPPS Program to ensure that the data were accurate and complete, the data are self-reported and have not been formally "double-checked," or validated. Until additional data validation is completed, numbers should be interpreted with caution.

2. **There may be differences in reporting practices among hospitals.** Hospitals with more infection control personnel and resources may be able to identify and report more infections compared to a hospital with fewer infection control resources.

3. **There may be differences between results published by the North Carolina SHARPPS Program and results published elsewhere** (e.g., CMS - Centers for Medicare and Medicaid Services Hospital Compare website). Results may differ due to using data from different time periods, different facility types, different patient populations, and/or different methods of analysis.

4. **The North Carolina SHARPPS Program chose not to present some data** for individual hospital units, procedures or hospitals that did not meet a threshold (minimum value) for the reporting period. The minimum threshold numbers are based on CDC recommendations for reporting healthcare-associated infection data.

5. **The North Carolina SHARPPS Program does not calculate an SIR when the number of predicted infections is less than 1**. In these situations, the "How Does the State Compare to the National Experience" text says "No conclusion." This does not mean that hospitals failed to report data; it only means that the number of patients, devices (central lines or urinary catheters), and/or procedures that were seen during this time period did not meet the established threshold for calculating an SIR. In other words, there is not enough information to make a reliable conclusion about performance on this measure.

6. **Laboratory-Identified Events (LabID Events):** *Clostridium difficile* infections (CDI) and methicillin-resistant *Staphylococcus aureus* (MRSA) bacteremia (blood infection) LabID events rely on laboratory data. Patients did not have to be ill to have a positive result, and a positive result can be determined without requiring clinical information about the patient. This allows for a much less labor-intensive means to track CDI and MRSA infections. Only those LabID events that are acquired in the hospital are displayed in this report. The sensitivity of various testing methodologies, particularly for CDI may vary. NHSN makes risk adjustments to account for these differences when calculating SIRs for LabID CDI events.

7. **In previous reports Critical Access Hospitals were inadvertently included in summary data presented in the annual report.** Overall trends were not impacted by the unintentional inclusion of these facility types. Data from these facilities are not included in the 2016 Annual Report.

III.Statewide Healthcare-Associated Infections

A. Central Line-Associated Bloodstream Infections (CLABSI)

1. CLABSI in Adult/Pediatric ICUs

North Carolina 2016 CLABSI Highlights in Adult/Pediatric Medical, Surgical and Medical/Surgical Wards & ICUs

- North Carolina hospitals reported 590 infections, compared to the 975 infections predicted.
- This was better than the 2006-2008 national experience.
- In North Carolina, there is an upward trend in CLABSI infections when compared to previous years.
- In 2016, North Carolina did not meet the U.S. Department of Health and Human Services goal to reduce CLABSIs by 50% from the 2006-2008 baseline experience.
- The most commonly identified organisms from adult and pediatric CLABSI patients were *Candida* and other yeasts/fungi.

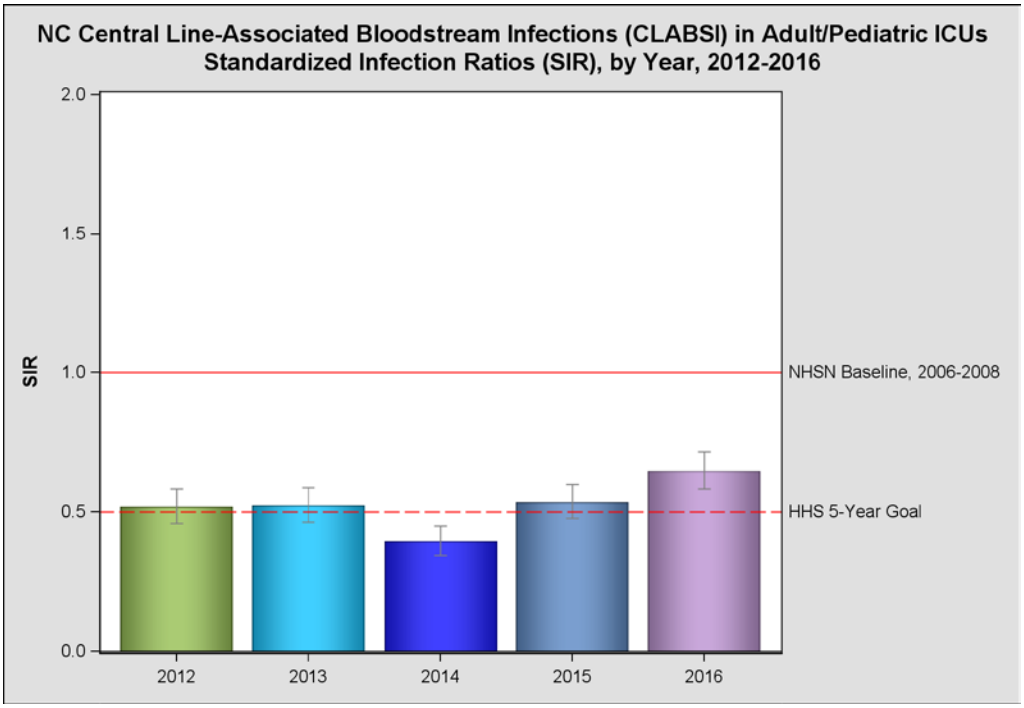
Note: In previous years' reports NICU locations were inadvertently included in Adult/Pediatric summary data. Overall data trends were not impacted by their inclusion.

Table 1. NC Central Line Associated Bloodstream Infections (CLABSI) in Adult/Pediatric Medical, Surgical and Medical/Surgical Wards & ICUs, by Year, 2012-2015

Year	# Observed Infections	# Predicted Infections	How Does North Carolina Compare to the National Experience?
2012	271	524	★Better: Fewer infections than were predicted (better than the national experience)
2013	273	523	★Better: Fewer infections than were predicted (better than the national experience)
2014	215	544	★Better: Fewer infections than were predicted (better than the national experience)
2015*	574	996	★Better: Fewer infections than were predicted (better than the national experience)
2016	590	975	★Better: Fewer infections than were predicted (better than the national experience

*In 2015, CLABSI surveillance was expanded to include medical, surgical and medical/surgical wards.

Figure 1.

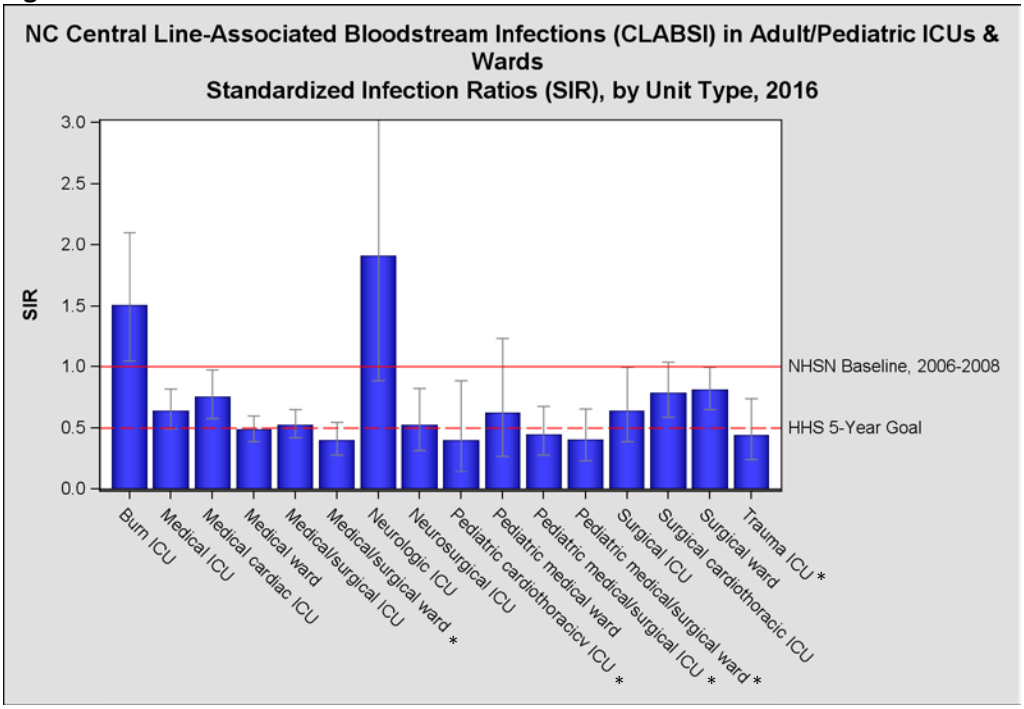


How to Understand Figure 1:

- Annually from 2012-2016, ICUs in North Carolina have observed FEWER infections than predicted, performing BETTER than the 2006-2008 national experience
- The number of observed CLABSI infections in ICUs began trending upwards in 2015; this increasing trend continued in 2016

Note: This figure excludes infections in ward/non-ICU locations, which became reportable in 2015.

Figure 2.

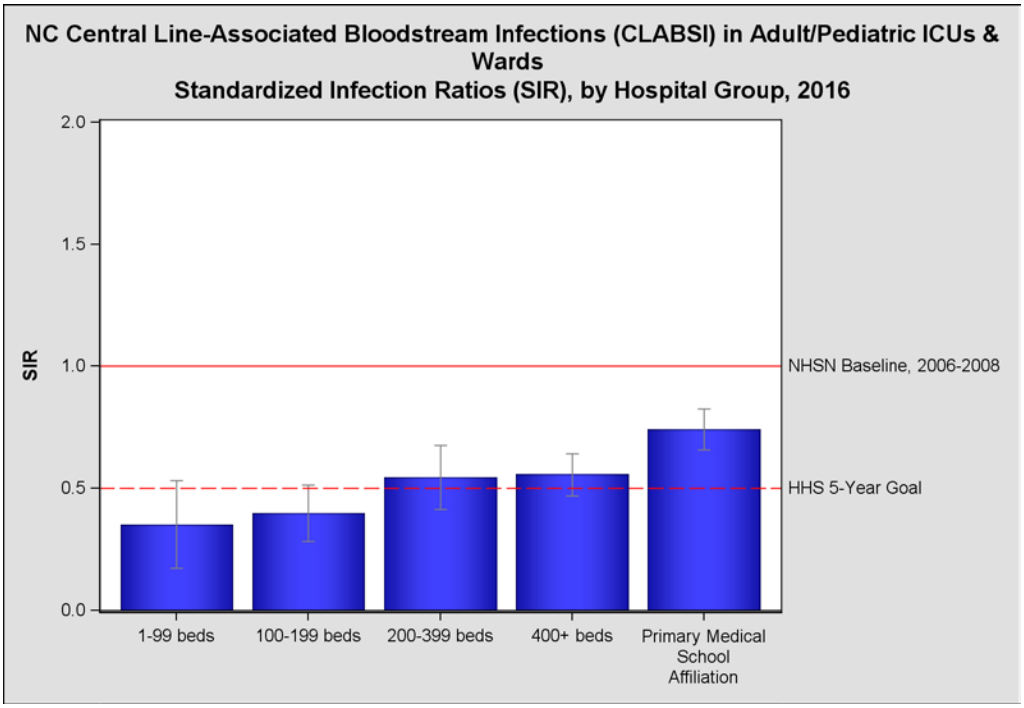


*Locations Meeting the HHS 5-Year Reduction Goal

How to Understand Figure 2:

- There is variability in reported CLABSIs by unit type
- In 2016, neurologic ICUs and burn ICUs had the highest number of observed infections
- In 2016, five adult/pediatric reporting locations met than the HHS 5-year goal to reduce CLABSIs 50% compared to the 2006-2008 national experience

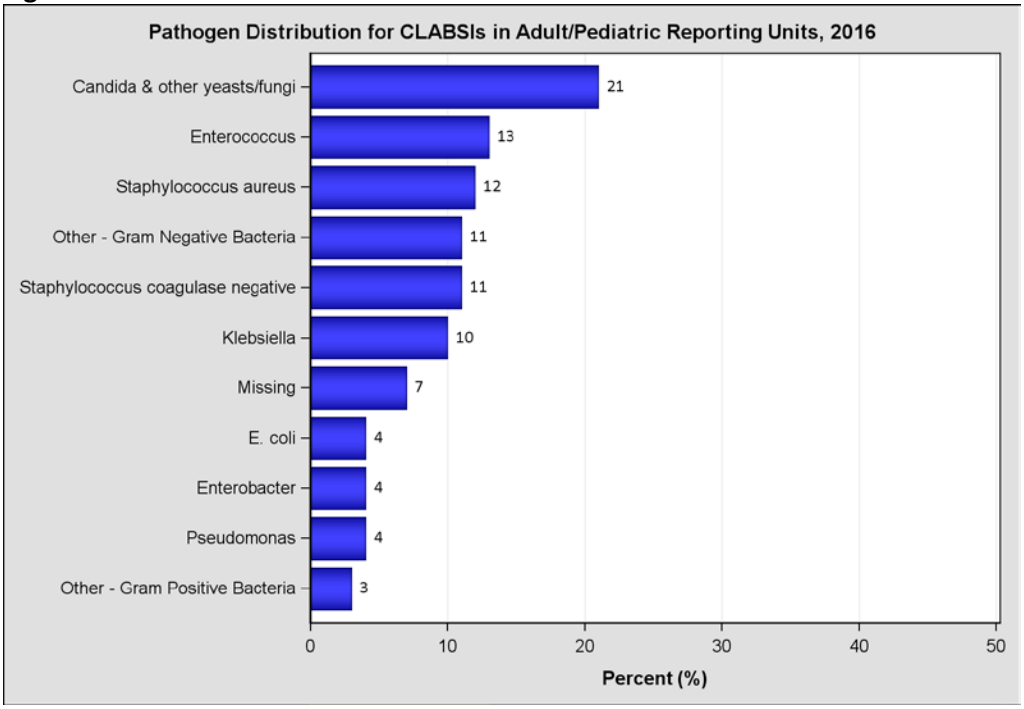
Figure 3.



How to Understand Figure 3:

- In 2016 all hospital groups observed fewer infections than predicted and performed BETTER than predicted compared to the 2006-2008 national experience
- Even after risk adjustment larger facilities experience a larger burden of CLABSIs compared to smaller facilities
- Hospitals with less than 100 beds and 100-199 beds met the targeted HHS 5-year goal to reduce CLABSIs by 50% compared to the national experience

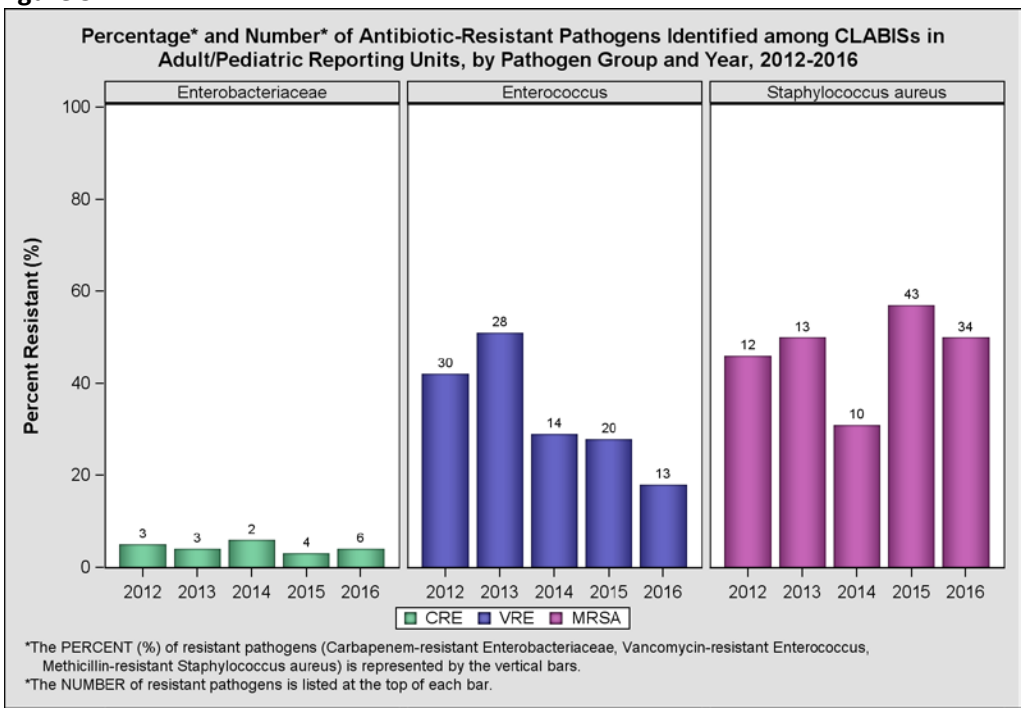
Figure 4.



How to Understand Figure 4:

- In 2016, *Candida* and other yeasts/fungi (21%) were the most common pathogens identified from observed CLABSI infections in adult and pediatric locations
- *Staphylococcus aureus* (13%) and *Enterococcus* (12%) were the second and third most common pathogens identified

Figure 5.



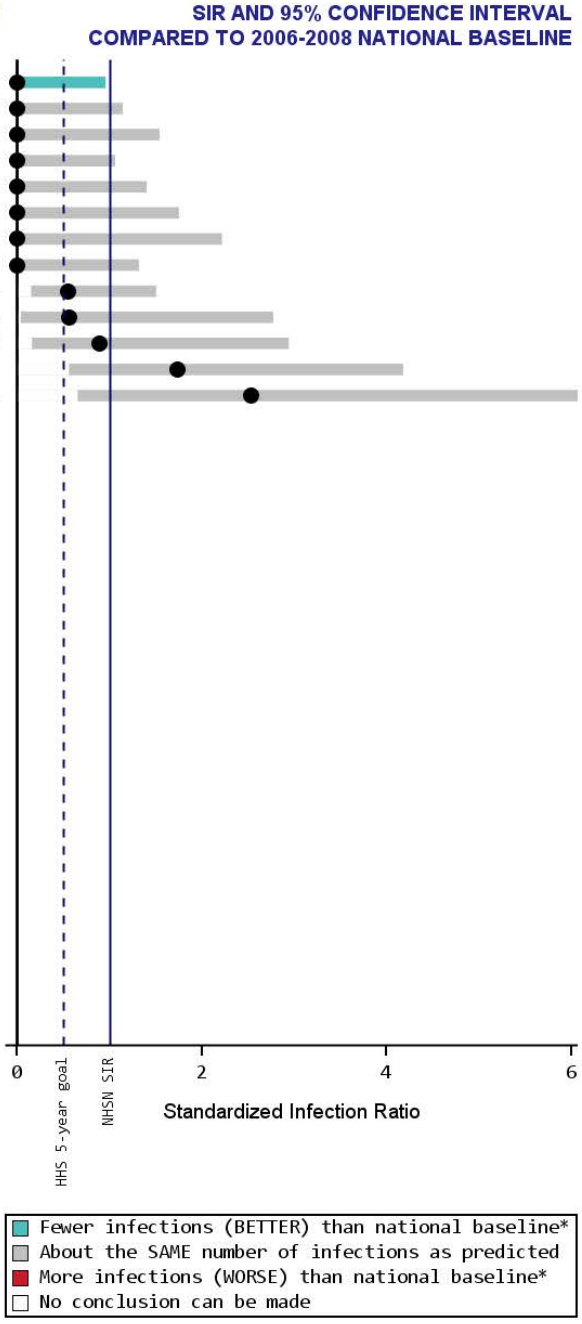
How to Understand Figure 5:

- In 2016, 50% of *Staphylococcus aureus* were resistant to methicillin. This is a 7% decrease from 2015
- In 2016, 13% of *Enterococcus* were resistant to vancomycin, a decrease from previous years
- The percentage of *Enterobacteriaceae* resistant to carbapenems is very low (4%). This is consistent with previous years

The following SIR plots summarize CLABSI infection data among Adult/Pediatric locations for North Carolina hospitals by hospital groups (Appendix E).

CLABSI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with less than 100 Beds

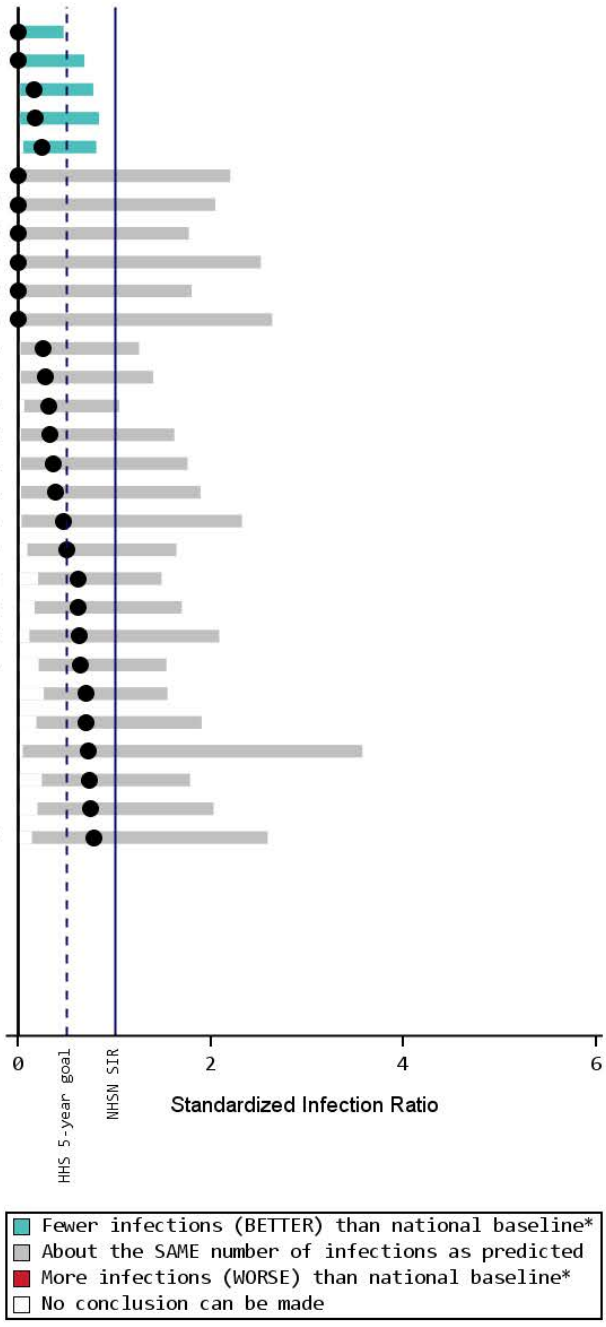
HOSPITAL	OBS	PRED	CLD	SIR
Novant Health Huntersville	0	3.2	2504	0.0
Dlp - Harris Regional Hospital	0	2.6	1818	0.0
Sentara Albemarle Medical Center	0	2.0	1447	0.0
Columbus Regional Healthcare System	0	2.8	1981	0.0
Randolph Hospital	0	2.2	1619	0.0
Vidant Beaufort Hospital	0	1.7	1175	0.0
Granville Medical Center	0	1.4	1012	0.0
Hugh Chatham Memorial Hospital	0	2.3	1788	0.0
Caldwell Memorial Hospital	3	5.5	3882	0.5
Annie Penn Hospital	1	1.8	1374	0.6
Betsy Johnson Regional	2	2.3	1716	0.9
Halifax Regional Medical Center	4	2.3	1820	1.7
Novant Health Brunswick Medical Center	3	1.2	932	2.5
Blue Ridge Regional Hospital	0	0.3	215	NC
Transylvania Regional Hospital	0	0.5	387	NC
McDowell Hospital	0	0.6	468	NC
St Lukes Hospital	0	0.3	223	NC
Cherokee Indian Hospital	0	0.9	633	NC
Murphy Medical Center	0	0.6	448	NC
Angel Medical Center	0	0.5	368	NC
Dosher Memorial Hospital	0	0.2	160	NC
Dlp - Swain Community Hospital	0	0.2	157	NC
Sandhills Regional Medical Center	0	0.6	433	NC
Martin General Hospital	0	0.1	71	NC
Vidant Duplin Hospital	0	0.8	554	NC
The Outer Banks Hospital	0	0.1	86	NC
Vidant Chowan Hospital	0	0.1	97	NC
Vidant Bertie Hospital	NA	NA	N	NC
Kings Mountain Hospital	0	0.7	500	NC
Person Memorial Hospital	1	0.5	290	NC
Wake Forest Baptist Health-Lexington	0	0.6	456	NC
Novant Health Medical Park Hospital	1	0.4	288	NC
Carolinas Healthcare System Anson	NA	NA	N	NC
North Carolina Specialty Hospital	0	0.1	72	NC
Johnston Health Clayton	0	0.9	609	NC
Firsthealth Moore Regional-Hoke	0	0.1	99	NC
Firsthealth Moore Regional-Richmond	0	0.9	687	NC



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 central line days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

CLABSI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 100 to 199 Beds

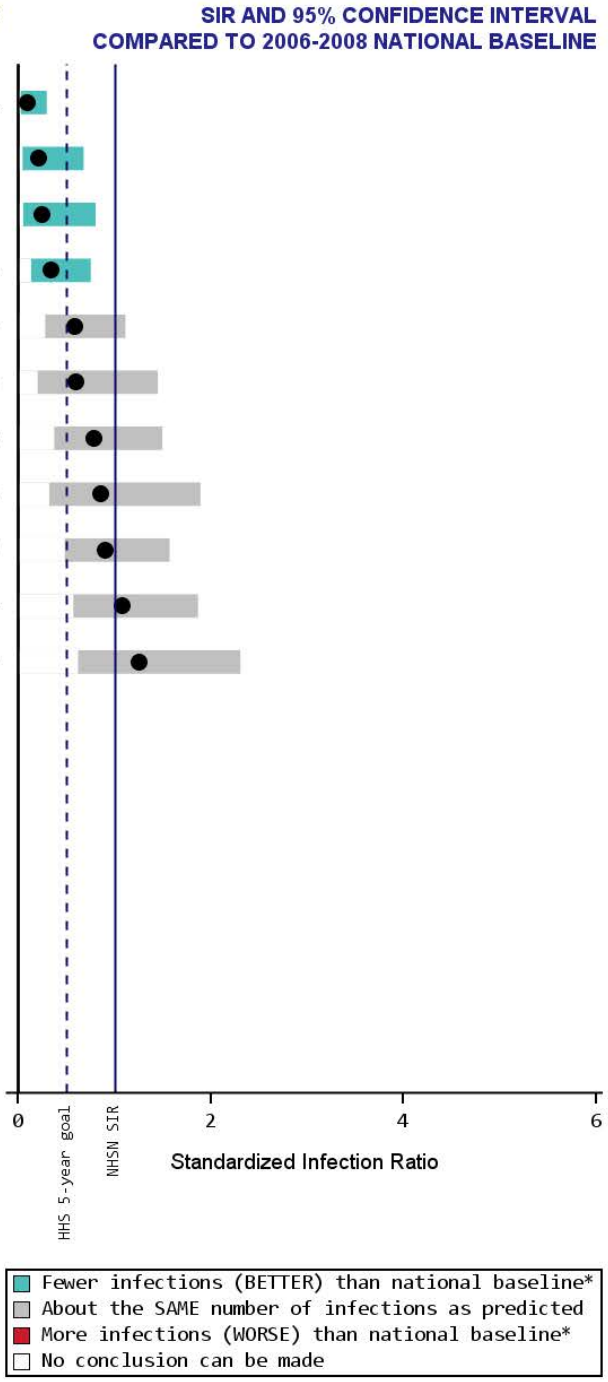
HOSPITAL	OBS	PRED	CLD	SIR
Vidant Edgecombe Hospital	0	6.5	3824	0.0
Carteret General Hospital	0	4.4	3009	0.0
Catawba Valley Medical Center	1	6.4	4339	0.2
Johnston Health	1	6.0	3727	0.2
Frye Regional Medical Center	2	8.3	5323	0.2
Haywood Regional Medical Center	0	1.4	961	0.0
Davis Regional Medical Center	0	1.5	902	0.0
Vidant Roanoke Chowan Hospital	0	1.7	1169	0.0
Sampson Regional Medical Center	0	1.2	947	0.0
Stanly Regional Medical Center	0	1.7	1159	0.0
Morehead Memorial Hospital	0	1.1	856	0.0
Maria Parham Medical Center	1	4.0	2677	0.3
Carolinas Healthcare System Lincoln	1	3.5	2519	0.3
Wesley Long Hospital	2	6.4	4323	0.3
Lake Norman Regional Medical Center	1	3.1	1878	0.3
Onslow Memorial Hospital	1	2.8	2056	0.4
Carolinas Medical Center-University	1	2.6	1920	0.4
Rutherford Regional Medical Center	1	2.1	1614	0.5
Novant Health Matthews Medical Center	2	4.0	3117	0.5
Wilson Medical Center	4	6.5	4447	0.6
Iredell Memorial Hospital	3	4.8	3525	0.6
Carolinas Healthcare System Blue Ridge	2	3.2	2089	0.6
Carolinas Medical Center-Mercy	4	6.3	4141	0.6
Duke Raleigh Hospital	5	7.2	4903	0.7
WakeMed Cary Hospital	3	4.3	3233	0.7
Novant Health Thomasville Medical Center	1	1.4	1056	0.7
Lenoir Memorial Hospital	4	5.4	3991	0.7
Carolinas Medical Center-Union	3	4.0	2925	0.7
Central Carolina Hospital	2	2.6	1736	0.8
Pardee Hospital	2	0.9	757	NC
ARHS-Watauga Medical Center	0	0.9	738	NC
Northern Hospital Of Surry County	0	0.8	592	NC
Scotland Memorial Hospital	0	0.4	310	NC
Wilkes Regional Medical Center	0	0.1	83	NC
Women's Hospital	NA	NA	N	NC



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 central line days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

CLABSI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 200 to 399 Beds

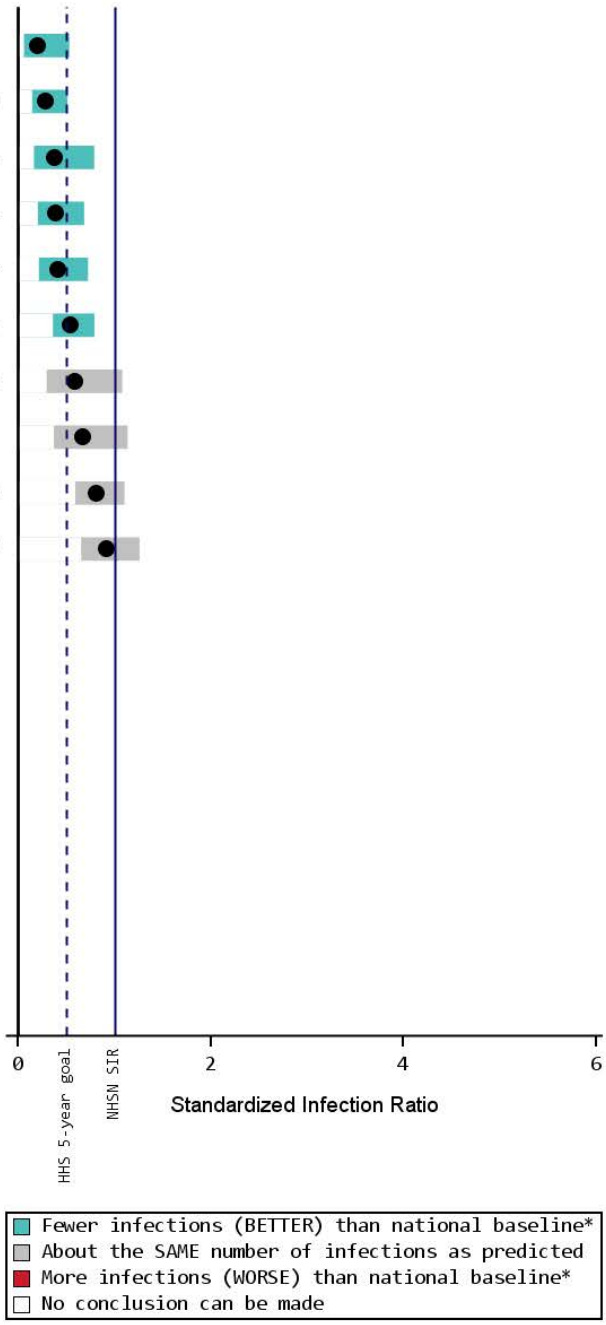
HOSPITAL	OBS	PRED	CLD	SIR
FirstHealth Moore Regional Hospital	2	23.2	15755	0.1
CarolinaEast Medical Center	2	9.9	7456	0.2
High Point Regional Health System	2	8.3	5477	0.2
Duke Regional Hospital	5	14.9	8691	0.3
Wayne Memorial Hospital	8	13.8	9295	0.6
Carolinas Healthcare System Cleveland	4	6.7	4514	0.6
Southeastern Regional Medical Center	8	10.2	7024	0.8
Alamance Regional Medical Center	5	5.9	4138	0.8
Carolinas Medical Center-Pineville	11	12.2	7718	0.9
Nash Health Care Systems	11	10.3	6982	1.1
Novant Health Rowan Medical Center	9	7.2	4843	1.3



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 central line days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

CLABSI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 400 or More Beds

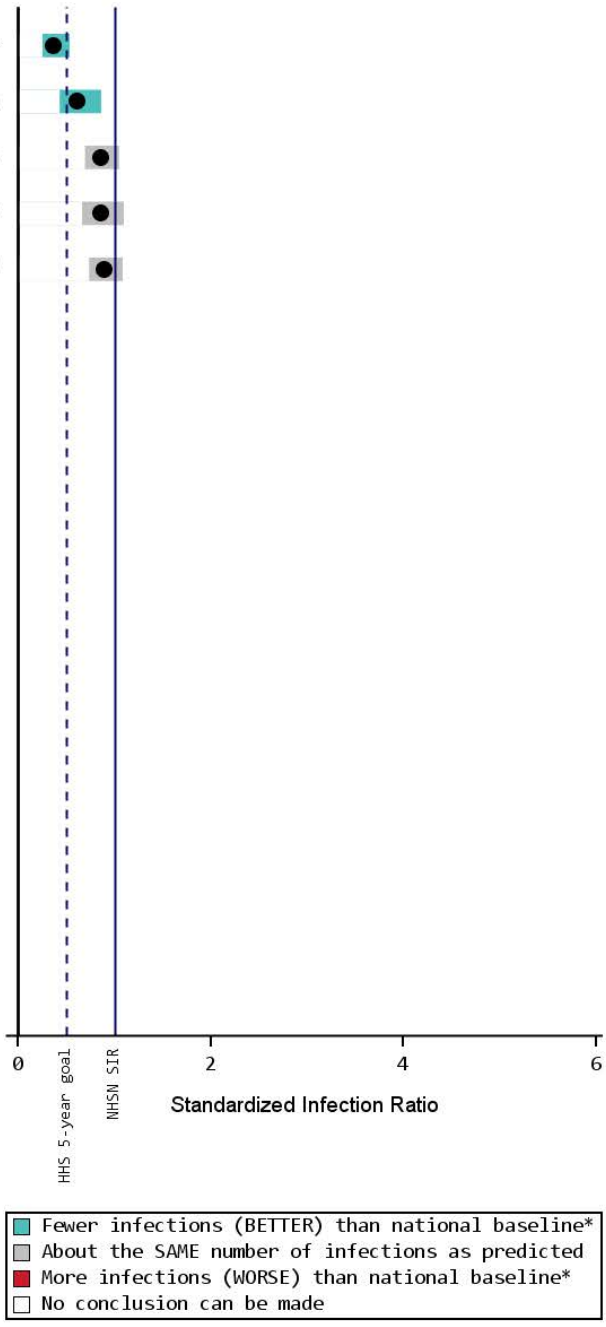
HOSPITAL	OBS	PRED	CLD	SIR
Cape Fear Valley Health System	3	15.7	10744	0.2
New Hanover Regional Medical Center	9	32.9	18396	0.3
Carolinas Medical Center-Northeast	6	16.0	10889	0.4
Moses Cone Hospital	10	26.5	16026	0.4
Rex Healthcare	10	25.0	16429	0.4
Mission Hospital	24	45.1	25340	0.5
Gaston Memorial Hospital	9	15.4	8386	0.6
Novant Health Presbyterian Medical	12	18.1	9714	0.7
WakeMed	39	48.3	24863	0.8
Novant Health Forsyth Medical Center	35	38.5	23616	0.9



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 central line days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

CLABSI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with Primary Medical School Affiliation

HOSPITAL	OBS	PRED	CLD	SIR
Carolinas Medical Center	26	72.0	31197	0.4
Vidant Medical Center	31	51.1	27802	0.6
Duke University Hospital	88	104	57987	0.8
Wake Forest University Baptist Medical	59	69.6	33445	0.8
UNC Health Care	100	113	50636	0.9



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 central line days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

2. CLABSI in Neonatal Intensive Care Units

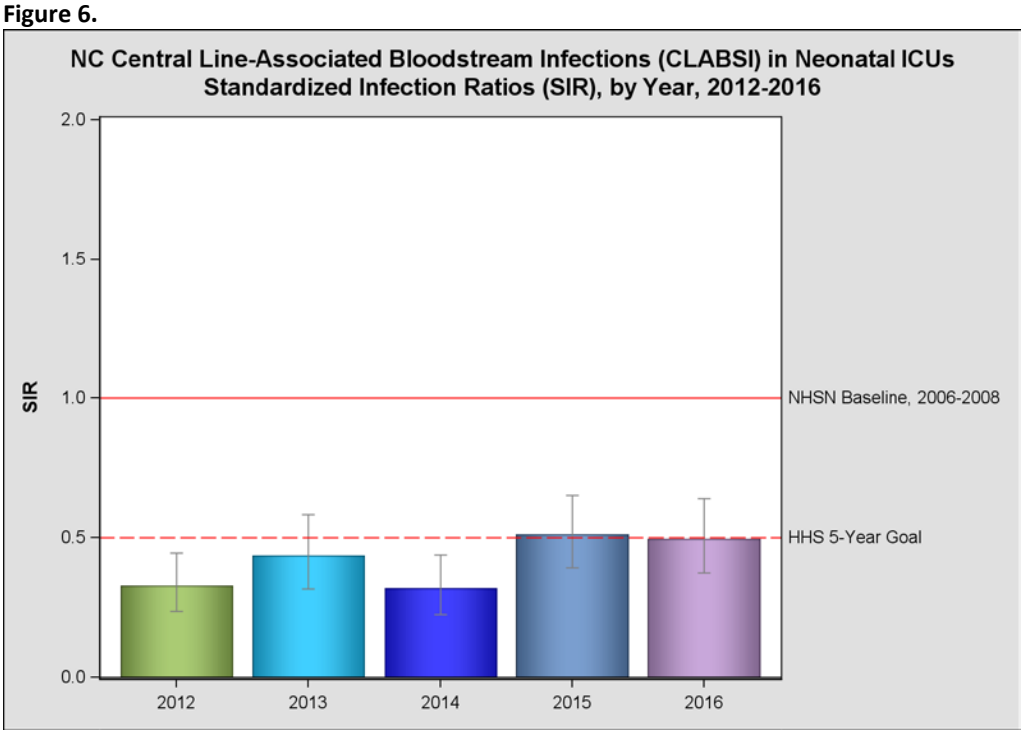
North Carolina 2016 CLABSI Highlights in NICUs

- In 2016, North Carolina hospitals reported 54 infections in neonatal ICUs, compared to the 109 infections that were predicted. This was better than the 2006-2008 national experience.
- The most commonly identified organism from NICU CLABSI patients was *Staphylococcus aureus*.
- While an increase of CLABSIs in neonatal intensive care units was seen in 2015, the number of observed CLABSIs in neonatal ICUs in 2016 is similar to the number observed in 2015.

Table 2. NC Central Line Associated Bloodstream Infections (CLABSI) in neonatal ICUs, by year, 2012-2016

Year	# Observed Infections	# Predicted Infections	How Does North Carolina Compare to the National Experience?
2012	**39**	**119**	**★Better: Fewer infections than were predicted (better than the national experience)**
2013	**42**	**97**	**★Better: Fewer infections than were predicted (better than the national experience)**
2014	**34**	**107**	**★Better: Fewer infections than were predicted (better than the national experience)**
2015	**60**	**118**	**★Better: Fewer infections than were predicted (better than the national experience)**
2016	**54**	**109**	**★Better: Fewer infections than were predicted (better than the national experience)**

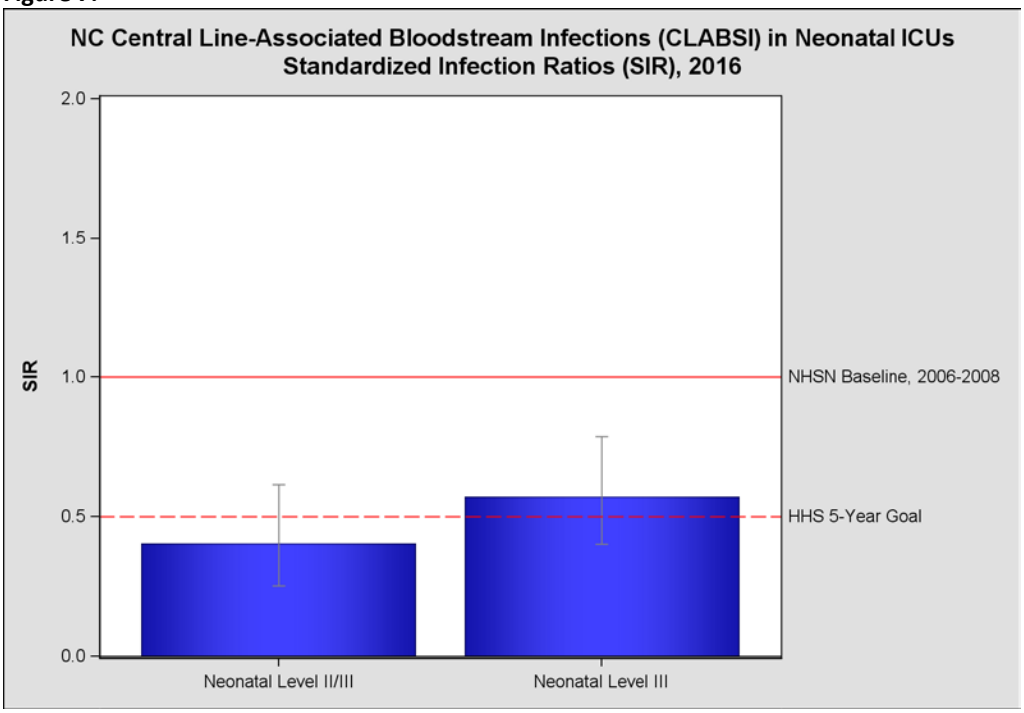
Figure 6.



How to Understand Figure 6:

- Since 2012, NC NICUs have reported fewer CLABSIs then predicted, performing BETTER than predicted based on the 2006-2008 national experience
- The number of observed infections in 2016 is similar to the previous year

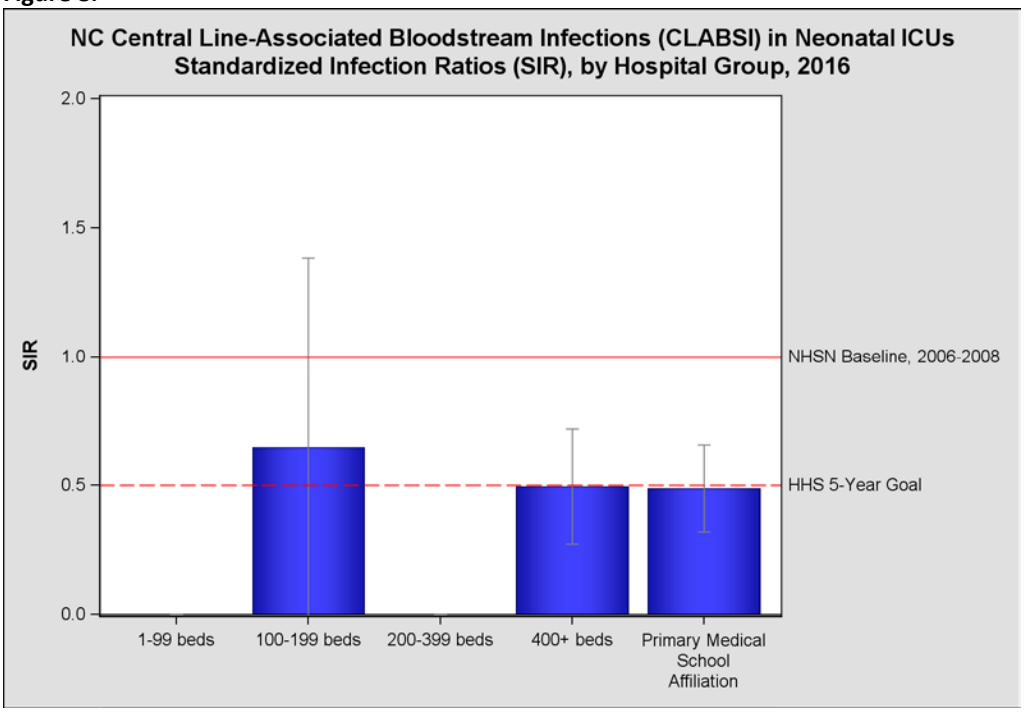
Figure 7.



How to Understand Figure 7:

- In 2016, both level II/III and level III Neonatal ICUs observed fewer infections than predicted, performing BETTER than the national experience
- Neonatal level II/III ICUs met the HHS 5 year goal to reduce CLABSIs by 50% from the 2006-2008 national baseline
- Neonatal level III ICUs did not meet the HHS 5 year goal

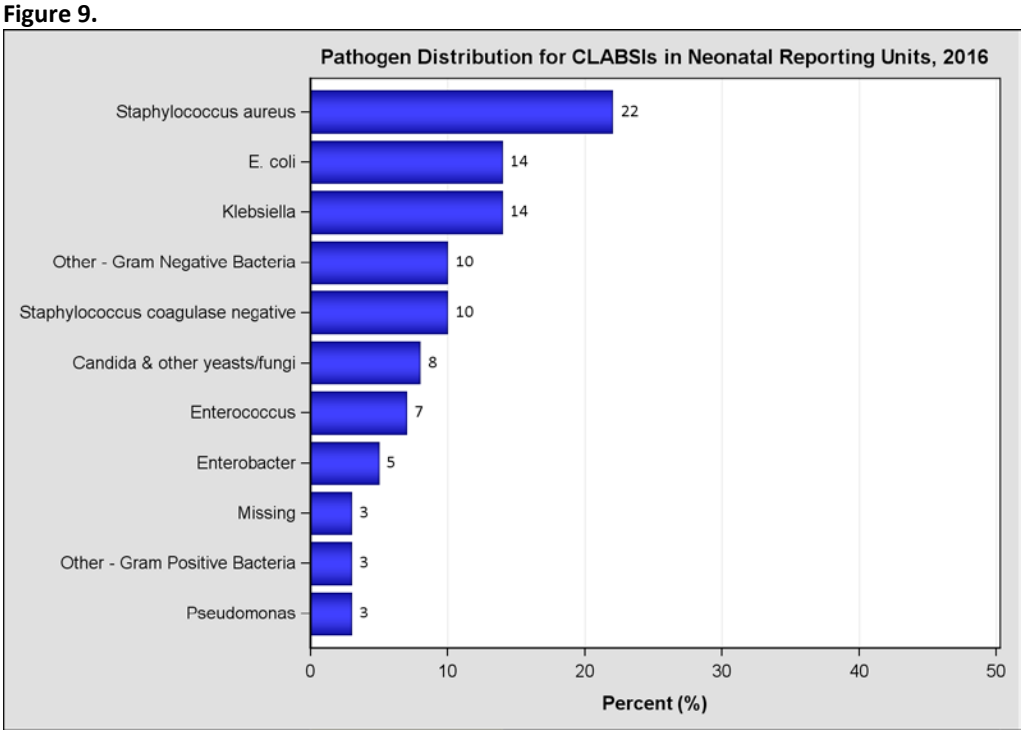
Figure 8.



How to Understand Figure 8:

- Not all hospital size groups have NICU locations
- Among hospitals with 400+ beds and those with a primary medical school affiliation, the number of reported CLABSIs reported was less than predicted; these locations performed BETTER than the 2006-2008 national experience
- NICUs in hospitals with 100-199 beds observed the SAME number of infections as predicted by the national experience

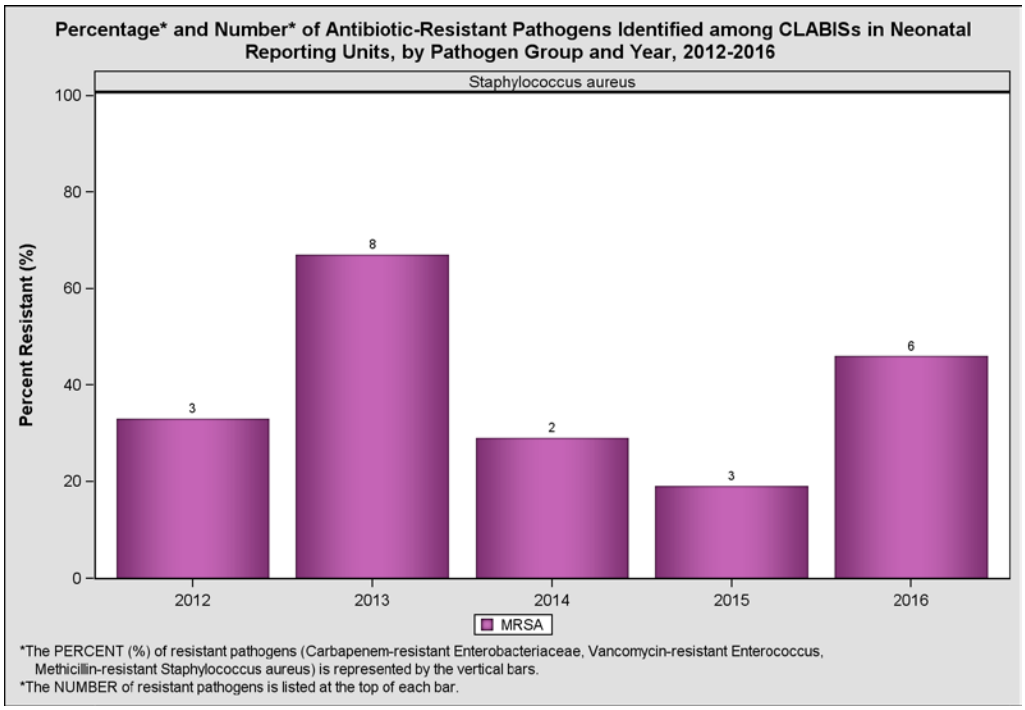
Figure 9.



How to Understand Figure 9:

- In 2016, *Staphylococcus aureus* (22%), *E. Coli* (14%) and K*lebsiella* (14%) were the most common pathogens identified from CLABSIs in NICU locations
- The most common pathogen identified from CLABSIs in NICU locations (*Staphylococcus aureus*) differs from the most common pathogen from CLABSIs in adult/pediatric locations (*Candida* and other yeasts/fungi)

Figure 10.



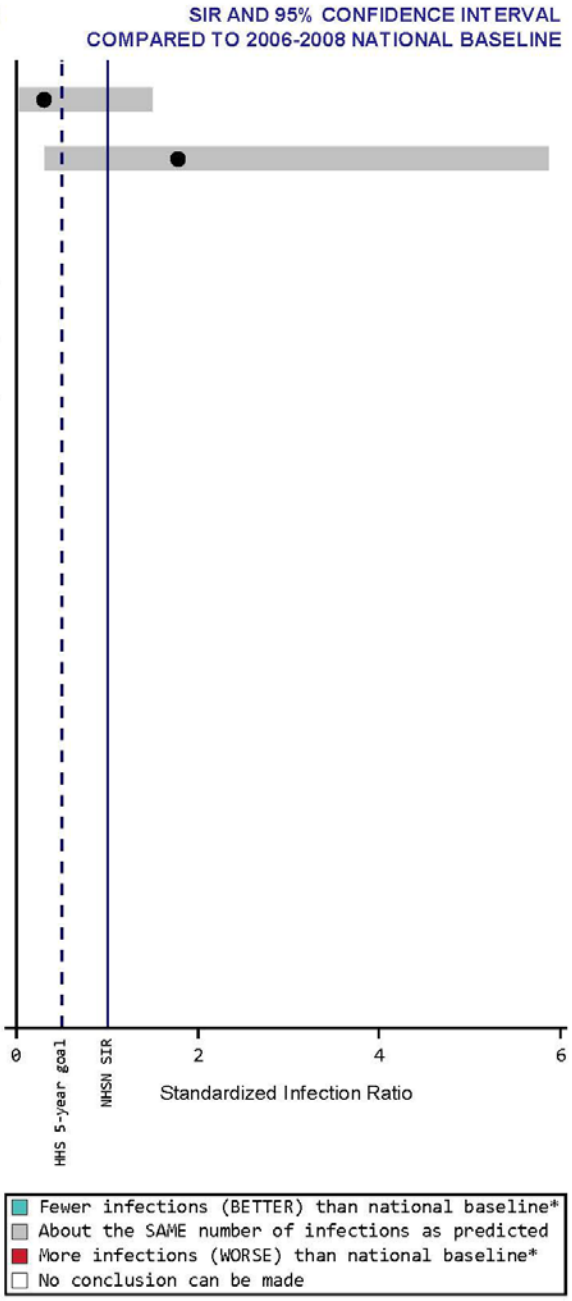
How to Understand Figure 10:

- In 2016, 46% of *Staphylococcus aureus* identified among observed CLABSI infections in NICUs were resistant to methicillin. This is a higher percentage than in previous years
- Small numbers of *Staphylococcus aureus* identified among observed CLABSIs in NICUs contributes to the variability of resistance from year to year

The following SIR plots summarize CLABSI infection data among NICUs in North Carolina hospitals by hospital groups (Appendix E).

CLABSI in Neonatal ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 100 to 199 Beds

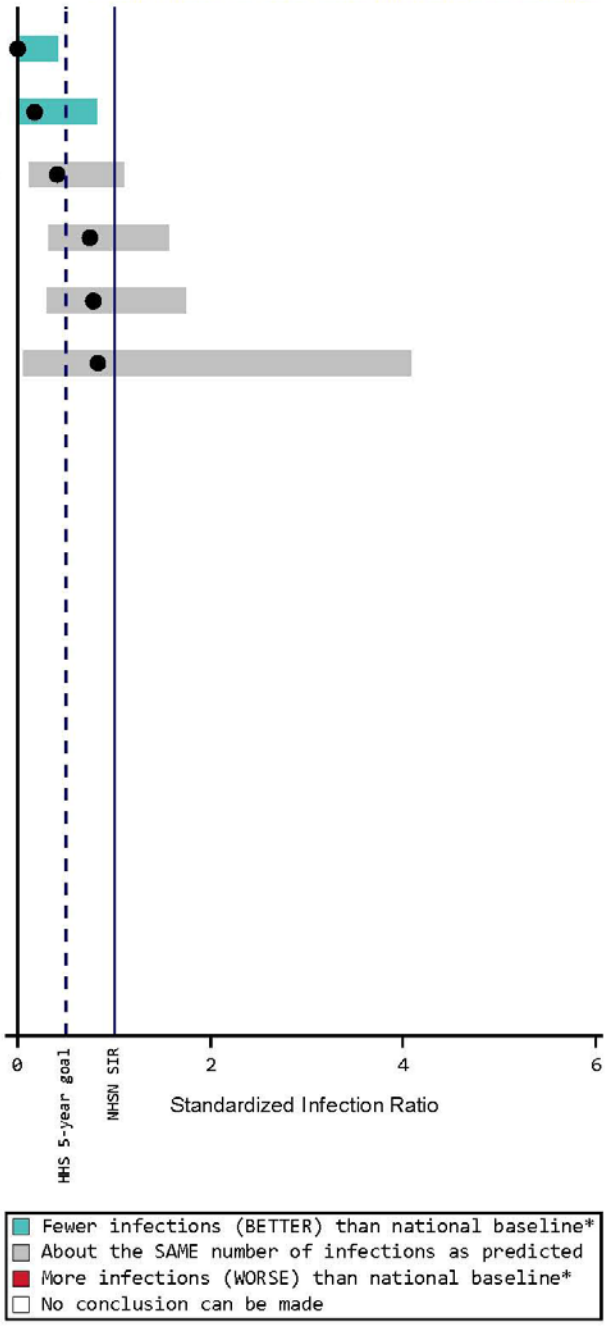
HOSPITAL	OBS	PRED	CLD	SIR
Women's Hospital	1	3.3	1588	0.3
Catawba Valley Medical Center	2	1.1	600	1.8
Carolinas Medical Center-University	0	0.2	87	NC
Lake Norman Regional Medical Center	NA	NA	N	NA
Novant Health Matthews Medical Center	NA	NA	N	NA
Onslow Memorial Hospital	NA	NA	N	NA



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 catheter days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

CLABSI in Neonatal ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 400 or More Beds

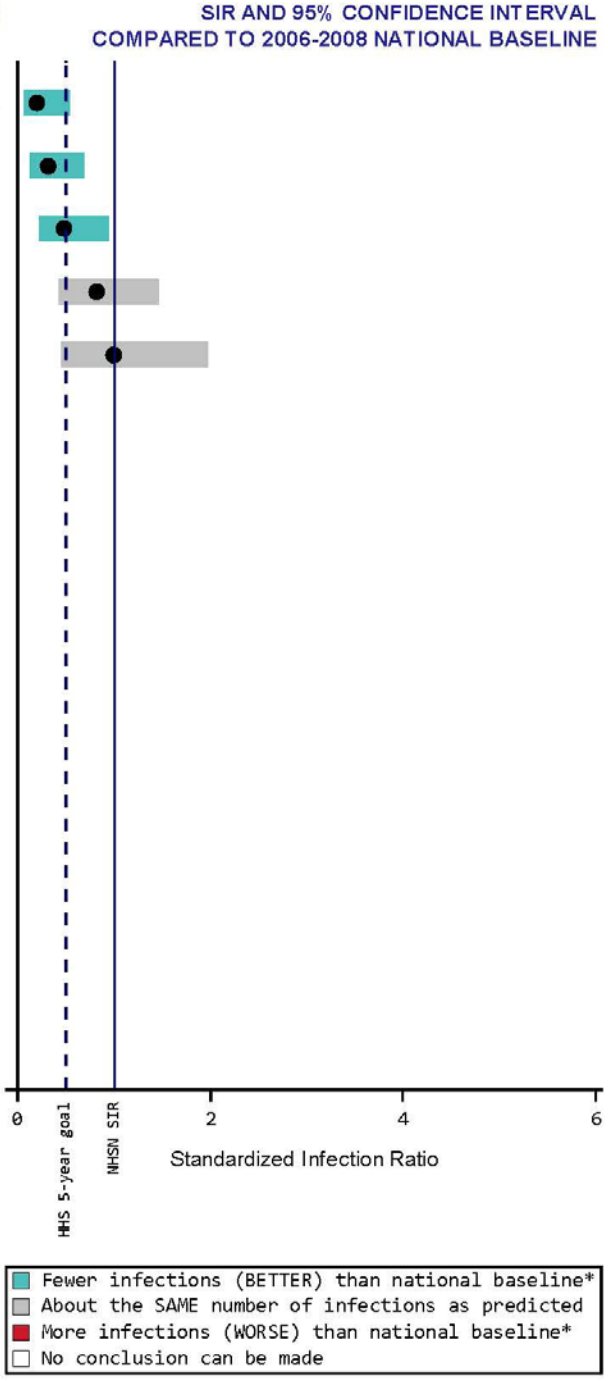
HOSPITAL	OBS	PRED	CLD	SIR
New Hanover Regional Medical Center	0	7.2	2673	0.0
Mission Hospital	1	6.0	2322	0.2
Novant Health Presbyterian Medical	3	7.5	2744	0.4
WakeMed	6	8.0	3395	0.8
Novant Health Forsyth Medical Center	5	6.4	2103	0.8
Cape Fear Valley Health System	1	1.2	387	0.8
Rex Healthcare	0	0.5	292	NC
Carolinas Medical Center-Northeast	2	0.9	396	NC
Gaston Memorial Hospital	1	0.5	295	NC



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 catheter days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

CLABSI in Neonatal ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with Primary Medical School Affiliation

HOSPITAL	OBS	PRED	CLD	SIR
Wake Forest University Baptist Medical	3	15.2	5365	0.2
Carolinas Medical Center	5	16.2	7015	0.3
Duke University Hospital	7	14.8	5889	0.5
UNC Health Care	10	12.2	5067	0.8
Vidant Medical Center	7	7.0	2749	1.0



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 catheter days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

B. Catheter-Associated Urinary Tract Infections (CAUTI)

North Carolina 2016 CAUTI Highlights

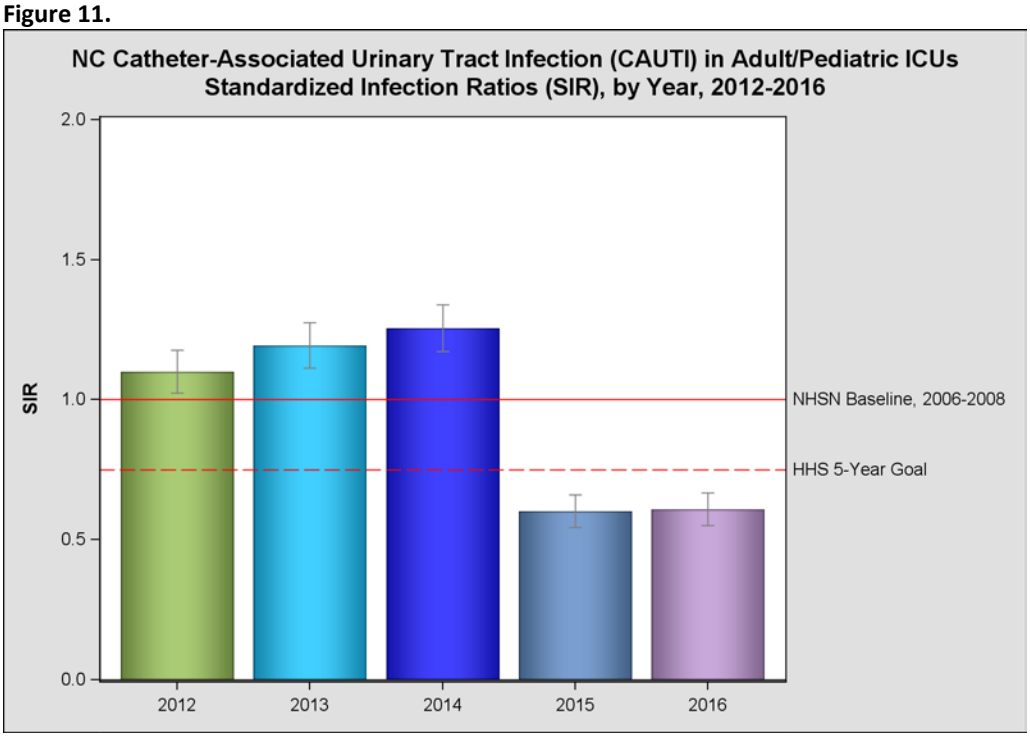
- In 2016, North Carolina hospitals reported 660 CAUTI infections, compared to the 1,207 infections that were predicted.
- This was better than the 2009 national experience.
- This was the lowest number of CAUTIs observed since North Carolina hospitals began reporting in 2012.
- North Carolina met the U.S. Department of Health and Human Services goal to reduce CAUTIs nationally by 25% from the 2009 baseline in 2015 and 2016.
- The most commonly identified organisms were *E. coli* and *Enterococcus*
- MRSA was the most commonly identified antibiotic-resistant pathogen.

Table 3. NC Catheter-Associated Urinary Tract Infections (CAUTI) in ICUs and wards, by year, 2012-2016

Year	# Observed Infections	# Predicted Infections	How Does North Carolina Compare to the National Experience?
2012	**789**	**718**	**✖ Worse: More infections than were predicted (worse than the national experience)**
2013	**832**	**698**	**✖ Worse: More infections than were predicted (worse than the national experience)**
2014	**861**	**687**	**✖ Worse: More infections than were predicted (worse than the national experience)**
2015*	**679**	**1227**	**★Better: Fewer infections than were predicted (better than the national experience)**
2016*	**660**	**1207**	**★Better: Fewer infections than were predicted (better than the national experience)**

*In 2015, CAUTI surveillance was expanded to include Medical, Surgical and Medical/Surgical wards. Infections with only yeast, mold, dimorphic fungi or parasites identified were also excluded beginning in 2015.

Figure 11.

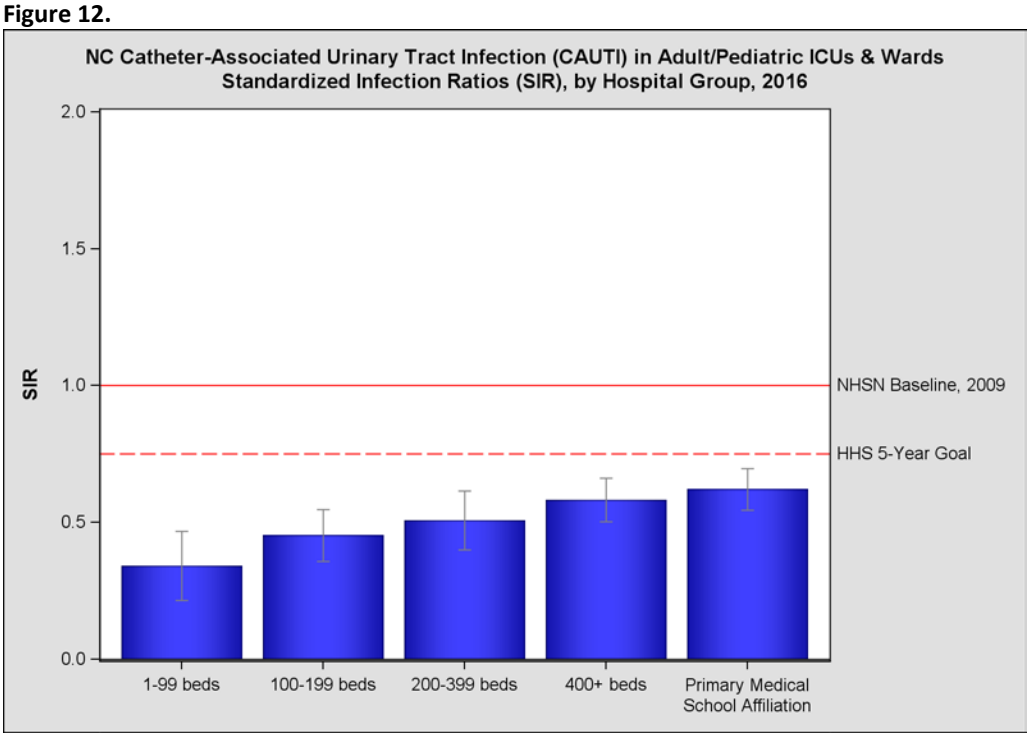


* This figure excludes ward locations, which became reportable in 2015.

How to Understand Figure 11:

- In 2016, North Carolina observed fewer infections than predicted, performing BETTER than the national experience
- In 2016, North Carolina met the HHS 5-year goal to decrease CAUTIs by 25% for the second year in a row
- Some of the reduction in reported CAUTIs can be explained by the 2015 definition change which excludes yeasts, mold, dimorphic fungi and parasites

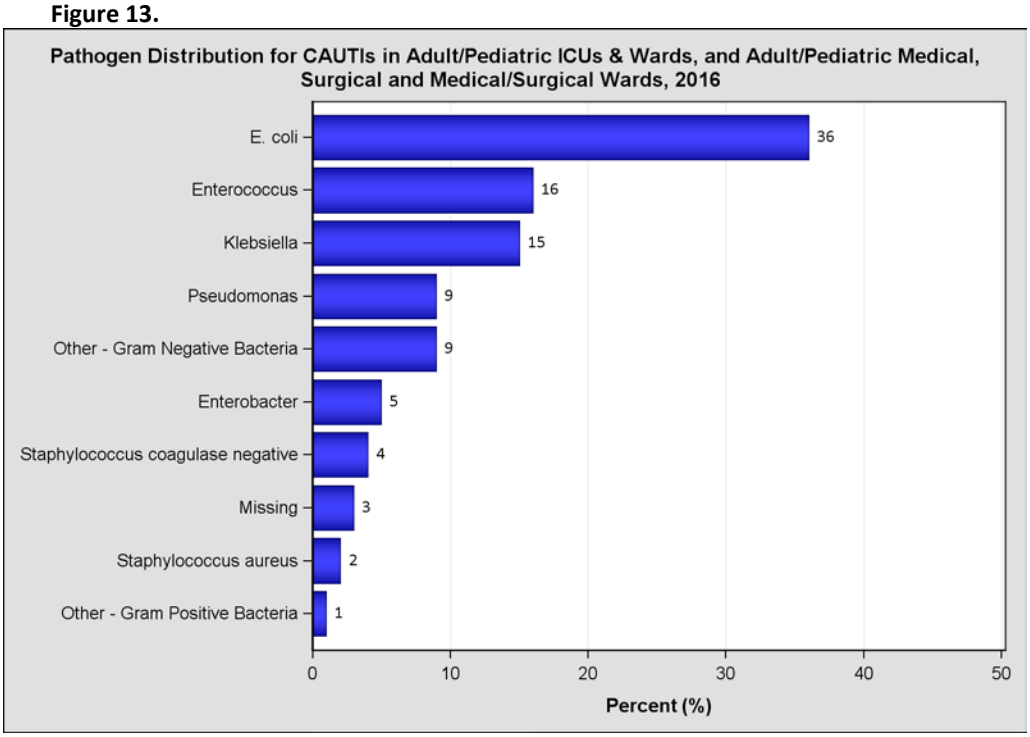
Figure 12.



How to Understand Figure 12:

- In 2016, all hospital groups reported fewer infections than predicted, performing BETTER than the 2009 national experience
- This year all hospital groups met the HHS 5-year goal of a 25% reduction in CAUTIs
- The burden of CAUTI infections trends upward with increasing hospital size

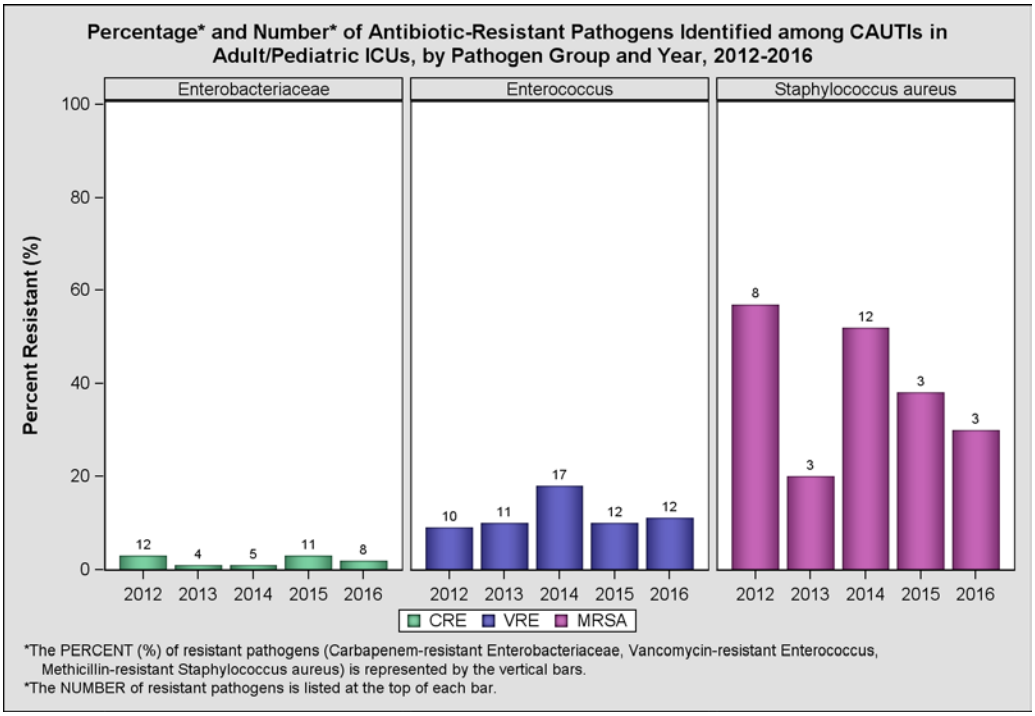
Figure 13.



How to Understand Figure 13:

- *E. coli* (36%), *Enterococcus* (16%), and *Klebsiella* (15%) were the most commonly identified pathogens among reported CAUTI infections in 2016

Figure 14.



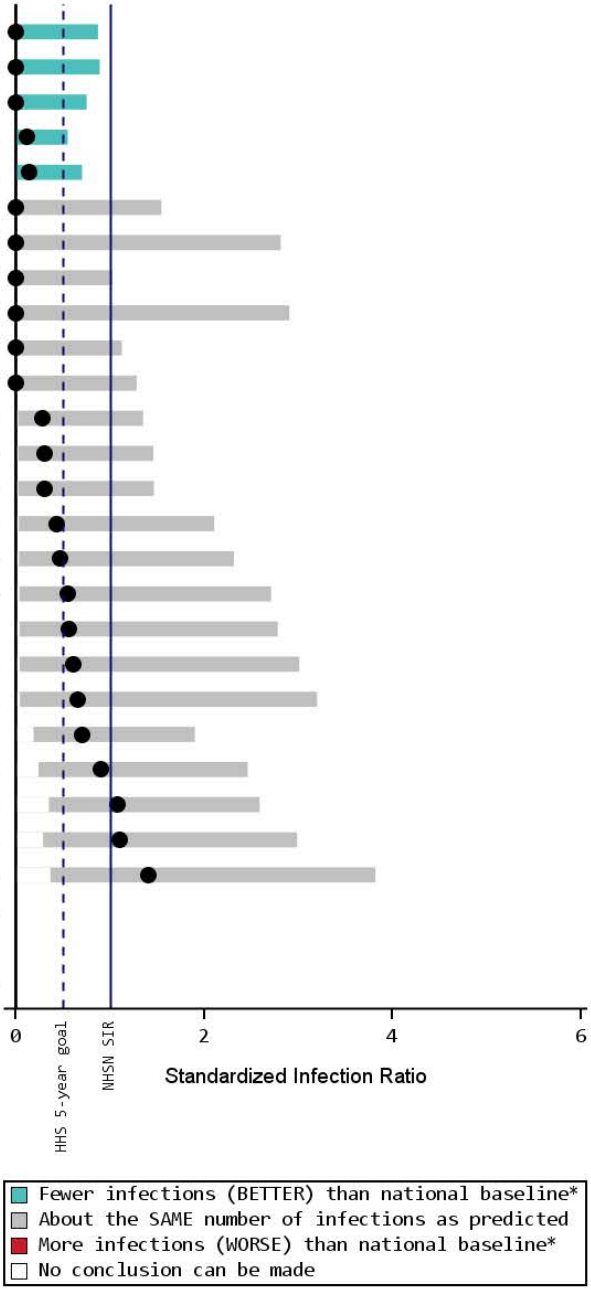
How to Understand Figure 14:

- In 2016, 30% of *Staphylococcus aureus* identified among reported CAUTIs were resistant to methicillin – this continues a downward trend since 2014
- The percentage of antibiotic resistant *Staphylococcus aureus* and antibiotic resistant *Enterobacteriaceae* identified among reported CAUTIs was similar to previous years

The following SIR plots summarize CAUTI infection data for North Carolina hospitals by hospital groups (Appendix E).

CAUTI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with less than 100 Beds

HOSPITAL	OBS	PRED	CLD	SIR
Randolph Hospital	0	3.5	2405	0.0
Novant Health Brunswick Medical Center	0	3.4	2237	0.0
Hugh Chatham Memorial Hospital	0	4.0	2723	0.0
Caldwell Memorial Hospital	1	9.1	5884	0.1
Betsy Johnson Regional	1	7.1	4690	0.1
Murphy Medical Center	0	2.0	1317	0.0
Martin General Hospital	0	1.1	713	0.0
Granville Medical Center	0	3.0	2002	0.0
Vidant Duplin Hospital	0	1.0	729	0.0
North Carolina Specialty Hospital	0	2.7	1493	0.0
Johnston Health Clayton	0	2.4	1239	0.0
Novant Health Medical Park Hospital	1	3.7	2043	0.3
Novant Health Huntersville	1	3.4	2126	0.3
Sentara Albemarle Medical Center	1	3.4	2327	0.3
Vidant Beaufort Hospital	1	2.4	1408	0.4
Kings Mountain Hospital	1	2.1	1181	0.5
Firsthealth Moore Regional-Richmond	1	1.8	1251	0.5
Sandhills Regional Medical Center	1	1.8	996	0.6
Person Memorial Hospital	1	1.6	854	0.6
McDowell Hospital	1	1.5	1078	0.6
Halifax Regional Medical Center	3	4.3	2837	0.7
Annie Penn Hospital	3	3.3	2247	0.9
Dlp - Harris Regional Hospital	4	3.7	2331	1.1
Columbus Regional Healthcare System	3	2.7	1795	1.1
Wake Forest Baptist Health-Lexington	3	2.1	1517	1.4
Carolinas Healthcare System Anson	NA	NA	N	NA
Firsthealth Moore Regional-Hoke	0	0.1	62	NC
Cape Fear Valley Hoke Hospital	NA	NA	N	NA



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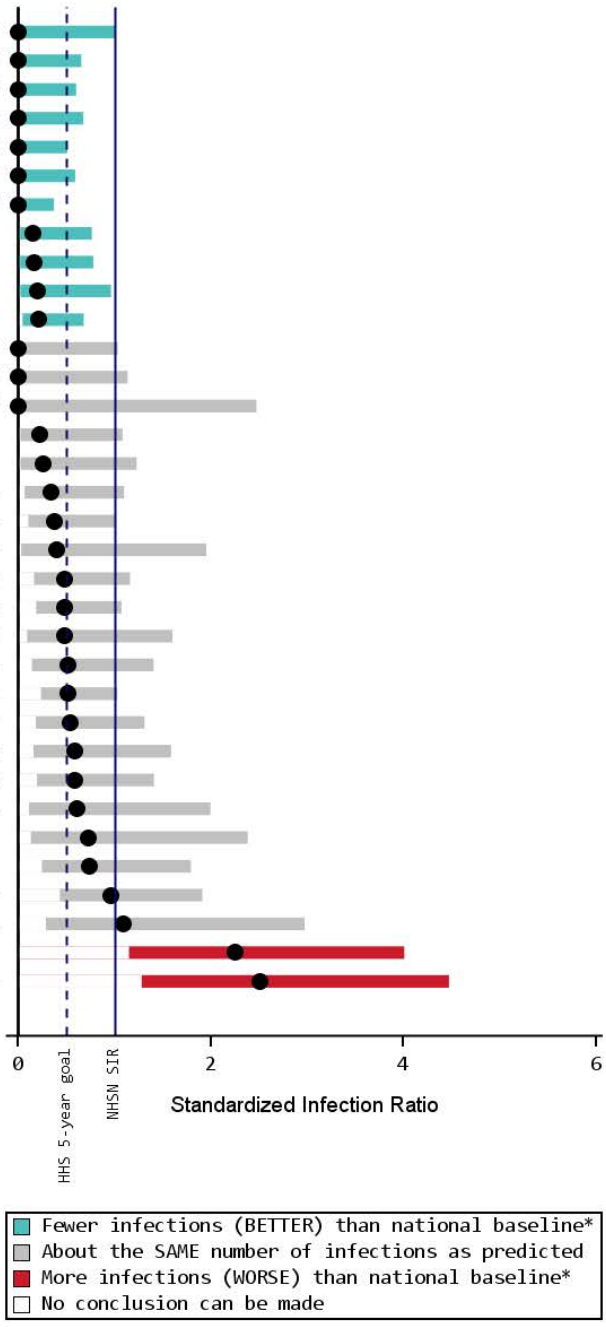
CAUTI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 100 to 199 Beds

HOSPITAL	OBS	PRED	CLD	SIR
Davis Regional Medical Center	0	3.0	1550	0.0
Sampson Regional Medical Center	0	4.7	3095	0.0
Maria Parham Medical Center	0	5.1	3242	0.0
Onslow Memorial Hospital	0	4.5	3141	0.0
Carolinas Healthcare System Blue Ridge	0	6.0	3308	0.0
Central Carolina Hospital	0	5.2	3129	0.0
Duke Raleigh Hospital	0	8.3	5262	0.0
Iredell Memorial Hospital	1	6.6	4404	0.2
Novant Health Matthews Medical Center	1	6.4	4270	0.2
Morehead Memorial Hospital	1	5.2	3254	0.2
Catawba Valley Medical Center	2	9.9	6571	0.2
Haywood Regional Medical Center	0	2.9	1922	0.0
Northern Hospital Of Surry County	0	2.7	1812	0.0
Women's Hospital	0	1.2	791	0.0
Carolinas Healthcare System Lincoln	1	4.6	3019	0.2
Stanly Regional Medical Center	1	4.1	2296	0.2
Lake Norman Regional Medical Center	2	6.1	3162	0.3
Carolinas Medical Center-Mercy	3	8.1	4376	0.4
Carolinas Medical Center-University	1	2.5	1781	0.4
WakeMed Cary Hospital	4	8.4	5343	0.5
Johnston Health	5	10.4	5488	0.5
Pardee Hospital	2	4.2	2883	0.5
Wilkes Regional Medical Center	3	5.9	3489	0.5
Frye Regional Medical Center	7	13.6	6401	0.5
Wilson Medical Center	4	7.4	4680	0.5
Carolinas Medical Center-Union	3	5.2	3683	0.6
Vidant Edgecombe Hospital	4	6.9	3391	0.6
Novant Health Thomasville Medical Center	2	3.3	2296	0.6
Vidant Roanoke Chowan Hospital	2	2.8	1715	0.7
Wesley Long Hospital	4	5.4	3925	0.7
Lenoir Memorial Hospital	7	7.3	4564	1.0
ARHS-Watauga Medical Center	3	2.8	1846	1.1
Rutherford Regional Medical Center	10	4.5	2893	2.2
Carteret General Hospital	10	4.0	2472	2.5
Scotland Memorial Hospital	3	0.9	610	NC



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CAUTI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 200 to 399 Beds

HOSPITAL	OBS	PRED	CLD	SIR
Wayne Memorial Hospital	2	17.0	10447	0.1
Duke Regional Hospital	4	16.9	8154	0.2
Nash Health Care Systems	3	10.3	6622	0.3
Carolinas Healthcare System Cleveland	3	9.8	6450	0.3
Carolinas Medical Center-Pineville	8	20.4	11312	0.4
Southeastern Regional Medical Center	13	23.1	13921	0.6
FirstHealth Moore Regional Hospital	19	32.4	19285	0.6
Novant Health Rowan Medical Center	6	9.0	6124	0.7
Alamance Regional Medical Center	4	5.9	4102	0.7
High Point Regional Health System	11	14.3	8681	0.8
CarolinaEast Medical Center	13	10.0	6778	1.3

SIR AND 95% CONFIDENCE INTERVAL
COMPARED TO 2006-2008 NATIONAL BASELINE

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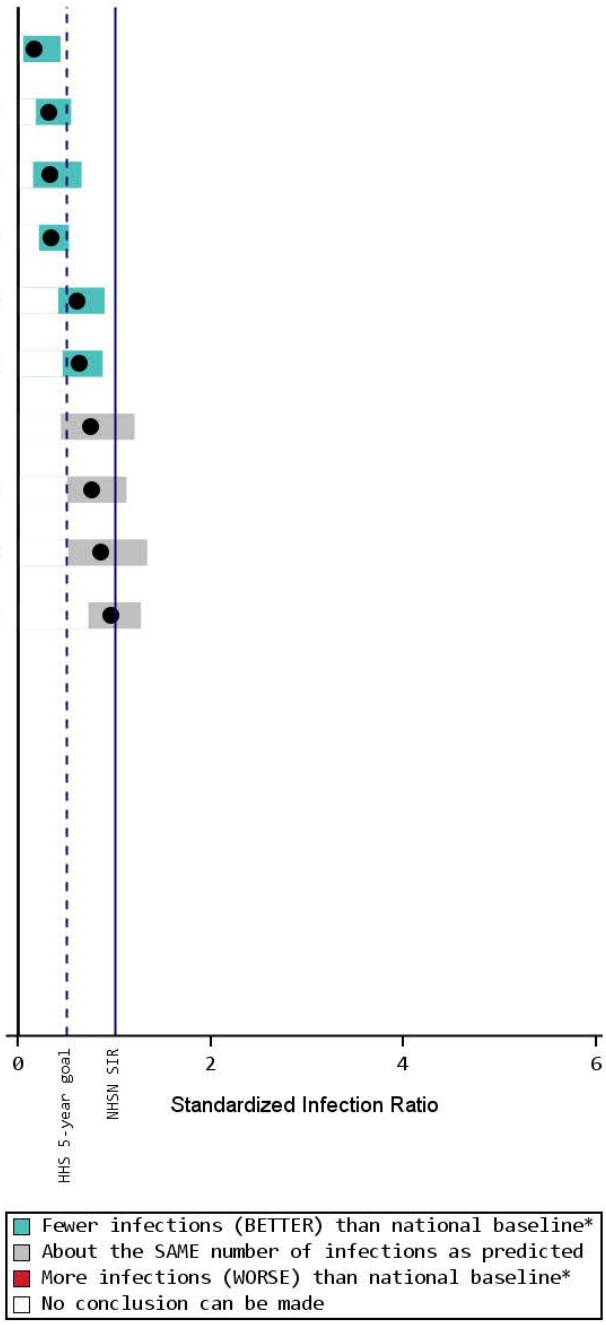
CAUTI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 400 or More Beds

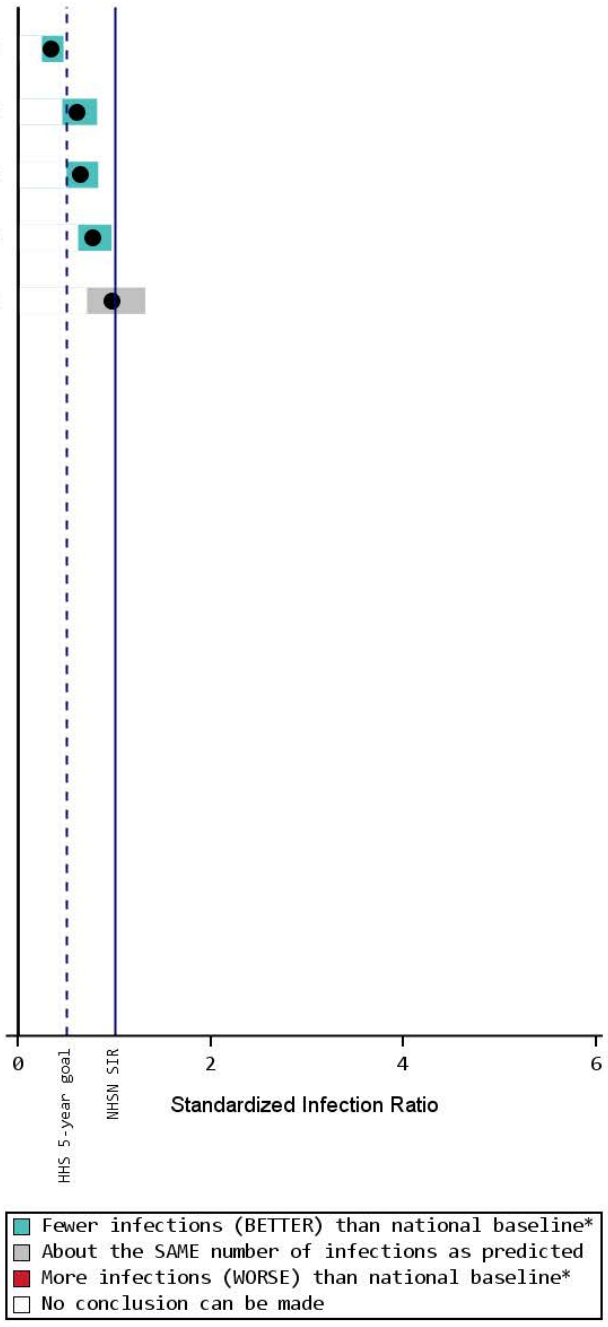
HOSPITAL	OBS	PRED	CLD	SIR
Gaston Memorial Hospital	3	19.0	9314	0.2
New Hanover Regional Medical Center	12	37.9	18206	0.3
Carolinas Medical Center-Northeast	7	21.4	13830	0.3
Rex Healthcare	18	54.1	28795	0.3
Novant Health Forsyth Medical Center	25	41.0	21511	0.6
Mission Hospital	36	56.9	24343	0.6
Novant Health Presbyterian Medical	15	20.2	10681	0.7
Moses Cone Hospital	24	31.6	15076	0.8
Cape Fear Valley Health System	17	20.1	13010	0.8
WakeMed	48	49.9	23195	1.0



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <50 catheter days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

CAUTI in Adult/Pediatric Medical, Surgical, and Medical/Surgical Wards and ICUs
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with Primary Medical School Affiliation

HOSPITAL	OBS	PRED	CLD	SIR
Wake Forest University Baptist Medical	34	102	42690	0.3
Carolinas Medical Center	44	72.5	27971	0.6
Duke University Hospital	58	90.8	41339	0.6
UNC Health Care	76	98.8	40729	0.8
Vidant Medical Center	40	41.2	19972	1.0



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PRED = # infections statistically 'predicted' by national baseline
CLD = # central line days
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NA = Data not shown for hospitals with <50 catheter days
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

C. Surgical Site Infections (SSI)

1. Abdominal Hysterectomies

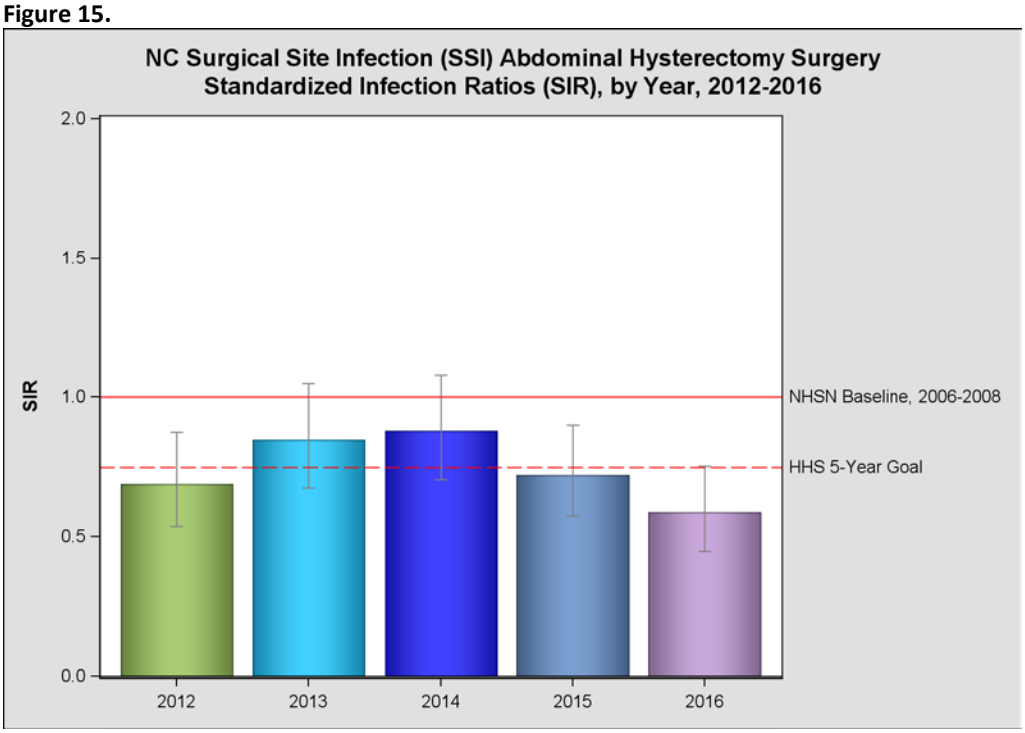
North Carolina 2016 SSI Highlights Post Abdominal Hysterectomy

- North Carolina reported 57 surgical site infections after inpatient abdominal hysterectomies performed on adults ≥ 18 years in acute care hospitals compared to the 97 infections predicted.
- This was better than the 2006-2008 national experience.
- NC met the U.S. Department of Health and Human Services goal to reduce SSIs nationally by 25% from the baseline experience in 2006-2008 in 2012. After a two year increase in 2013 and 2014, NC met this goal again in both 2015 and 2016.
- In 2016, the most commonly identified organisms from adult patients with SSI following inpatient abdominal hysterectomies were Gram Negative Bacteria other than *Enterobacter, Pseudomonas, Klebsiella, or E. Coli*

Table 4. NC Surgical Site Infections following Abdominal Hysterectomies, by year, 2012-2016

Year	# Observed Infections	# Predicted Infections	How Does North Carolina Compare to the National Experience?
2012	65	94	★Better: Fewer infections than were predicted (better than the national experience)
2013	80	95	= Same: about the same number of infections as were predicted (same as the national experience)
2014	86	98	= Same: about the same number of infections as were predicted (same as the national experience)
2015	75	104	★Better: Fewer infections than were predicted (better than the national experience)
2016	57	97	★Better: Fewer infections than were predicted (better than the national experience)

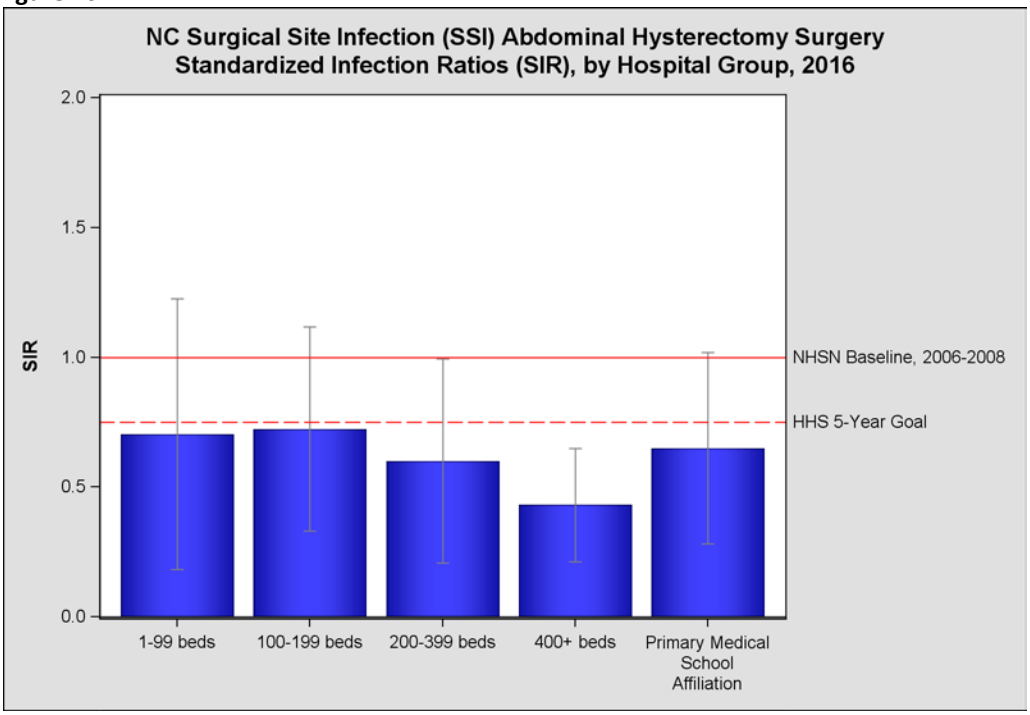
Figure 15.



How to Understand Figure 15:

- N.C. reporting facilities reported fewer SSIs following abdominal hysterectomies than predicted, performing BETTER than predicted by the national experience
- In 2016, NC facilities met the HHS 5 year goal to reduce SSIs by 25% from the 2006-2008 national baseline

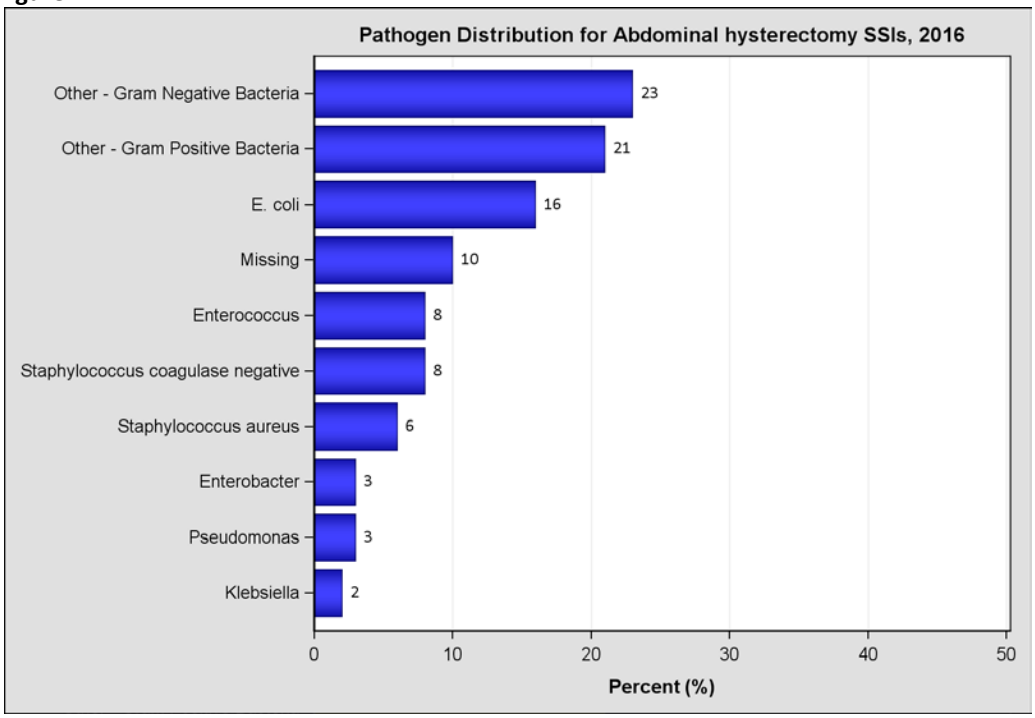
Figure 16.



How to Understand Figure 16:

- Hospitals with 200-399 beds and 400+ beds reported fewer SSIs following abdominal hysterectomies than predicted, performing BETTER than the 2006-2008 national experience
- Other hospital groups reported about the SAME number of infections as predicted by the national experience

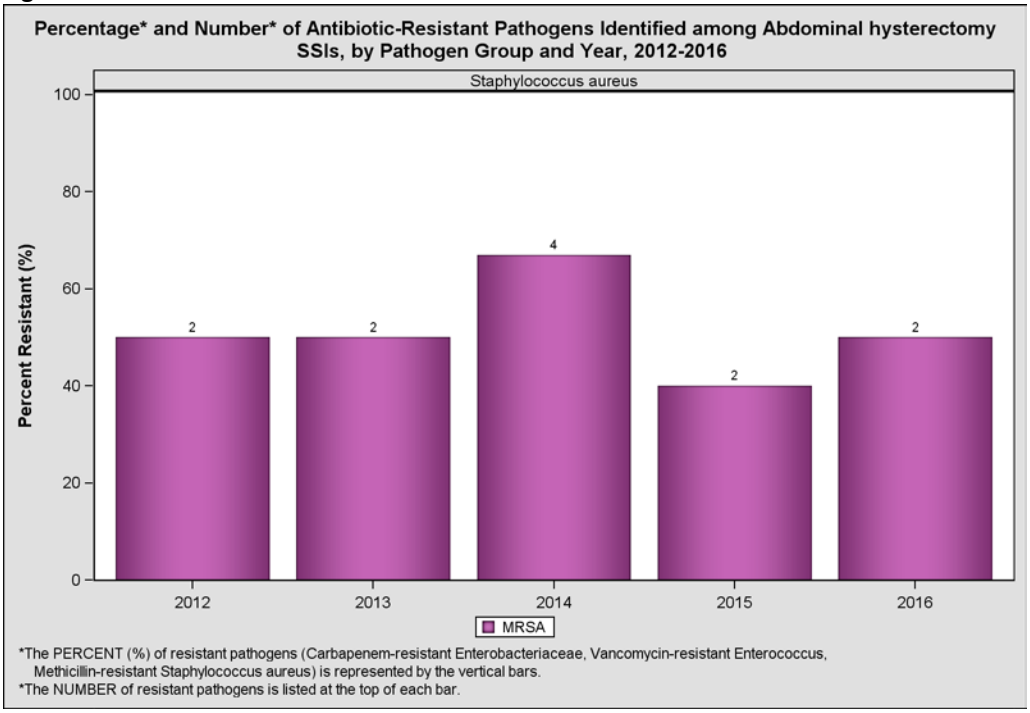
Figure 17.



How to Understand Figure 17:

- Gram negative bacteria other than *Enterobacter, Pseudomonas, Klebsiella*, or *E. Coli* (23%) were the most commonly reported pathogens among SSIs following abdominal hysterectomies
- Gram positive bacteria other than *Staphylococci* and *Enterococci* were the 2nd most common, accounting for 21% of infections

Figure 18.



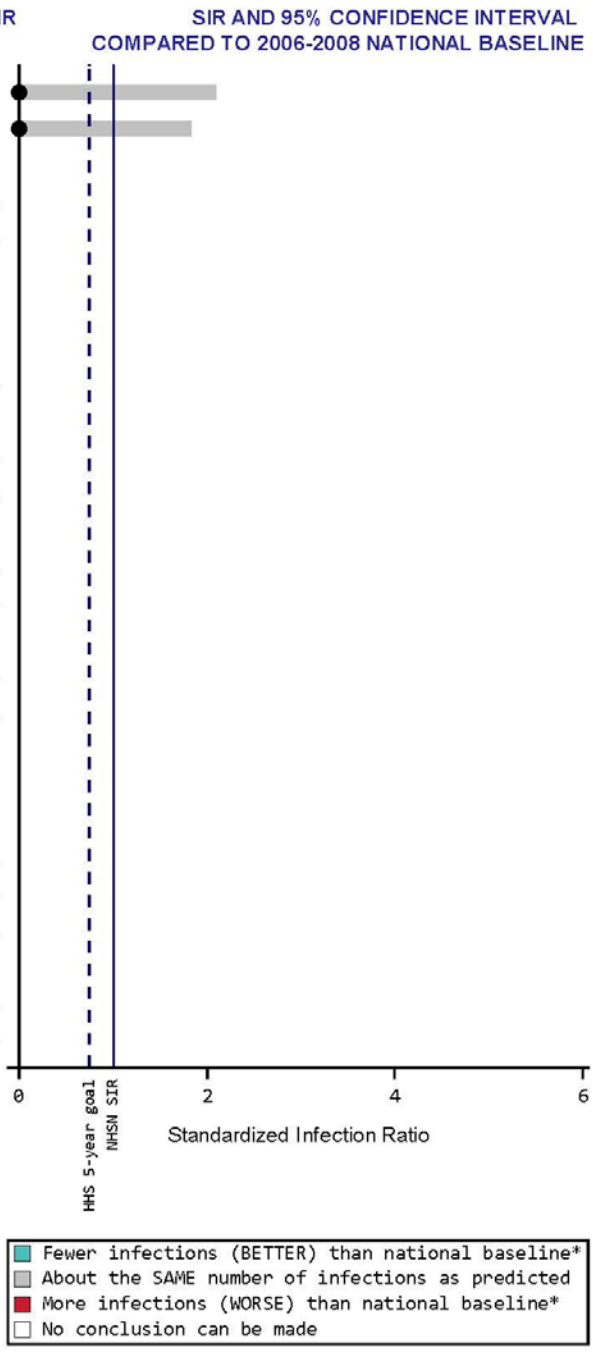
How to Understand Figure 18:

- In NC, fewer than ten *Staphylococcus aureus* organisms are isolated from SSIs following abdominal hysterectomies in NC each year
- In 2015, 50% of *Staphylococcus aureus* identified among abdominal hysterectomy SSIs were methicillin-resistant

The following SIR plots summarize SSI HYST infection data for North Carolina hospitals by hospital groups (Appendix E).

SSI Folowing Abdominal Hysterectomy Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with less than 100 Beds

HOSPITAL	OBS	PRED	PROC	SIR
Novant Health Huntersville	0	1.4	150	0.0
Novant Health Medical Park Hospital	0	1.6	178	0.0
McDowell Hospital	2	0.3	33	NC
Murphy Medical Center	NA	NA	NA	NA
Dlp - Harris Regional Hospital	NA	NA	NA	NA
Sentara Albemarle Medical Center	0	0.6	43	NC
Sandhills Regional Medical Center	0	0.4	44	NC
Columbus Regional Healthcare System	0	0.7	56	NC
Martin General Hospital	NA	NA	NA	NA
Randolph Hospital	1	0.8	77	NC
Vidant Beaufort Hospital	NA	NA	NA	NA
Granville Medical Center	NA	NA	NA	NA
Novant Health Brunswick Medical Center	0	0.8	68	NC
Vidant Duplin Hospital	NA	NA	NA	NA
Kings Mountain Hospital	NA	NA	NA	NA
Caldwell Memorial Hospital	1	0.3	26	NC
Person Memorial Hospital	NA	NA	NA	NA
Wake Forest Baptist Health-Lexington	NA	NA	NA	NA
Halifax Regional Medical Center	1	0.4	30	NC
Betsy Johnson Regional	1	0.7	61	NC
Hugh Chatham Memorial Hospital	0	0.3	31	NC
Carolinas Healthcare System Anson	NA	NA	NA	NA
Annie Penn Hospital	NA	NA	NA	NA
North Carolina Specialty Hospital	NA	NA	NA	NA
Johnston Health Clayton	0	0.2	20	NC
Firsthealth Moore Regional-Richmond	NA	NA	NA	NA
Cape Fear Valley Hoke Hospital	NA	NA	NA	NA



Data reported from adult/pediatric units as of March 24, 2017 .
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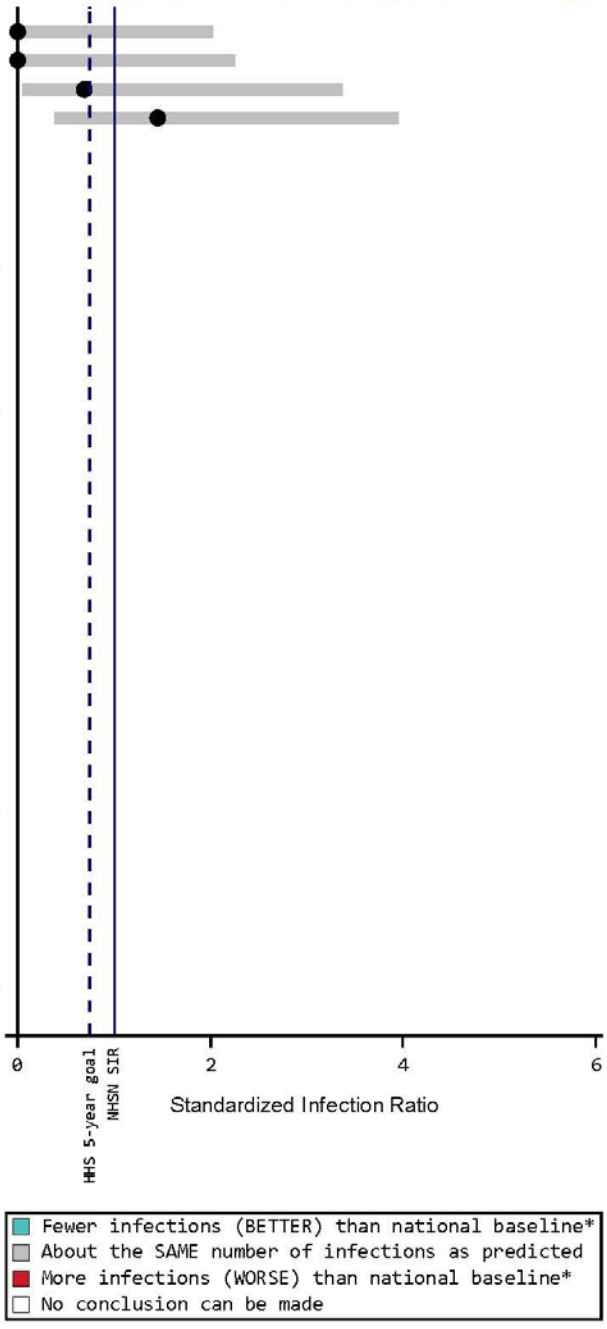
PROC = # procedures
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <20 procedures
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

SSI Folowing Abdominal Hysterectomy Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 100 to 199 Beds

HOSPITAL	OBS	PRED	PROC	SIR
Carolinas Medical Center-University	0	1.5	154	0.0
WakeMed Cary Hospital	0	1.3	128	0.0
Novant Health Matthews Medical Center	1	1.5	153	0.7
Women's Hospital	3	2.1	196	1.5
Carolinas Medical Center-Mercy	0	0.9	94	NC
Pardee Hospital	0	0.3	26	NC
Rutherford Regional Medical Center	0	0.3	28	NC
Haywood Regional Medical Center	0	0.3	28	NC
ARHS-Watauga Medical Center	NA	NA	NA	NA
Davis Regional Medical Center	NA	NA	NA	NA
Vidant Roanoke Chowan Hospital	1	0.4	33	NC
Vidant Edgecombe Hospital	0	0.5	43	NC
Novant Health Thomasville Medical Center	0	0.2	23	NC
Sampson Regional Medical Center	NA	NA	NA	NA
Lenoir Memorial Hospital	0	0.3	24	NC
Iredell Memorial Hospital	2	0.7	80	NC
Maria Parham Medical Center	0	0.3	27	NC
Northern Hospital Of Surry County	0	0.3	26	NC
Lake Norman Regional Medical Center	0	0.3	35	NC
Frye Regional Medical Center	0	0.7	88	NC
Johnston Health	0	0.6	64	NC
Scotland Memorial Hospital	0	0.6	53	NC
Carteret General Hospital	1	0.2	26	NC
Carolinas Healthcare System Lincoln	1	0.2	30	NC
Wilson Medical Center	1	0.6	73	NC
Onslow Memorial Hospital	0	0.5	54	NC
Catawba Valley Medical Center	0	0.8	73	NC
Carolinas Healthcare System Blue Ridge	NA	NA	NA	NA
Central Carolina Hospital	0	0.3	35	NC
Carolinas Medical Center-Union	0	0.5	43	NC
Duke Raleigh Hospital	0	0.7	66	NC
Stanly Regional Medical Center	NA	NA	NA	NA
Morehead Memorial Hospital	0	0.4	32	NC
Wilkes Regional Medical Center	NA	NA	NA	NA
Wesley Long Hospital	1	0.4	43	NC



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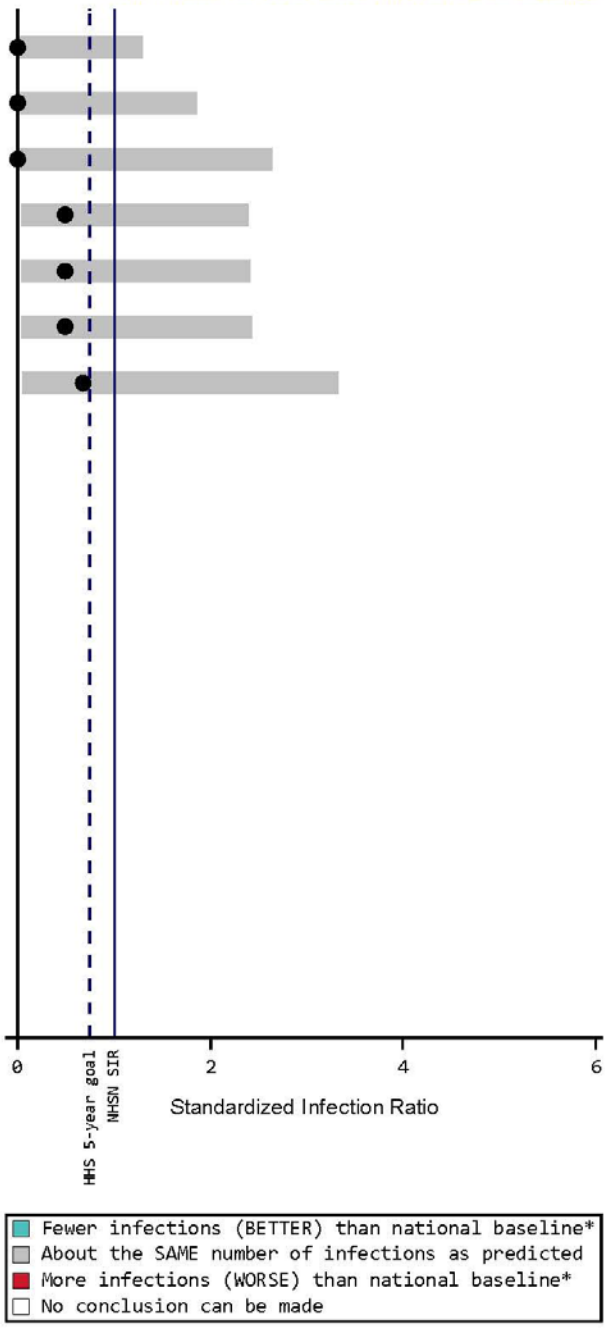
SSI Folowing Abdominal Hysterectomy Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 200 to 399 Beds

HOSPITAL	OBS	PRED	PROC	SIR
Duke Regional Hospital	0	2.3	280	0.0
Carolinas Healthcare System Cleveland	0	1.6	141	0.0
Southeastern Regional Medical Center	0	1.1	94	0.0
CarolinaEast Medical Center	1	2.1	212	0.5
High Point Regional Health System	1	2.0	193	0.5
Carolinas Medical Center-Pineville	1	2.0	223	0.5
Wayne Memorial Hospital	1	1.5	142	0.7
Novant Health Rowan Medical Center	1	0.4	35	NC
Nash Health Care Systems	2	0.9	91	NC
FirstHealth Moore Regional Hospital	2	0.7	83	NC
Alamance Regional Medical Center	0	0.3	31	NC



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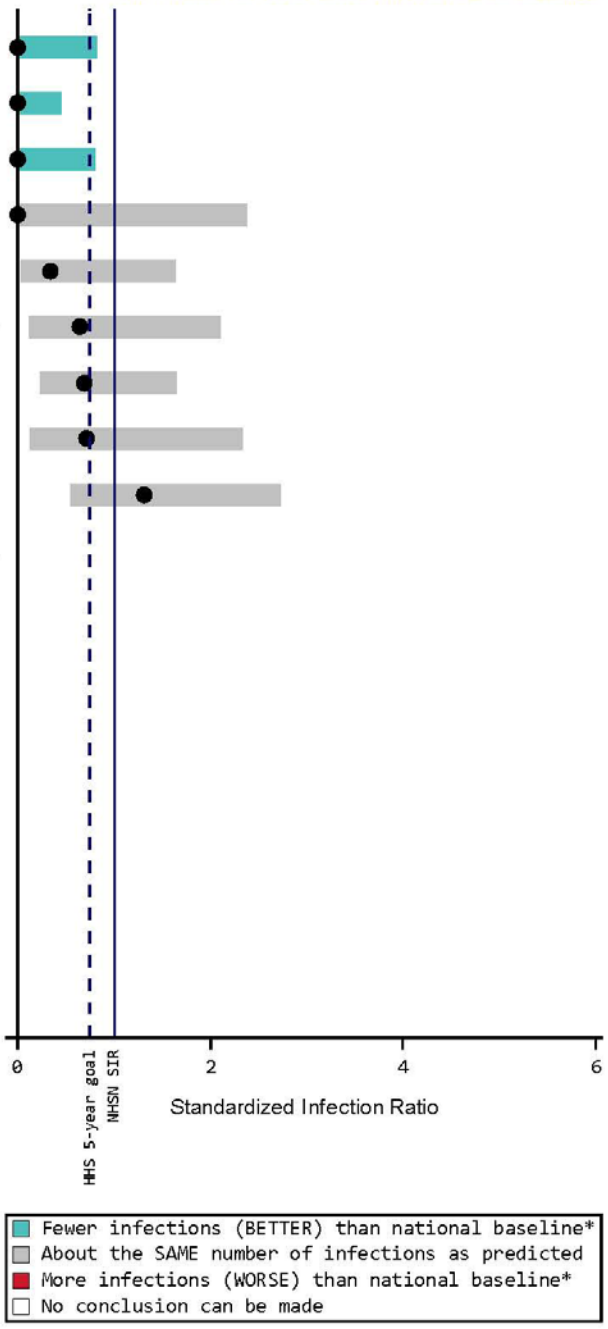
SSI Folowing Abdominal Hysterectomy Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 400 or More Beds

HOSPITAL	OBS	PRED	PROC	SIR
Rex Healthcare	0	3.7	375	0.0
New Hanover Regional Medical Center	0	6.6	669	0.0
Novant Health Forsyth Medical Center	0	3.7	377	0.0
Gaston Memorial Hospital	0	1.3	128	0.0
WakeMed	1	3.0	299	0.3
Carolinas Medical Center-Northeast	2	3.1	316	0.6
Novant Health Presbyterian Medical	4	5.9	631	0.7
Cape Fear Valley Health System	2	2.8	228	0.7
Mission Hospital	6	4.6	488	1.3
Moses Cone Hospital	NA	NA	NA	NA



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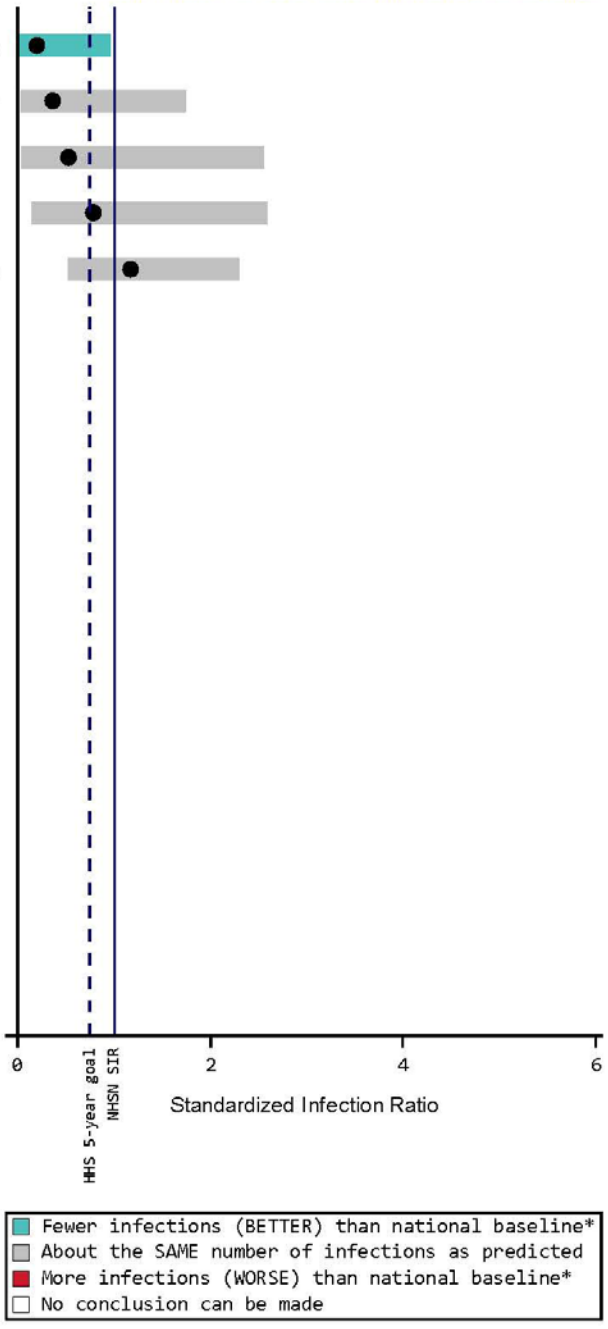
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

SSI Folowing Abdominal Hysterectomy Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with Primary Medical School Affiliation

HOSPITAL	OBS	PRED	PROC	SIR
Carolinas Medical Center	1	5.1	494	0.2
Wake Forest University Baptist Medical	1	2.8	242	0.4
Duke University Hospital	1	1.9	164	0.5
Vidant Medical Center	2	2.6	239	0.8
UNC Health Care	7	6.0	523	1.2



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PROC = # procedures
SIR = Standardized infection ratio (OBS/PRED # of infections)
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NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

2. Colon Surgeries

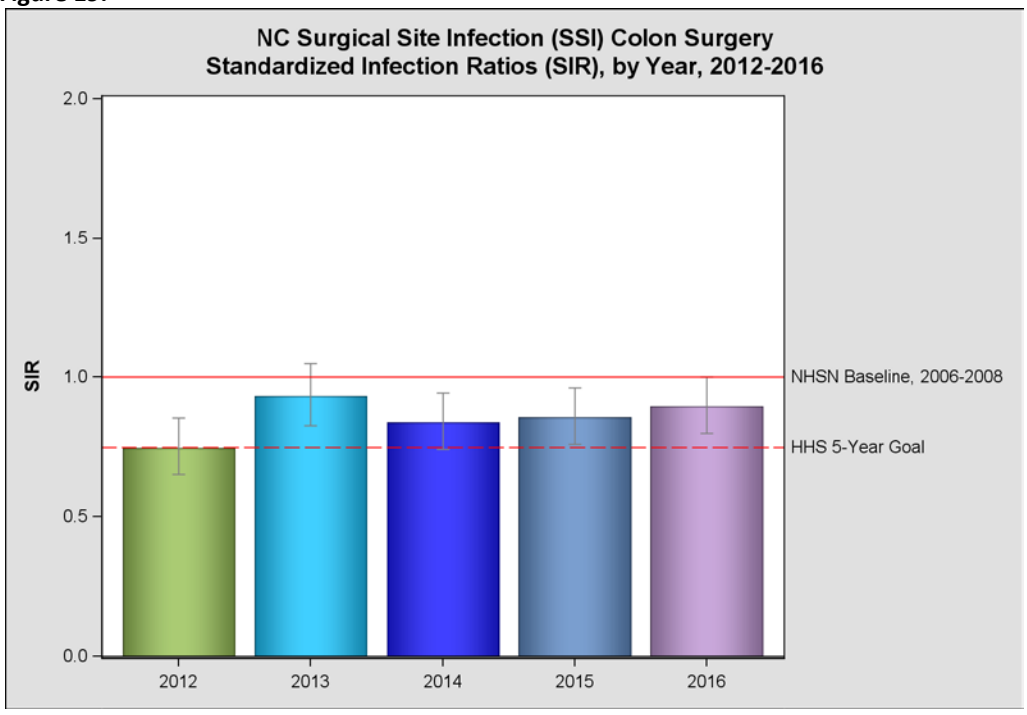
North Carolina 2016 SSI Highlights Post Colon Surgery

- Among inpatient colon surgeries performed on adults ≥ 18 years, North Carolina hospitals reported 306 infections, compared to the 342 infections which were predicted.
- This was the same as the 2006-2008 national experience.
- The U.S. Department of Health and Human Services set a goal to reduce SSIs nationally by 25% from the baseline experience in 2006-2008; North Carolina has not met this goal.
- The most commonly identified organisms isolated from colon surgery SSI patients were *E. coli* and *Enterococcus*.
- In 2016, MRSA was the most commonly identified antibiotic-resistant pathogen among colon surgery SSI patients.

Table 5. NC Surgical Site Infections following colon surgeries, by year, 2012-2016

Year	# Observed Infections	# Predicted Infections	How Does North Carolina Compare to the National Experience?
2012	213	285	★Better: Fewer infections than were predicted (better than the national experience)
2013	277	297	= Same: about the same number of infections as were predicted (same as the national experience)
2014	264	315	★Better: Fewer infections than were predicted (better than the national experience)
2015	280	327	★Better: Fewer infections than were predicted (better than the national experience)
2016	306	342	= Same: about the same number of infections as were predicted (same as the national experience)

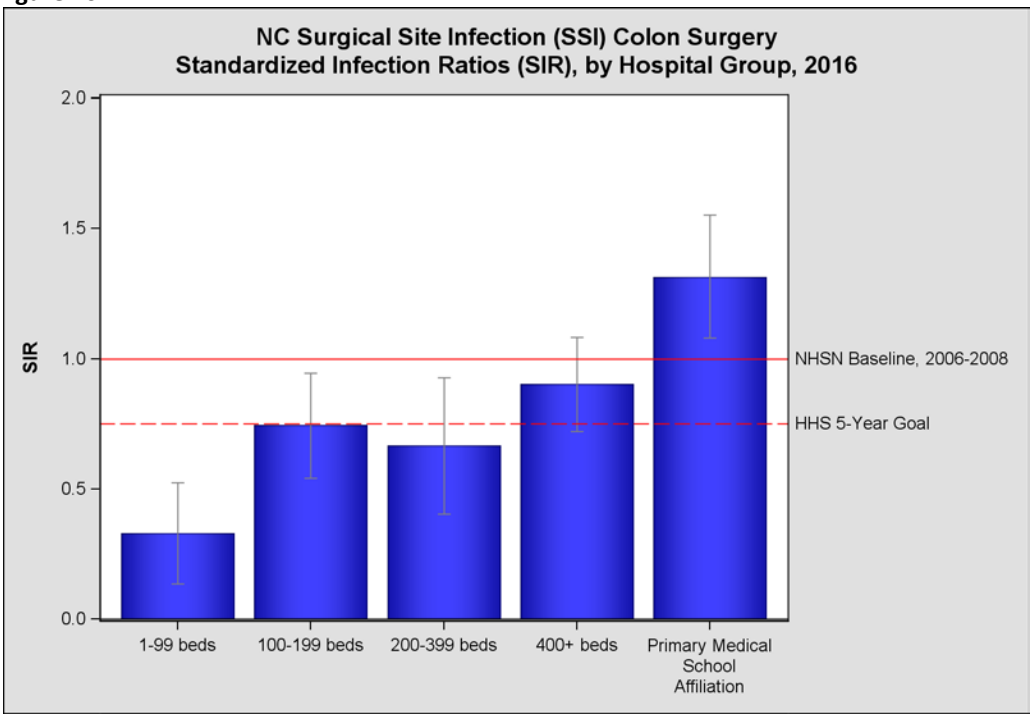
Figure 19.



How to Understand Figure 19:

- In 2016, the number of reported SSIs following colon surgeries in NC was the SAME as the national experience
- In the previous two years the number of reported SSIs following colon surgeries in NC was BETTER, with fewer infections reported than predicted by the national experience
- North Carolina did not meet the HHS 5-year goal to decrease SSIs following colon surgeries by 25%

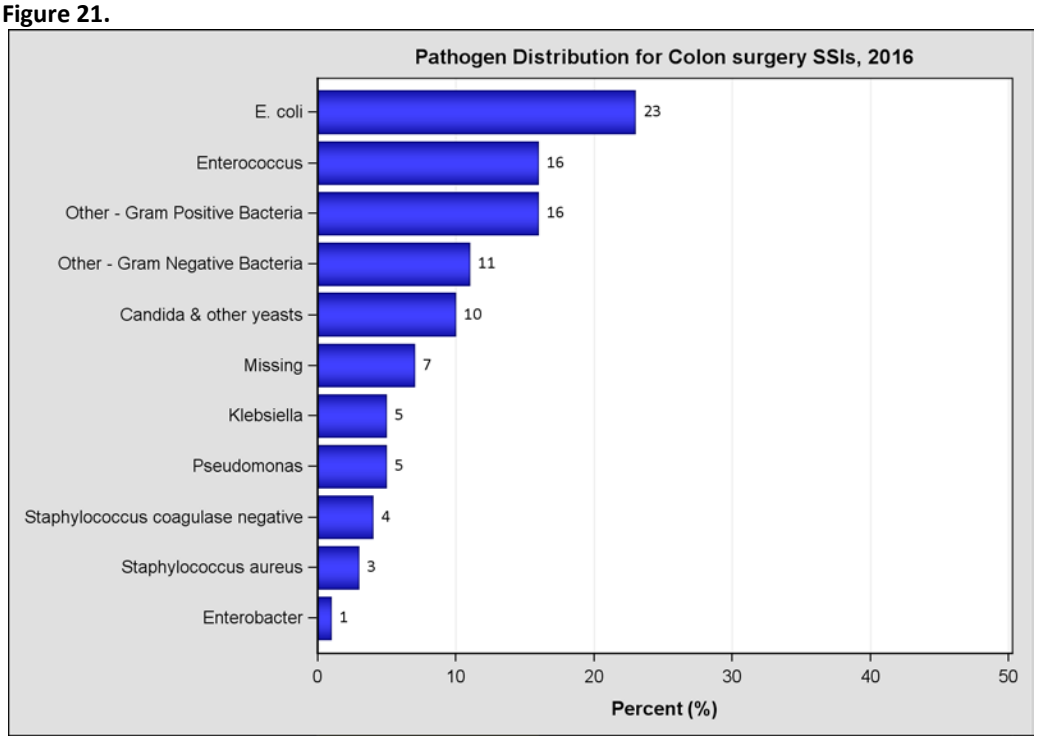
Figure 20.



How to Understand Figure 20:

- Hospitals with a primary medical school affiliation reported more infections then predicted, performing WORSE then the 2006-2008 national experience
- Hospitals with 400+ beds reported the SAME number of SSIs as predicted by the national experience
- All smaller hospital sized groups performed BETTER than the national experience, reporting fewer SSIs following colon surgeries than predicted

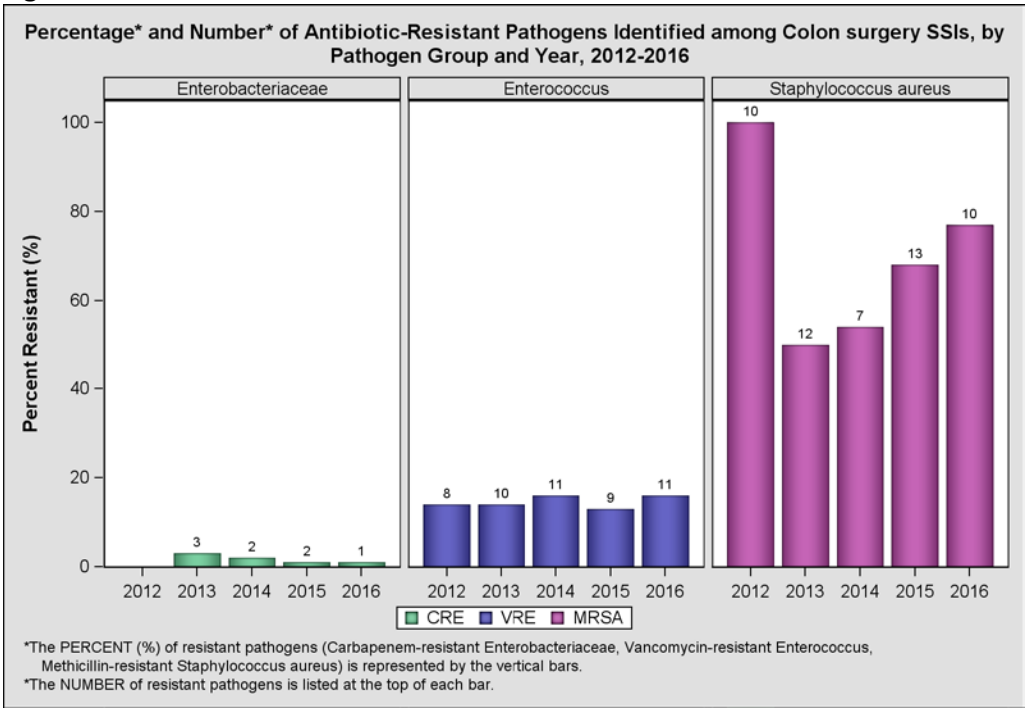
Figure 21.



How to Understand Figure 21:

- *E. coli* (23%), *Enterococcus* (16%) and Gram positive bacteria other than other than *Staphylococci* and *Enterococci* were the most commonly reported pathogens isolated from patients with surgical site infections following colon surgeries

Figure 22.



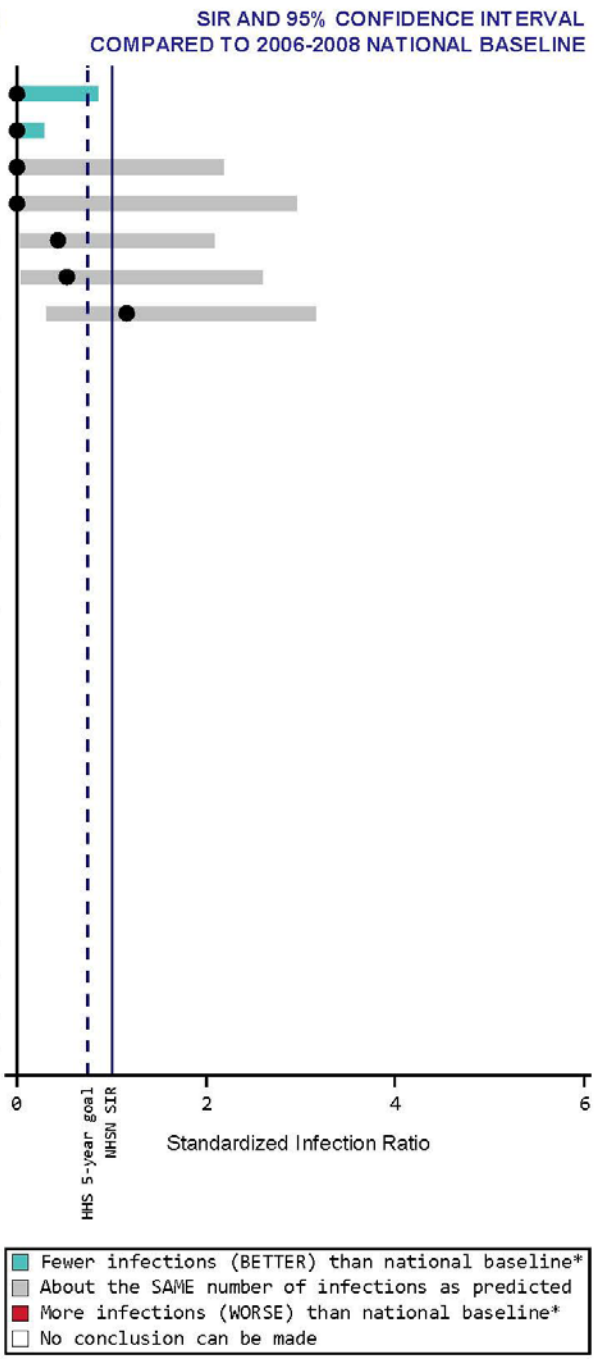
How to Understand Figure 22:

- In 2016, 77% of *Staphylococcus aureus* identified among SSIs following colon surgeries were resistant to methicillin. This is an increase from the past three years, when the percent of *Staphylococcus aureus* resistant to methicillin ranged from 50-68%
- The percentage and number of antibiotic-resistant *Enterobacteriaceae* and *Enterococcus* identified among SSIs following colon surgeries was similar in 2016 to previous years

The following SIR plots summarize colon surgery SSI infection data for North Carolina hospitals by hospital groups (Appendix E).

SSI following Colon Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with less than 100 Beds

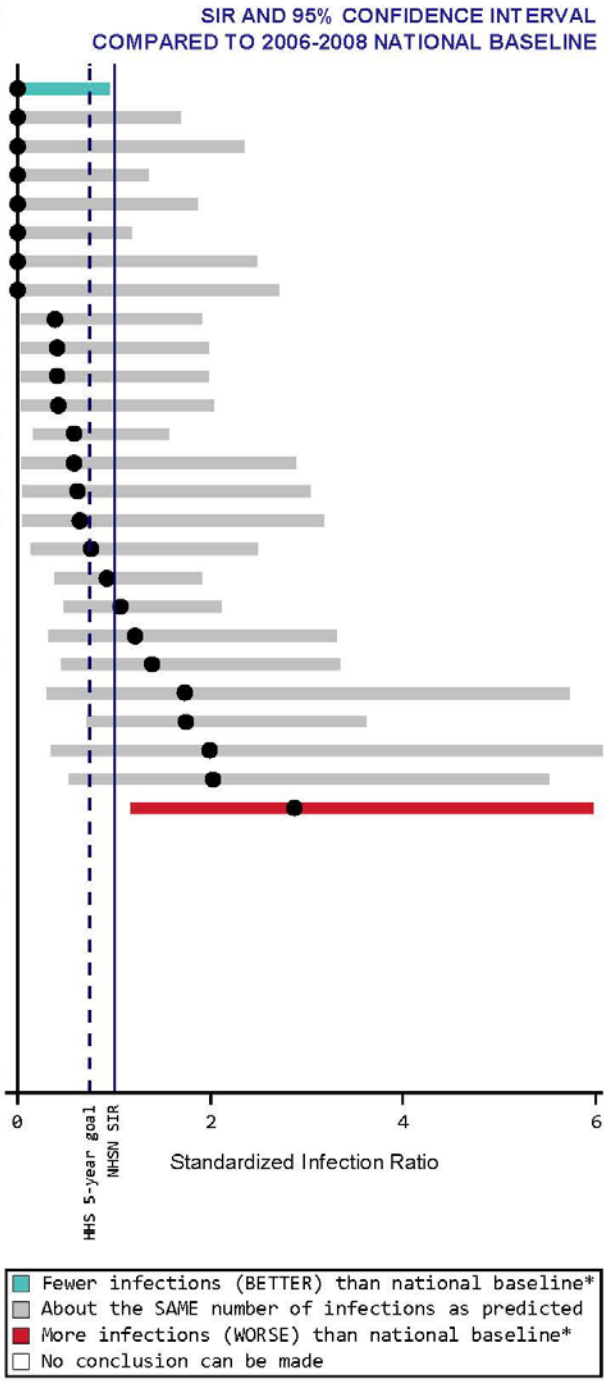
HOSPITAL	OBS	PRED	PROC	SIR
Novant Health Huntersville	0	3.5	113	0.0
Novant Health Medical Park Hospital	0	10.7	341	0.0
Granville Medical Center	0	1.4	39	0.0
Hugh Chatham Memorial Hospital	0	1.0	31	0.0
Randolph Hospital	1	2.4	73	0.4
Columbus Regional Healthcare System	1	1.9	53	0.5
Novant Health Brunswick Medical Center	3	2.6	81	1.2
McDowell Hospital	1	0.7	24	NC
Murphy Medical Center	NA	NA	NA	NA
Dlp - Harris Regional Hospital	NA	NA	NA	NA
Sentara Albemarle Medical Center	2	0.9	27	NC
Sandhills Regional Medical Center	NA	NA	NA	NA
Martin General Hospital	NA	NA	NA	NA
Vidant Beaufort Hospital	0	0.7	23	NC
Vidant Duplin Hospital	NA	NA	NA	NA
Kings Mountain Hospital	0	0.7	21	NC
Caldwell Memorial Hospital	NA	NA	NA	NA
Person Memorial Hospital	NA	NA	NA	NA
Wake Forest Baptist Health-Lexington	NA	NA	NA	NA
Halifax Regional Medical Center	0	0.9	25	NC
Betsy Johnson Regional	0	0.8	24	NC
Carolinas Healthcare System Anson	NA	NA	NA	NA
Annie Penn Hospital	NA	NA	NA	NA
North Carolina Specialty Hospital	NA	NA	NA	NA
Johnston Health Clayton	NA	NA	NA	NA
Firsthealth Moore Regional-Richmond	NA	NA	NA	NA
Cape Fear Valley Hoke Hospital	NA	NA	NA	NA



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
PROC = # procedures
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <20 procedures
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

SSI following Colon Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 100 to 199 Beds

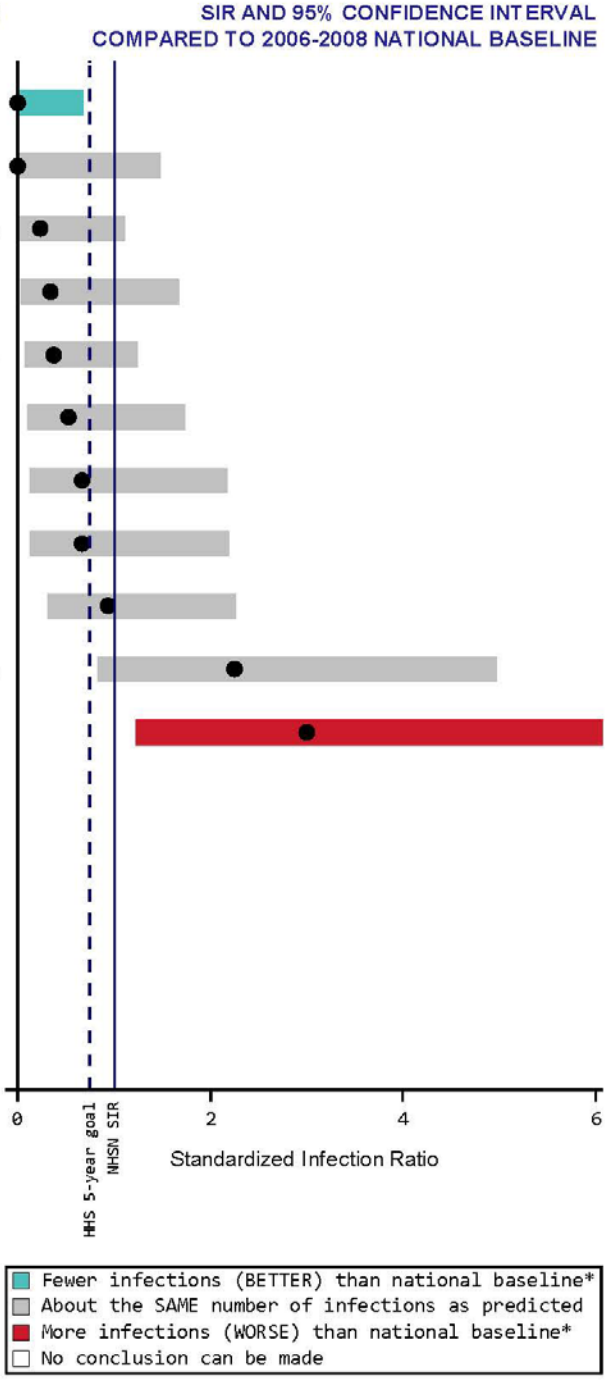
HOSPITAL	OBS	PRED	PROC	SIR
Catawba Valley Medical Center	0	3.2	99	0.0
Haywood Regional Medical Center	0	1.8	59	0.0
Lake Norman Regional Medical Center	0	1.3	42	0.0
Johnston Health	0	2.2	69	0.0
Onslow Memorial Hospital	0	1.6	52	0.0
Carolinas Healthcare System Blue Ridge	0	2.5	78	0.0
Central Carolina Hospital	0	1.2	42	0.0
Stanly Regional Medical Center	0	1.1	37	0.0
Carteret General Hospital	1	2.6	85	0.4
Lenoir Memorial Hospital	1	2.5	74	0.4
Iredell Memorial Hospital	1	2.5	78	0.4
Frye Regional Medical Center	1	2.4	79	0.4
Duke Raleigh Hospital	3	5.2	150	0.6
Maria Parham Medical Center	1	1.7	54	0.6
Carolinas Medical Center-University	1	1.6	51	0.6
Wilson Medical Center	1	1.6	50	0.6
Carolinas Medical Center-Union	2	2.7	80	0.8
WakeMed Cary Hospital	6	6.6	197	0.9
Wesley Long Hospital	7	6.6	217	1.1
Novant Health Matthews Medical Center	3	2.5	78	1.2
Pardee Hospital	4	2.9	91	1.4
Carolinas Healthcare System Lincoln	2	1.2	34	1.7
Carolinas Medical Center-Mercy	6	3.5	102	1.7
Morehead Memorial Hospital	2	1.0	30	2.0
Rutherford Regional Medical Center	3	1.5	42	2.0
Novant Health Thomasville Medical Center	6	2.1	70	2.9
ARHS-Watauga Medical Center	1	0.8	28	NC
Davis Regional Medical Center	NA	NA	NA	NA
Vidant Roanoke Chowan Hospital	NA	NA	NA	NA
Vidant Edgecombe Hospital	1	0.8	25	NC
Sampson Regional Medical Center	0	0.9	29	NC
Northern Hospital Of Surry County	0	0.9	32	NC
Scotland Memorial Hospital	0	0.9	28	NC
Wilkes Regional Medical Center	0	0.6	20	NC
Women's Hospital	NA	NA	NA	NA



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
PROC = # procedures
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <20 procedures
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

SSI following Colon Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 200 to 399 Beds

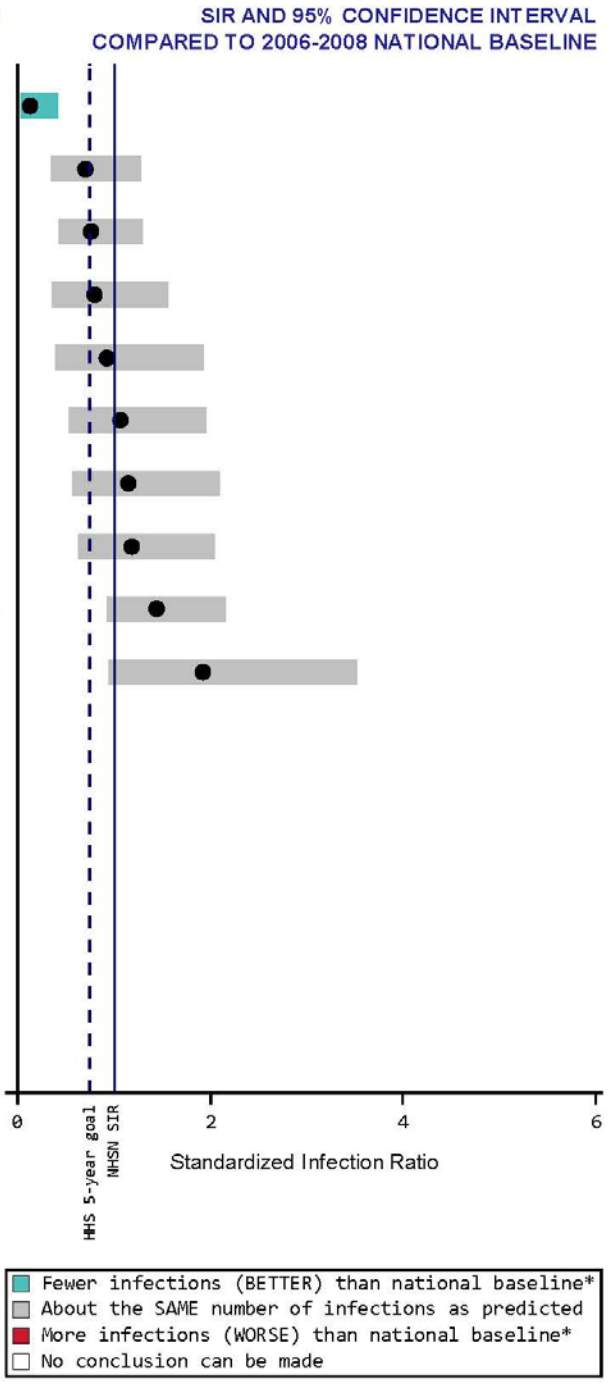
HOSPITAL	OBS	PRED	PROC	SIR
High Point Regional Health System	0	4.4	129	0.0
Nash Health Care Systems	0	2.0	61	0.0
FirstHealth Moore Regional Hospital	1	4.4	148	0.2
Carolinas Healthcare System Cleveland	1	2.9	87	0.3
Carolinas Medical Center-Pineville	2	5.3	166	0.4
CarolinaEast Medical Center	2	3.8	123	0.5
Alamance Regional Medical Center	2	3.0	90	0.7
Novant Health Rowan Medical Center	2	3.0	93	0.7
Wayne Memorial Hospital	4	4.3	122	0.9
Southeastern Regional Medical Center	5	2.2	65	2.2
Duke Regional Hospital	6	2.0	62	3.0



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
PROC = # procedures
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <20 procedures
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

SSI following Colon Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 400 or More Beds

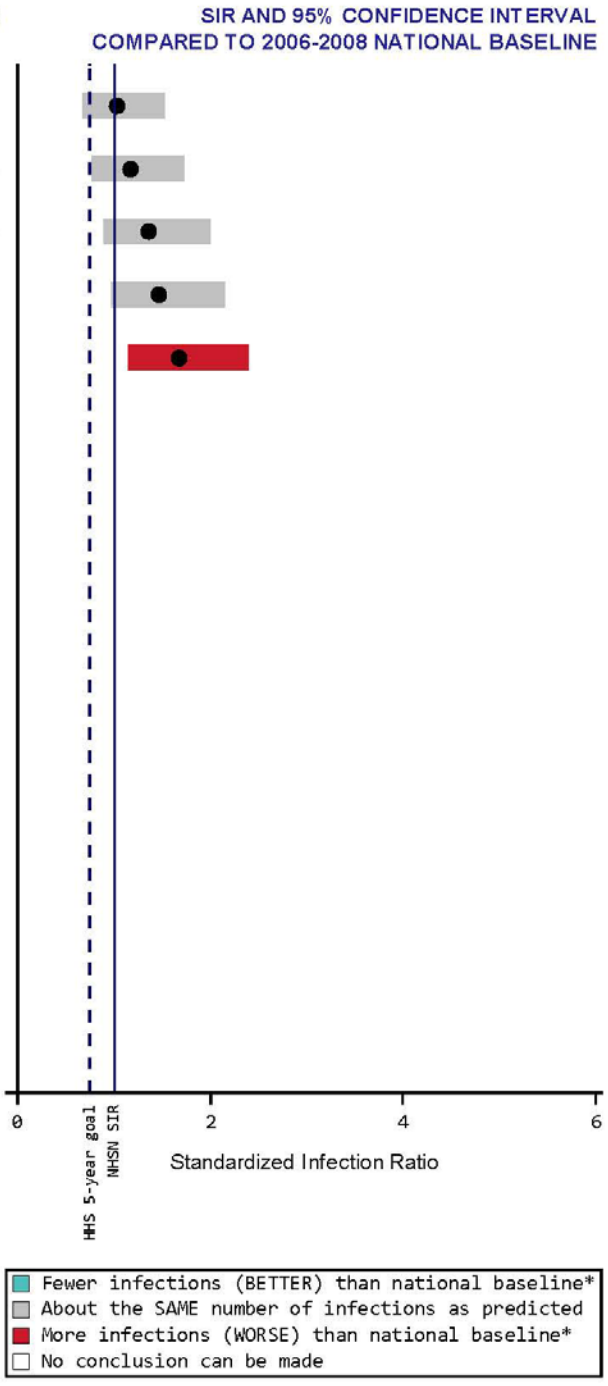
HOSPITAL	OBS	PRED	PROC	SIR
New Hanover Regional Medical Center	2	16.1	488	0.1
Novant Health Presbyterian Medical	9	13.0	398	0.7
Rex Healthcare	12	15.8	494	0.8
Cape Fear Valley Health System	7	8.9	253	0.8
Gaston Memorial Hospital	6	6.5	197	0.9
Carolinas Medical Center-Northeast	9	8.5	264	1.1
WakeMed	9	7.9	218	1.1
Novant Health Forsyth Medical Center	11	9.4	281	1.2
Mission Hospital	21	14.6	466	1.4
Moses Cone Hospital	9	4.7	142	1.9



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
PROC = # procedures
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <20 procedures
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

SSI following Colon Surgeries in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with Primary Medical School Affiliation

HOSPITAL	OBS	PRED	PROC	SIR
UNC Health Care	22	21.5	612	1.0
Carolinas Medical Center	23	19.7	542	1.2
Vidant Medical Center	23	17.0	502	1.4
Duke University Hospital	24	16.4	467	1.5
Wake Forest University Baptist Medical	28	16.7	451	1.7



Data reported from adult/pediatric units as of March 24, 2017 .
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PRED = # infections statistically 'predicted' by national baseline
PROC = # procedures
SIR = Standardized infection ratio (OBS/PRED # of infections)
NA = Data not shown for hospitals with <20 procedures
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

D. Laboratory-Identified Events

1. *Methicillin-resistant Staphylococcus aureus* Laboratory-Identified Events (MRSA LabID)

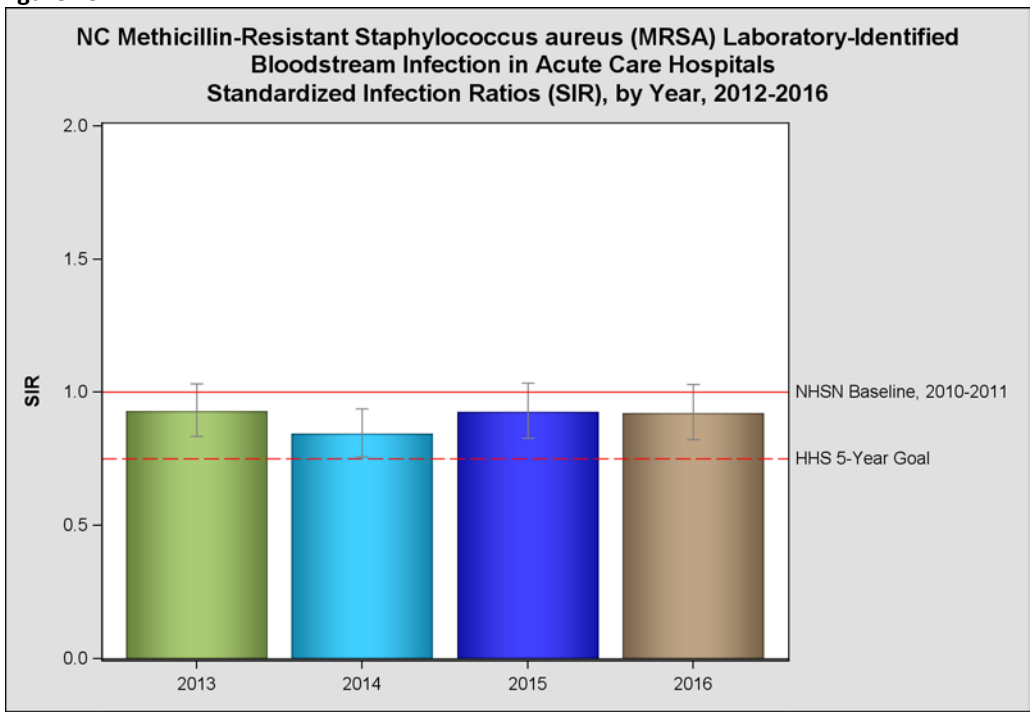
North Carolina 2016 MRSA LabID Highlights

- In 2016 North Carolina hospitals reported 305 MRSA LabID events, compared to the 332 MRSA LabID events which were predicted.
- This was the same as the 2010-2011 national experience.
- The U.S. Department of Health and Human Services set a goal to reduce MRSA nationally by 25% from the baseline experience in 2010-2011; North Carolina has not yet been met this goal.

Table 6. NC Methicillin-Resistant Staphylococcus Aureus Laboratory-Identified events, by year, 2012-2016

Year	# Observed Events	# Predicted Events	How Does North Carolina Compare to the National Experience?
2013	341	367	= Same: about the same number of infections as were predicted (same as the national experience)
2014	337	400	★Better: Fewer infections than were predicted (better than the national experience)
2015	314	339	= Same: about the same number of infections as were predicted (same as the national experience)
2016	305	332	= Same: about the same number of infections as were predicted (same as the national experience)

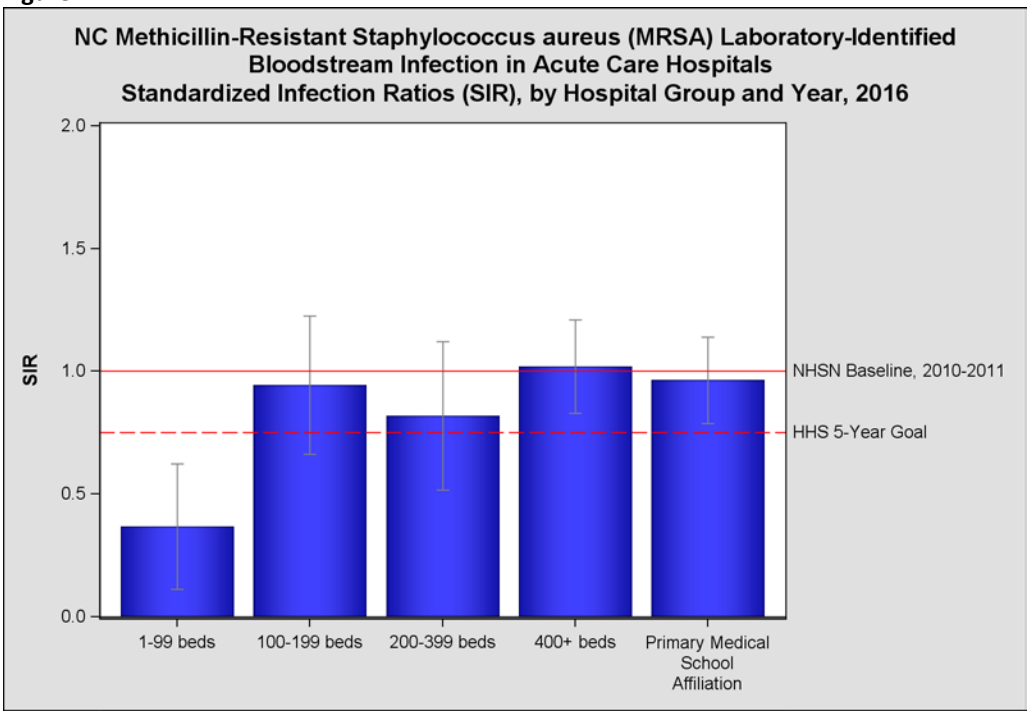
Figure 23.



How to Understand Figure 23:

- In 2016, North Carolina continued to report the SAME number of MRSA LabID events as predicted by the 2010-2011 national experience
- The number of reported MRSA LabID events in 2016 was similar to the numbers observed in previous years
- The HHS 5-year goal to reduce MRSA LabID events by 25% from the 2010-2011 has not yet been met in North Carolina

Figure 24.



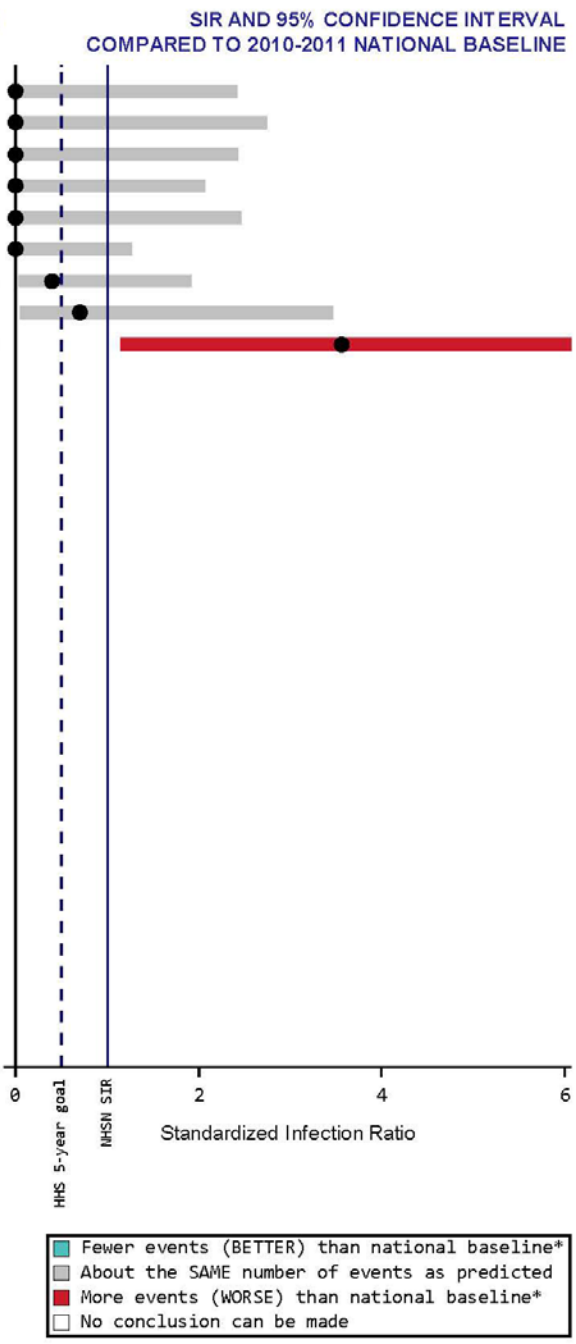
How to Understand Figure 24:

- Hospitals with 100-199 beds performed BETTER than the national experience, with fewer MRSA LabID events than predicted and met the HHS 5 year goal to reduce MRSA by 25% from the 2010-2011 national experience
- All SIRs among hospital groups with >100 beds experienced a similar burden of MRSA after risk adjustment and reported about the SAME number of infections as predicted by the national experience

The following SIR plots summarize MRSA labID data for North Carolina hospitals by hospital groups (Appendix E).

MRSA in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with less than 100 Beds

HOSPITAL	OBS	PRED	PD	SIR
Dlp - Harris Regional Hospital	0	1.2	12317	0.0
Sentara Albemarle Medical Center	0	1.1	22628	0.0
Randolph Hospital	0	1.2	17895	0.0
Caldwell Memorial Hospital	0	1.4	21253	0.0
Halifax Regional Medical Center	0	1.2	21857	0.0
Central Regional Hospital	0	2.4	66226	0.0
Columbus Regional Healthcare System	1	2.6	17890	0.4
Betsy Johnson Regional	1	1.4	30407	0.7
Novant Health Huntersville	4	1.1	28371	3.6
McDowell Hospital	1	0.4	8404	NC
Murphy Medical Center	0	0.2	6456	NC
Sandhills Regional Medical Center	0	0.5	6678	NC
Martin General Hospital	0	0.2	4257	NC
Vidant Beaufort Hospital	0	0.6	16657	NC
Granville Medical Center	0	0.5	9370	NC
Novant Health Brunswick Medical Center	0	0.7	17257	NC
Vidant Duplin Hospital	0	0.6	10951	NC
Kings Mountain Hospital	0	0.3	7667	NC
Person Memorial Hospital	0	0.2	3391	NC
Wake Forest Baptist Health-Lexington	0	0.4	9641	NC
Novant Health Charlotte Orthopedic Hosp	0	0.3	7746	NC
Novant Health Medical Park Hospital	0	0.2	5560	NC
Hugh Chatham Memorial Hospital	0	0.5	15220	NC
Carolinas Healthcare System Anson	0	0.0	312	NC
Annie Penn Hospital	1	0.6	16165	NC
North Carolina Specialty Hospital	0	0.2	4443	NC
Wake Forest Baptist Health-Davie Medica	0	0.2	3603	NC
Johnston Health Clayton	0	0.3	9074	NC
Firsthealth Moore Regional-Hoke	0	0.1	1411	NC
Firsthealth Moore Regional-Richmond	0	0.3	8782	NC
Cape Fear Valley Hoke Hospital	0	0.2	5115	NC



Data reported from adult/pediatric units as of March 24, 2017 .
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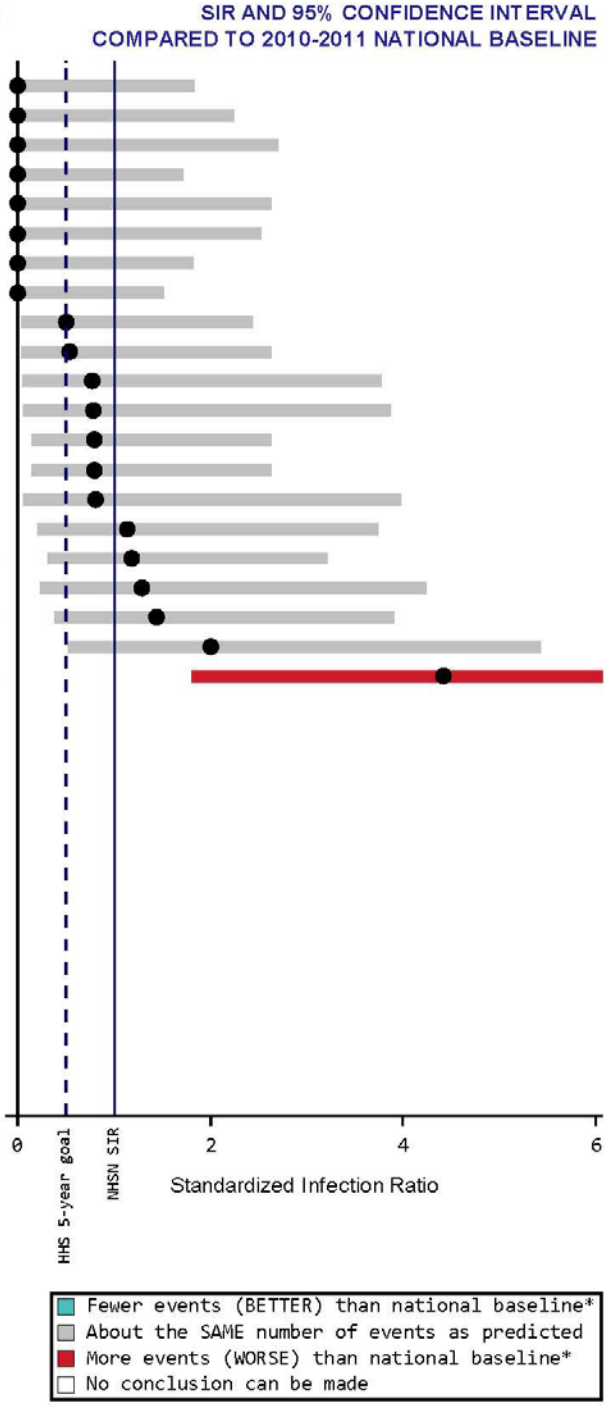
PRED = # infections statistically 'predicted' by national baseline
PD = # Patient days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

MRSA in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 100 to 199 Beds

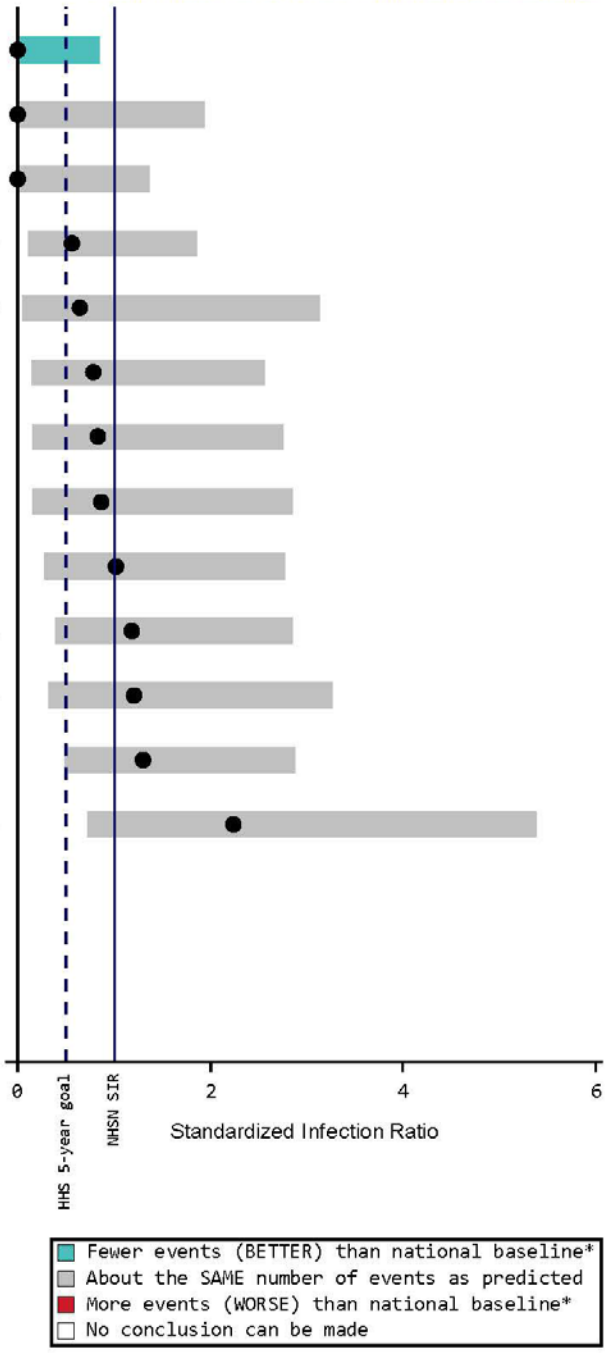
HOSPITAL	OBS	PRED	PD	SIR
WakeMed Cary Hospital	0	1.6	43164	0.0
Davis Regional Medical Center	0	1.3	18756	0.0
Vidant Edgecombe Hospital	0	1.1	14572	0.0
Iredell Memorial Hospital	0	1.7	38910	0.0
Maria Parham Medical Center	0	1.1	21495	0.0
Carteret General Hospital	0	1.2	25084	0.0
Carolinas Healthcare System Blue Ridge	0	1.6	34146	0.0
Women's Hospital	0	2.0	54285	0.0
Carolinas Medical Center-Mercy	1	2.0	41845	0.5
Rutherford Regional Medical Center	1	1.9	15526	0.5
Carolinas Medical Center-Union	1	1.3	33849	0.8
Johnston Health	1	1.3	27491	0.8
Wilson Medical Center	2	2.5	29415	0.8
Frye Regional Medical Center	2	2.5	37140	0.8
Onslow Memorial Hospital	1	1.2	31727	0.8
Novant Health Matthews Medical Center	2	1.8	46529	1.1
Duke Raleigh Hospital	3	2.5	48883	1.2
Wesley Long Hospital	2	1.6	41501	1.3
Catawba Valley Medical Center	3	2.1	53412	1.4
Pardee Hospital	3	1.5	29569	2.0
Lenoir Memorial Hospital	6	1.4	27999	4.4
Carolinas Medical Center-University	1	0.9	25504	NC
Haywood Regional Medical Center	1	0.8	23319	NC
ARHS-Watauga Medical Center	0	0.6	15387	NC
Vidant Roanoke Chowan Hospital	1	0.6	15623	NC
Novant Health Thomasville Medical Cente	2	0.8	14280	NC
Sampson Regional Medical Center	0	0.7	15318	NC
Northern Hospital Of Surry County	2	0.7	15373	NC
Lake Norman Regional Medical Center	1	0.6	16746	NC
Scotland Memorial Hospital	1	0.9	21702	NC
Carolinas Healthcare System Lincoln	1	0.9	17993	NC
Central Carolina Hospital	3	0.8	17192	NC
Stanly Regional Medical Center	1	0.4	12055	NC
Morehead Memorial Hospital	1	0.7	15578	NC
Wilkes Regional Medical Center	0	0.6	16103	NC



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
PD = # Patient days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

MRSA in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 200 to 399 Beds

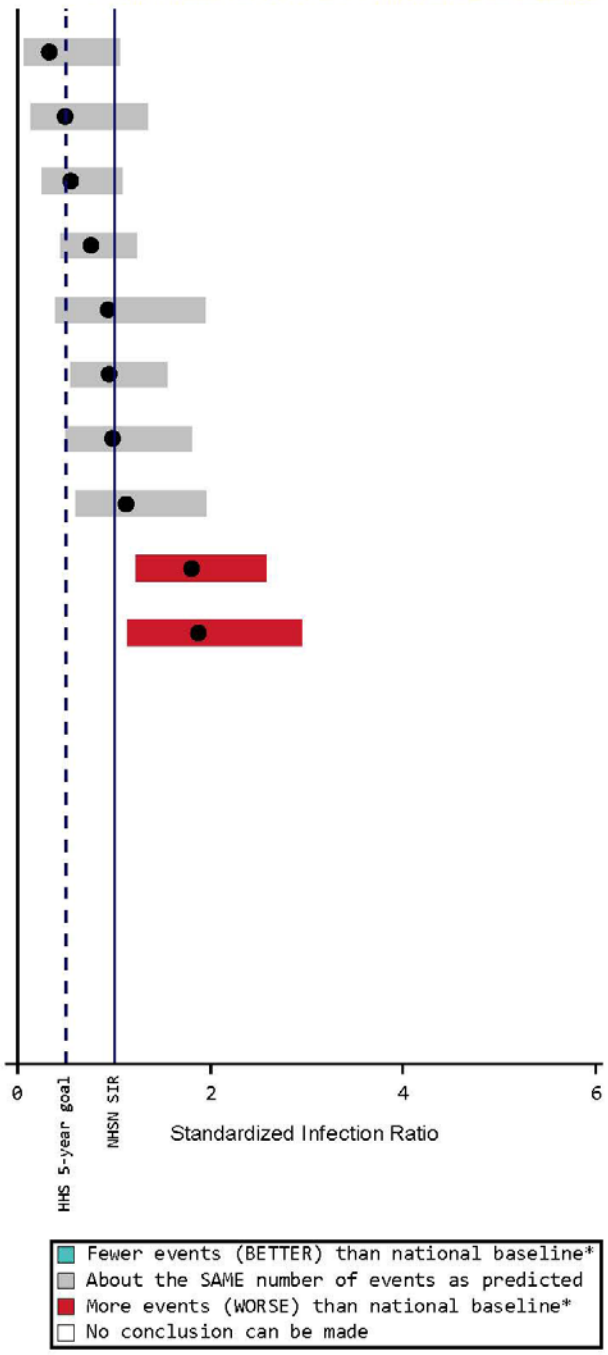
HOSPITAL	OBS	PRED	PD	SIR
Broughton Hospital	0	3.5	98585	0.0
Alamance Regional Medical Center	0	1.5	42325	0.0
Cherry Hospital	0	2.2	61503	0.0
Duke Regional Hospital	2	3.6	64013	0.6
Carolinas Healthcare System Cleveland	1	1.6	37011	0.6
Southeastern Regional Medical Center	2	2.6	68977	0.8
CarolinaEast Medical Center	2	2.4	63723	0.8
Nash Health Care Systems	2	2.3	46488	0.9
High Point Regional Health System	3	2.9	76179	1.0
Wayne Memorial Hospital	4	3.4	52165	1.2
Carolinas Medical Center-Pineville	3	2.5	65543	1.2
FirstHealth Moore Regional Hospital	5	3.8	102442	1.3
Novant Health Rowan Medical Center	4	1.8	41876	2.2



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
PD = # Patient days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

MRSA in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 400 or More Beds

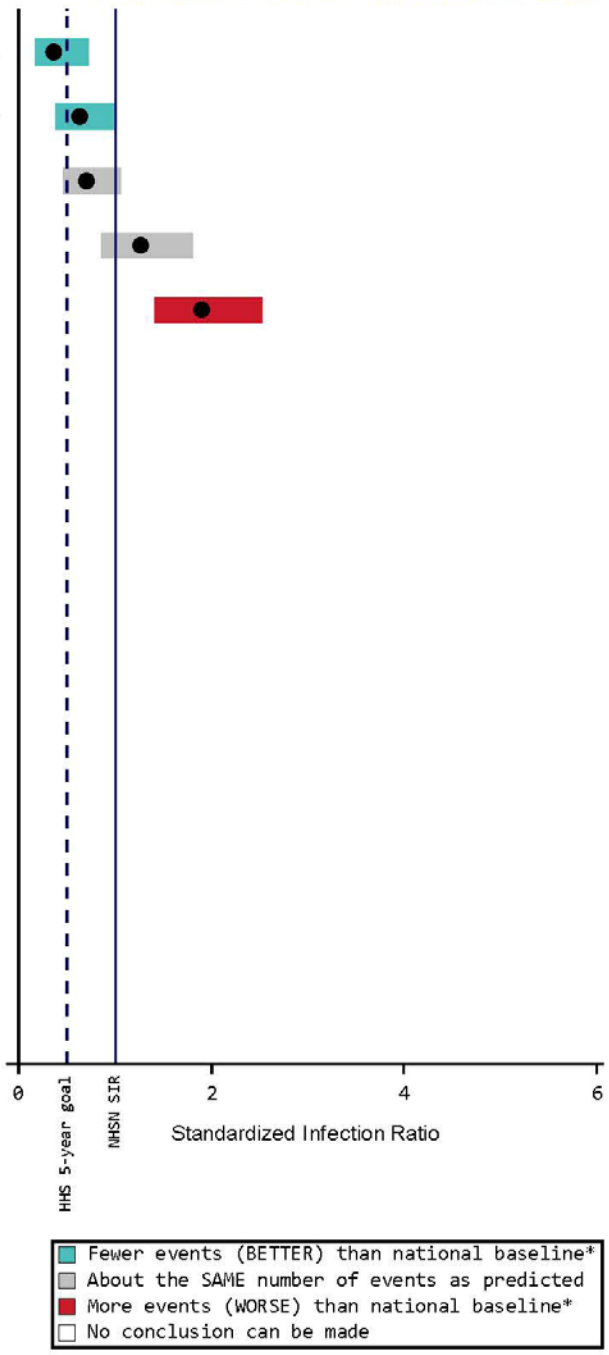
HOSPITAL	OBS	PRED	PD	SIR
Gaston Memorial Hospital	2	6.3	80923	0.3
Carolinas Medical Center-Northeast	3	6.1	106816	0.5
Rex Healthcare	7	12.8	125537	0.5
Mission Hospital	14	18.6	208726	0.8
Moses Cone Hospital	6	6.4	116542	0.9
New Hanover Regional Medical Center	14	14.8	171048	0.9
WakeMed	9	9.2	163305	1.0
Cape Fear Valley Health System	11	9.8	158150	1.1
Novant Health Forsyth Medical Center	27	15.0	218078	1.8
Novant Health Presbyterian Medical	17	9.1	146876	1.9



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
PD = # Patient days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

MRSA in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with Primary Medical School Affiliation

HOSPITAL	OBS	PRED	PD	SIR
Vidant Medical Center	7	19.3	242150	0.4
Carolinas Medical Center	16	25.5	275835	0.6
Duke University Hospital	21	29.9	332244	0.7
UNC Health Care	27	21.5	249554	1.3
Wake Forest University Baptist Medical	44	23.2	230079	1.9



Data reported from adult/pediatric units as of March 24, 2017 .
OBS = # infections observed
PRED = # infections statistically 'predicted' by national baseline
PD = # Patient days
SIR = Standardized infection ratio (OBS/PRED # of infections)
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

2. *Clostridium difficile* Laboratory-Identified Events (CDI LabID)

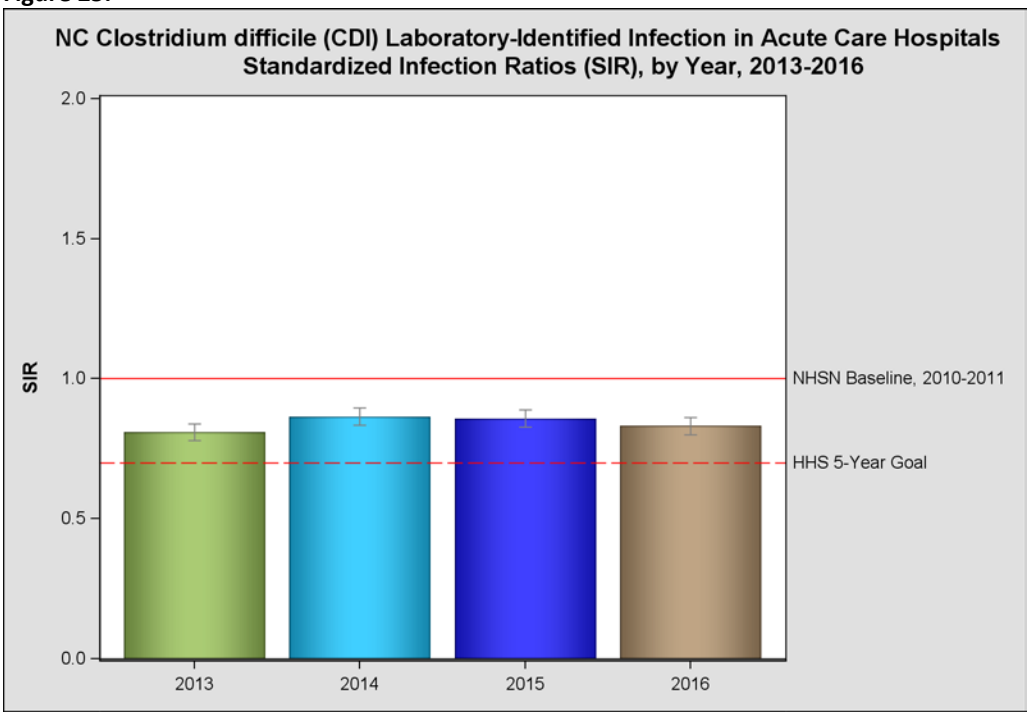
North Carolina 2016 CDI LabID Highlights

- In 2016, North Carolina hospitals reported 2,981 CDI LabID events, compared to the 3,589 CDI LabID events which were predicted. This was better than the 2010-2011 national experience.
- The U.S. Department of Health and Human Services set a goal to reduce CDI nationally by 30% from the baseline experience in 2010-2011; North Carolina has not yet met this goal.

Table 7. NC Clostridium difficile laboratory-identified events, by year, 2012-2016

Year	# Observed Infections	# Predicted Infections	How Does North Carolina Compare to the National Experience?
2013	**2852**	**3526**	**★Better: Fewer infections than were predicted (better than the national experience)**
2014	**3128**	**3621**	**★Better: Fewer infections than were predicted (better than the national experience)**
2015	**3103**	**3620**	**★Better: Fewer infections than were predicted (better than the national experience)**
2016	**2981**	**3589**	**★Better: Fewer infections than were predicted (better than the national experience)**

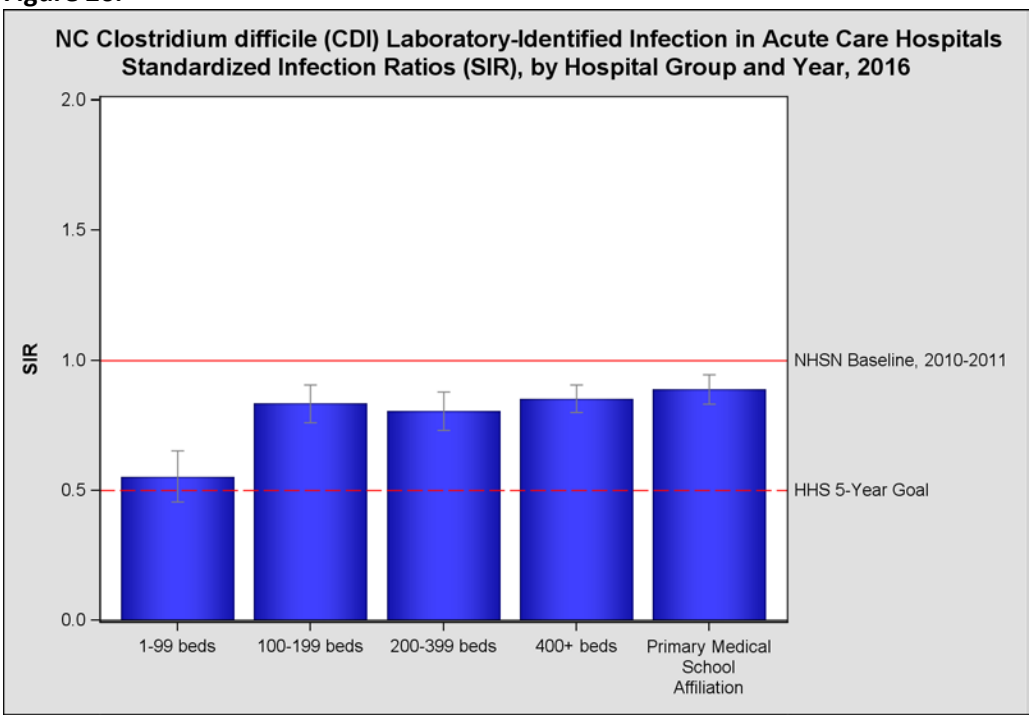
Figure 25.



How to Understand Figure 25:

- Since 2013, North Carolina has performed BETTER than the national experience, with fewer CDI LabID events than predicted
- North Carolina has not shown significant progress in reducing CDI since surveillance began in 2013
- The HHS 5-year goal to reduce CDI infections by 30% has not yet been met in North Carolina

Figure 26.



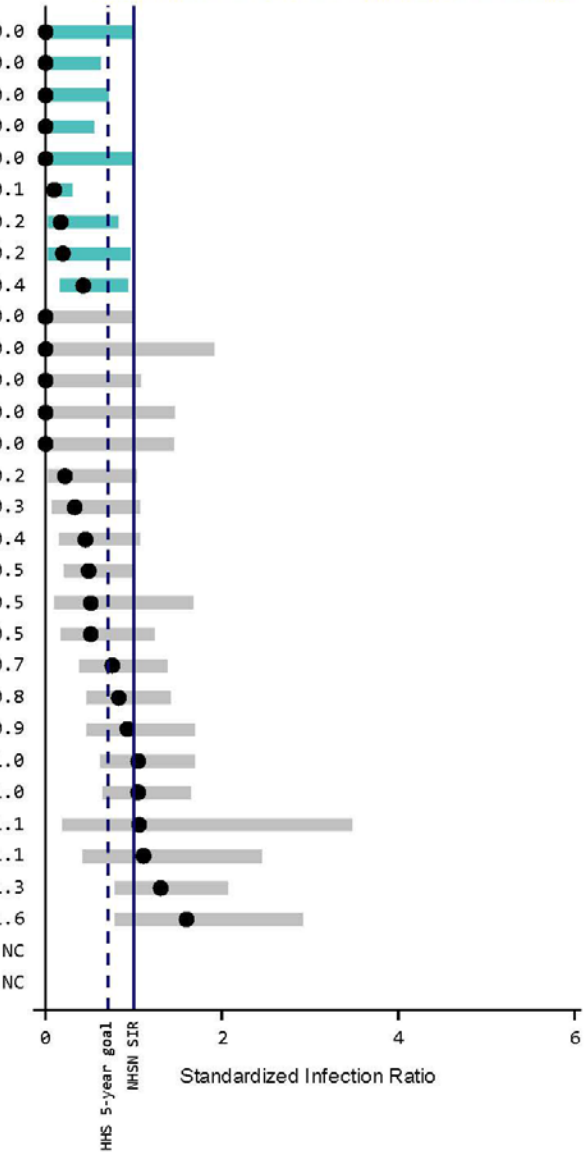
How to Understand Figure 26:

- All Hospital sized groups performed BETTER than the national experience, with fewer LabID CDI events than predicted
- With the exception of hospitals with <100 bed, there is little variability in burden by hospital size
- None of the hospital size groups met the HHS 5-year goal in 2016

The following SIR plots summarize CDI labID data for North Carolina hospitals by hospital groups (Appendix E).

C Difficile in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with less than 100 Beds

HOSPITAL	OBS	PRED	PD	SIR
Sandhills Regional Medical Center	0	3.0	6678	0.0
Kings Mountain Hospital	0	4.9	7667	0.0
Novant Health Charlotte Orthopedic Hosp	0	4.2	7746	0.0
Hugh Chatham Memorial Hospital	0	5.5	14212	0.0
Cape Fear Valley Hoke Hospital	0	3.0	5115	0.0
Central Regional Hospital	2	22.6	55410	0.1
Vidant Duplin Hospital	1	6.0	9992	0.2
Firsthealth Moore Regional-Richmond	1	5.2	8782	0.2
Randolph Hospital	5	12.0	17895	0.4
Murphy Medical Center	0	3.0	6456	0.0
Person Memorial Hospital	0	1.6	3391	0.0
Novant Health Medical Park Hospital	0	2.8	5560	0.0
North Carolina Specialty Hospital	0	2.1	4443	0.0
Wake Forest Baptist Health-Davie Medica	0	2.1	3603	0.0
McDowell Hospital	1	4.8	8013	0.2
Dlp - Harris Regional Hospital	2	6.2	12316	0.3
Novant Health Brunswick Medical Center	4	9.0	16636	0.4
Annie Penn Hospital	6	12.4	16165	0.5
Johnston Health Clayton	2	4.0	7806	0.5
Columbus Regional Healthcare System	4	7.9	17238	0.5
Sentara Albemarle Medical Center	9	12.0	21661	0.7
Betsy Johnson Regional	12	14.4	29129	0.8
Vidant Beaufort Hospital	9	9.8	16657	0.9
Halifax Regional Medical Center	15	14.3	20874	1.0
Novant Health Huntersville	17	16.2	25295	1.0
Martin General Hospital	2	1.9	4257	1.1
Wake Forest Baptist Health-Lexington	5	4.5	8662	1.1
Caldwell Memorial Hospital	16	12.4	20445	1.3
Granville Medical Center	9	5.7	8981	1.6
Carolinas Healthcare System Anson	0	0.1	132	NC
Firsthealth Moore Regional-Hoke	0	0.9	1411	NC



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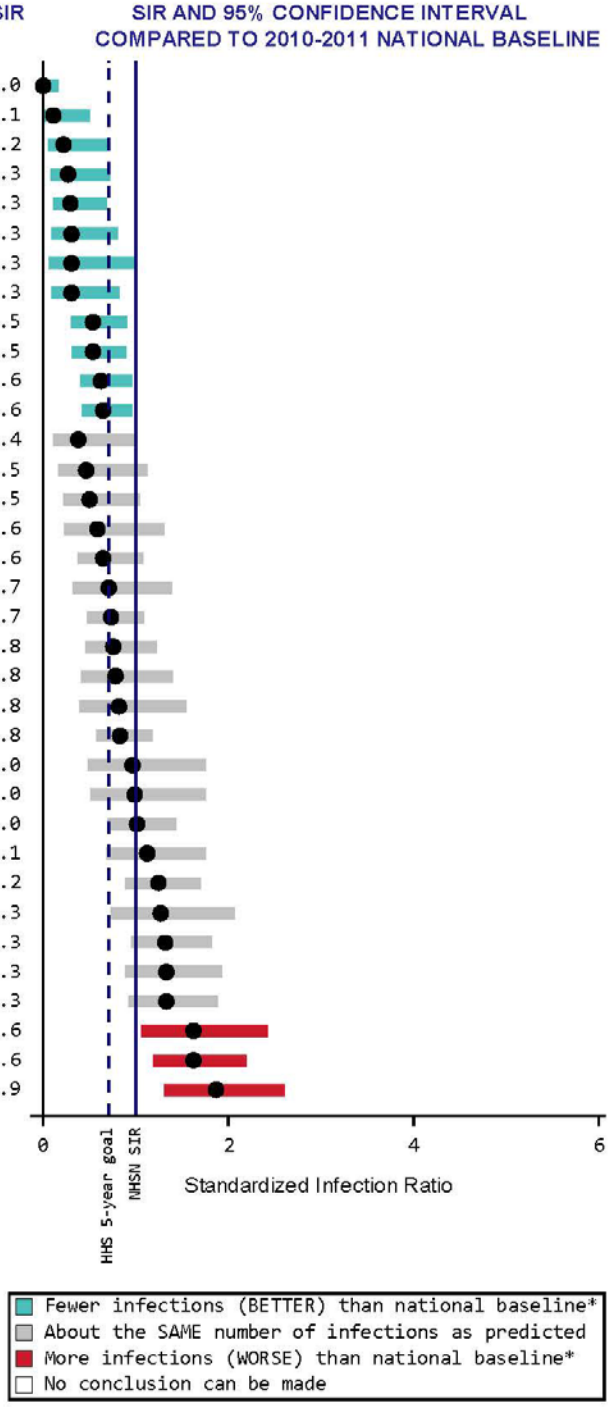
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

C Difficile in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 100 to 199 Beds

HOSPITAL	OBS	PRED	PD	SIR
Women's Hospital	0	19.1	31904	0.0
Scotland Memorial Hospital	1	10.0	19887	0.1
Novant Health Thomasville Medical Cente	2	9.3	12605	0.2
Haywood Regional Medical Center	3	11.4	22741	0.3
Carolinas Healthcare System Lincoln	4	14.2	17056	0.3
Davis Regional Medical Center	3	10.2	18756	0.3
Wilkes Regional Medical Center	2	6.7	13976	0.3
Morehead Memorial Hospital	3	10.0	14579	0.3
Pardee Hospital	12	22.6	29569	0.5
Catawba Valley Medical Center	13	24.4	50793	0.5
Carolinas Medical Center-Mercy	19	30.6	41845	0.6
Wesley Long Hospital	21	32.9	41501	0.6
Sampson Regional Medical Center	3	8.1	14440	0.4
Stanly Regional Medical Center	4	8.6	10993	0.5
Carolinas Medical Center-University	6	12.1	21093	0.5
Central Carolina Hospital	5	8.5	15640	0.6
Lenoir Memorial Hospital	13	20.1	27089	0.6
Lake Norman Regional Medical Center	7	10.0	14506	0.7
Carolinas Healthcare System Blue Ridge	21	29.1	33386	0.7
Carolinas Medical Center-Union	15	19.8	30716	0.8
Vidant Roanoke Chowan Hospital	10	12.8	14891	0.8
Northern Hospital Of Surry County	8	9.8	14722	0.8
Duke Raleigh Hospital	29	35.1	48883	0.8
Vidant Edgecombe Hospital	9	9.4	13427	1.0
ARHS-Watauga Medical Center	10	10.2	14780	1.0
Frye Regional Medical Center	28	27.8	36323	1.0
Maria Parham Medical Center	17	15.2	20633	1.1
Novant Health Matthews Medical Center	35	28.4	40466	1.2
Rutherford Regional Medical Center	14	11.1	14613	1.3
Iredell Memorial Hospital	35	26.6	37302	1.3
Onslow Memorial Hospital	25	18.9	27272	1.3
Wilson Medical Center	29	21.8	27307	1.3
Carteret General Hospital	22	13.6	23708	1.6
WakeMed Cary Hospital	40	24.6	37182	1.6
Johnston Health	32	17.2	25519	1.9



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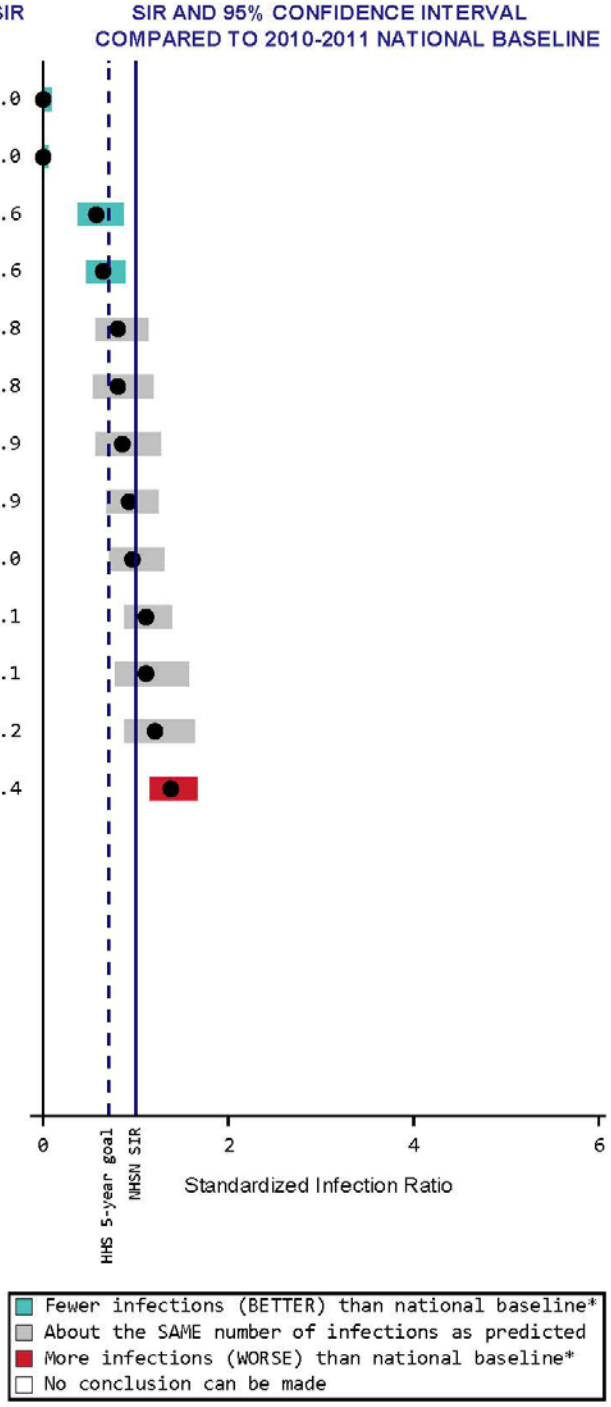
*Significantly different than 2009 national baseline

C Difficile in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 200 to 399 Beds

HOSPITAL	OBS	PRED	PD	SIR
Cherry Hospital	0	36.9	61503	0.0
Broughton Hospital	0	61.3	98585	0.0
Wayne Memorial Hospital	21	36.6	49304	0.6
Southeastern Regional Medical Center	35	54.6	64221	0.6
Carolinas Medical Center-Pineville	31	38.7	58800	0.8
Carolinas Healthcare System Cleveland	23	28.6	34816	0.8
Alamance Regional Medical Center	23	26.9	37961	0.9
CarolinaEast Medical Center	42	45.6	61509	0.9
Duke Regional Hospital	39	40.5	46484	1.0
High Point Regional Health System	69	62.5	73064	1.1
Novant Health Rowan Medical Center	30	27.0	39993	1.1
Nash Health Care Systems	38	31.6	43181	1.2
FirstHealth Moore Regional Hospital	105	76.1	96761	1.4



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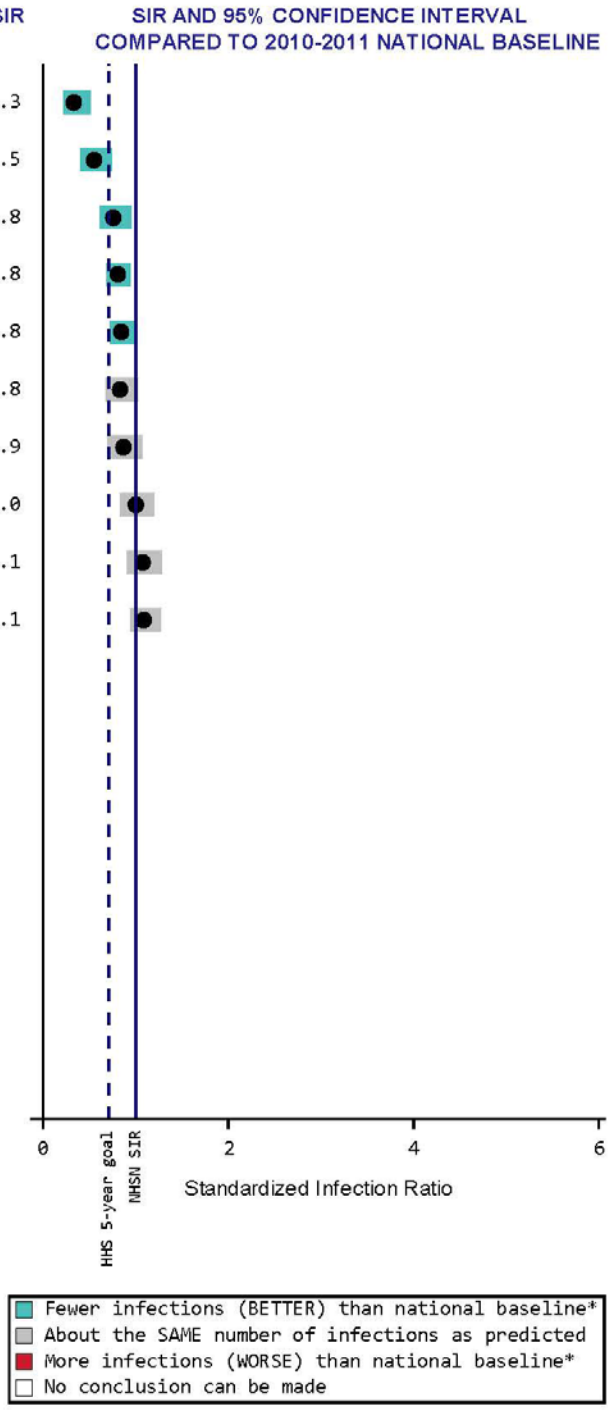
C Difficile in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with 400 or More Beds

HOSPITAL	OBS	PRED	PD	SIR
Gaston Memorial Hospital	19	57.5	74832	0.3
Carolinas Medical Center-Northeast	38	70.4	96296	0.5
Cape Fear Valley Health System	75	99.1	137236	0.8
Mission Hospital	138	173	190347	0.8
New Hanover Regional Medical Center	129	153	162082	0.8
Novant Health Presbyterian Medical	83	100	135023	0.8
Moses Cone Hospital	79	92.0	116542	0.9
Rex Healthcare	109	110	109585	1.0
WakeMed	121	113	136795	1.1
Novant Health Forsyth Medical Center	161	148	191379	1.1



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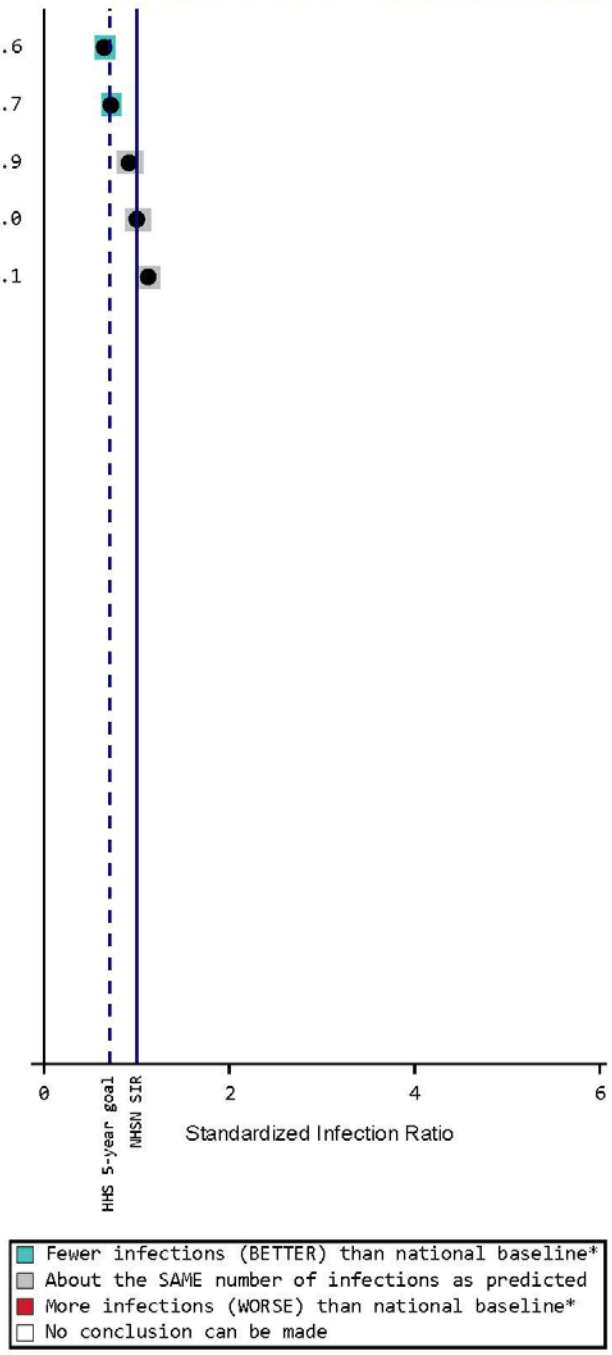
NC = SIR not calculated for hospitals with <1 predicted infection
*Significantly different than 2009 national baseline

C Difficile in Acute Care Hospitals
Standardized Infection Ratios: January 1 – December 31, 2016
Hospital Group: Hospitals with Primary Medical School Affiliation

HOSPITAL	OBS	PRED	PD	SIR
Vidant Medical Center	127	198	229825	0.6
Carolinas Medical Center	161	226	248677	0.7
Wake Forest University Baptist Medical	150	165	218317	0.9
UNC Health Care	198	199	224043	1.0
Duke University Hospital	301	269	310861	1.1



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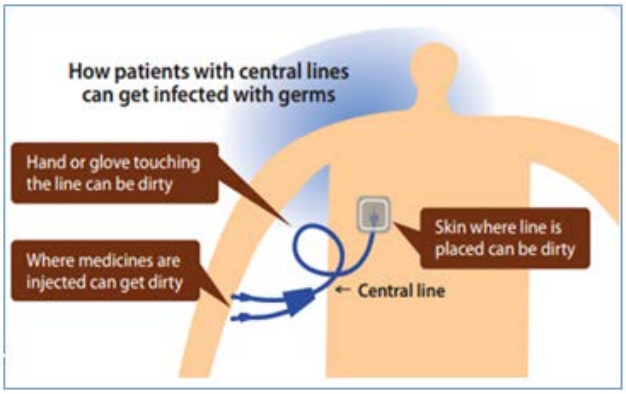
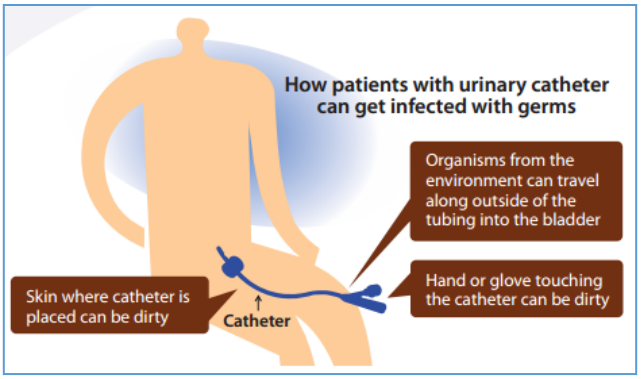
FAST FACTS: What You Need to Know About Healthcare-Associated Infections

Device-Associated HAIs

Sometimes, patients have medical devices inserted into their bodies to provide necessary medical care. These devices are called "invasive devices" and patients with these devices have a higher chance of getting an infection. Here is what you need to know about invasive devices and what kinds of infections they can be associated with:



- A **central line** is a tube placed in a large vein to allow access to the bloodstream and provide the patient with important medicine. A **central line-associated bloodstream infection (CLABSI)** can occur when bacteria or other germs travel along a central line and enter the blood. When not put in correctly or kept clean, central lines can become a pathway for germs to enter the body and cause serious bloodstream infections.



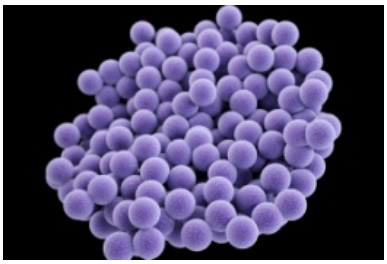
- A **urinary catheter** is a tube placed in the bladder to drain urine. A **catheter-associated urinary tract infection (CAUTI)** can occur when bacteria or other germs travel along a urinary catheter, resulting in an infection in your bladder or your kidney.

Other HAIs

- A **surgical site infection (SSI)** occurs after surgery in the part of the body where the surgery took place. These infections may involve only the skin or may be more serious and involve tissue under the skin or organs. SSIs sometimes take days or months after surgery to develop. Symptoms may include fever, redness or pain around the surgical site, or drainage of fluid from the wound.

- **Methicillin-resistant *Staphylococcus aureus* (MRSA)** infections are caused by bacteria that are resistant to certain types of drugs. MRSA can cause skin or wound infections. Sometimes, MRSA can infect the blood and cause serious illness and even death. Only bloodstream infections are shown in this report.

- ***Clostridium difficile* (*C. difficile*)** is a type of bacteria that causes severe diarrhea and can be deadly. *C. difficile* infections usually occur in people who have recently taken antibiotics and been under medical care.



READING GUIDE: Explanation of Each Variable in the Tables and Figures

Below is a list of all variables shown in the data tables and figures:

- **Title**: The title of the table gives you information about the infection type, time period, facility unit(s)/group(s) included in the table.

- **Procedure Type:** This is the specific type of surgery for which the surgical site infection (SSI) data are presented (e.g., abdominal hysterectomy, colon surgery).

- **Unit/Unit Type:** This is the specific unit/type of unit in the hospital from which the data was collected. Hospitals have distinct locations, or units, within the facility that are designated for certain types of patients. For example: "Med/Surg ICU" represents the intensive care unit (ICU) for very sick patients needing medical or surgical care.

- **Observed Infections (or Observed Events):** This is the number of infections (or events, for LabID measures) that was reported by the facility.

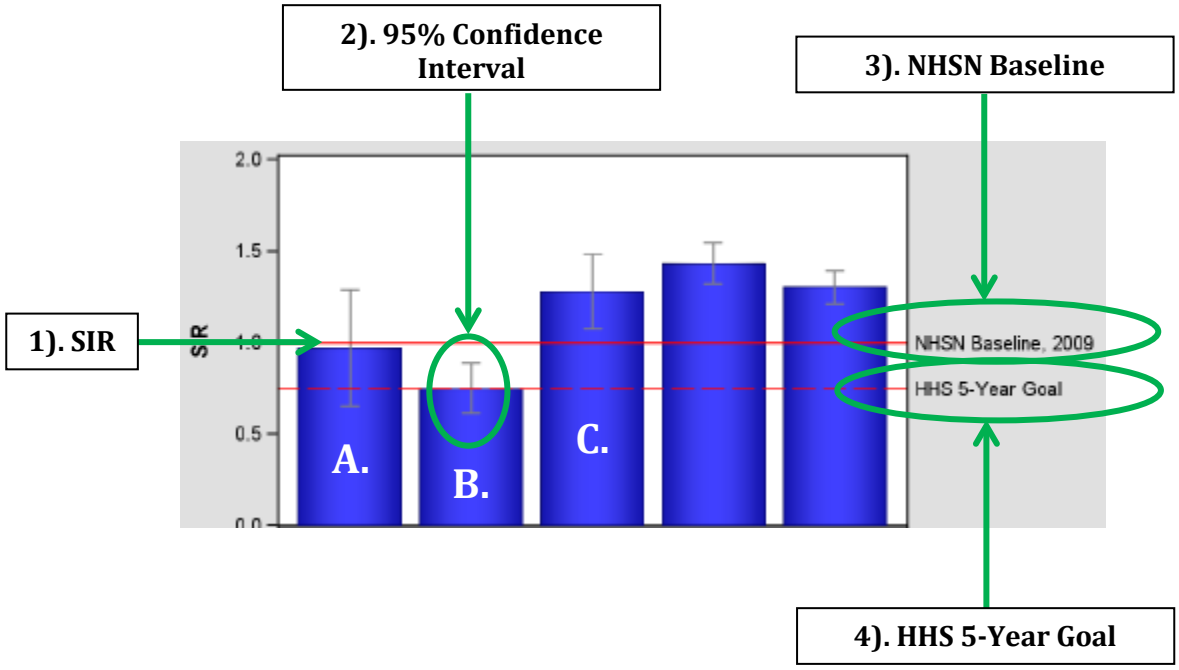
- **Predicted Infections (or Predicted Events):** This is a calculated value that reflects the number of infections (or events, for LabID measures) that we have "predicted" to occur in this facility, based on the national experience.

- **"How Does North Carolina Compare to the National Experience?"** Colors and symbols are used to help you quickly understand and interpret the hospital's data. This is the "take-home message" about healthcare-associated infections in this facility.

  ★ Indicates that North Carolina had fewer infections than were predicted (better than the national experience)
  = Indicates that North Carolina had about the same number of infections as were predicted (same as the national experience)
  ✖ Indicates that North Carolina had more infections than were predicted (worse than the national experience)
  No Conclusion: Indicates that North Carolina reported data, but there was not enough information to make a reliable comparison to the national experience (# of predicted infections was less than 1).

NUMBERS GUIDE: Explanation of Numbers and Data Calculations

Below is an explanation of numbers and data calculations used in the figures:



1). SIR - Represented by the colored bars in each figure.

- SIR = number of *observed* infections / number of *predicted* infections based on the national baseline experience
- SIR is calculated for each HAI
- The SIR is considered a "best guess" or estimate of observed infections compared to those predicted during January 1, 2016 – December 31, 2016

A) Represents an SIR value of 1
B) Represents an SIR value of less than 1
C) Represents an SIR value of greater than 1

2). 95% confidence intervals for the SIR – Represented by the skinny gray lines in each figure.
These gray lines represent a lower and a higher limit around the SIR; together these limits create an interval. It means we are 95% confident the SIR estimate falls within this interval. Wider bars indicate less confidence in the SIR estimate.

How to understand the 95% confidence intervals:

- If the value of 1.0 is included between the lower and upper limit, there is NO significant difference between the number of observed and number of predicted infections.
- If the value of 1.0 is NOT included between the lower and upper limit, there IS a significant difference between the number of observed and predicted infections.

3). NHSN Baseline (i.e., national experience) – Represented by the solid red line in each figure.

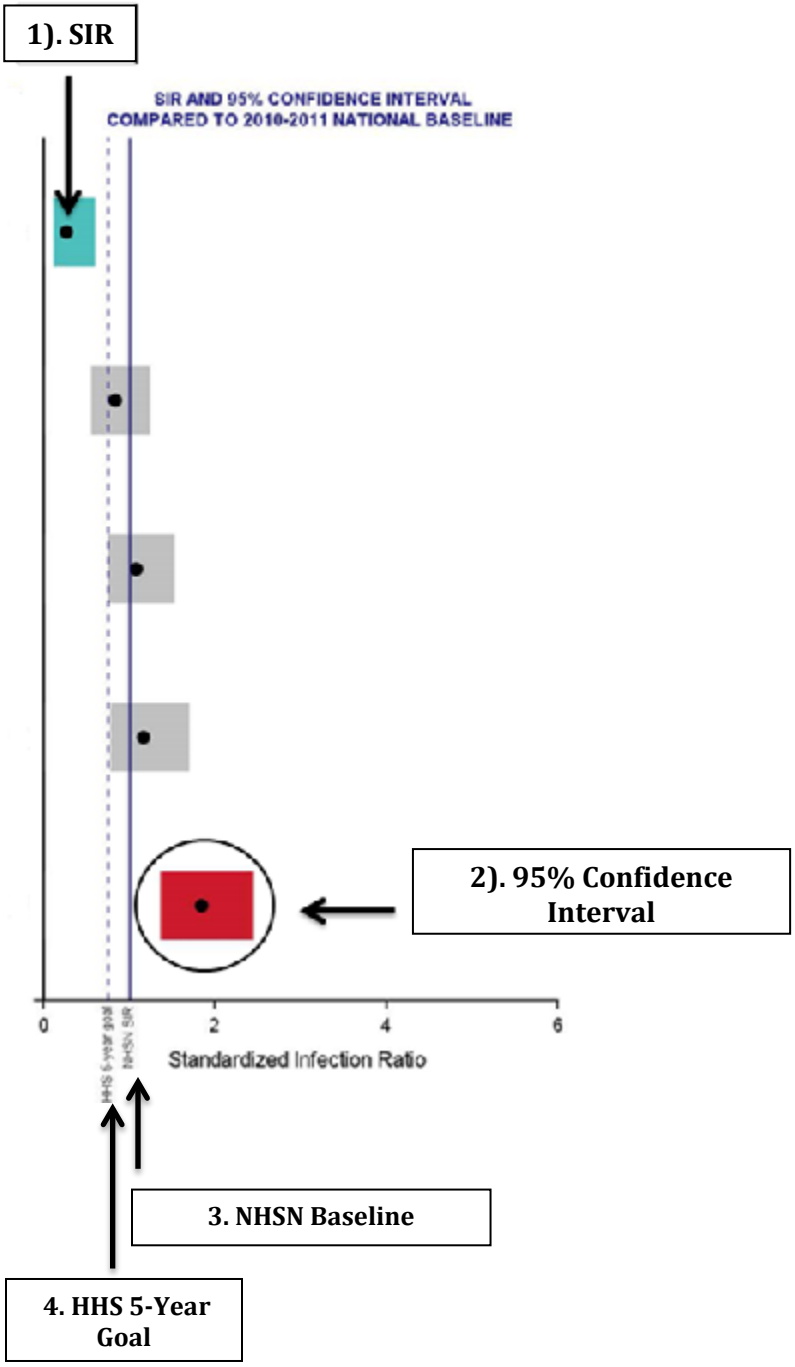
- The NHSN baseline is the number of predicted infections based on the national experience
- The NHSN baseline year may be different for each HAI:
    - The CLABSI and SSI baselines use data from 2006-2008
    - The CAUTI baselines use data from 2009
    - The MRSA and CDI LabID baselines use data from 2010-2011

4). HHS 5-Year Goal – Represented by the dotted red line in each figure.

- Health and Human Services established a 5-year goal to reduce each HAI by a certain percentage
- The CLABSI the 5-year goal is a 25% reduction, so the 5-year goal SIR will be 0.75 (or 1.0-.25).
- The goal is considered met when the SIR estimate is at or below this dotted line and the upper confidence limit is also at or below this dotted line.
- If the SIR estimate is at or below this dotted line but the upper confidence limit crosses this dotted line, the number of infections does not differ from the 5 year goal

5). How can I use the SIR, 95% Confidence Interval, and the NHSN Baseline to know how North Carolina did compared to the national experience? - To understand each figure, you will need to look at all three of these numbers. You'll Specifically need to know whether the SIR falls around 1.0, less than 1.0 or greater than 1.0 and whether the 95% Confidence Interval contains the value of 1.0.

Below is an explanation of numbers and data calculations used in the SIR plots:



SIR plots are used to compare HAI infection data in North Carolina by hospital size groups. Each plot displays the facilities in a particular hospital size group on the left hand side. To the right of each facility's information is the plot. The elements of this plot are described as follows:

1). SIR - Represented by a black circle on the plots

- SIR = number of *observed* infections / number of *predicted* infections based on the national baseline experience
- SIR is calculated for each facility
- The SIR is considered a "best guess" or estimate of observed infections compared to those predicted during January 1, 2016 – December 31, 2016

2). 95% confidence intervals for the SIR – Represented by the red, grey and green bands surrounding the SIR dot.

These bands represent a lower and a higher limit around the SIR. It means we are 95% confident the SIR estimate falls within this interval. Wider bands indicate less confidence in the SIR estimate.

How to understand the 95% confidence intervals:

- If the value of 1.0 is included between the lower and upper limit, there is NO significant difference between the number of observed and number of predicted infections. Facilities with about the same number observed infections as predicted will have a grey confidence interval.
- If the upper confidence limit is less than 1.0, there were FEWER observed infections than predicted by the national experience. Facilities with fewer observed infections than predicted will have a green confidence interval.
- If the lower confidence limit is greater than 1.0, there were MORE observed infections than predicted by the national experience. Facilities with MORE observed infections than predicted will have a red confidence interval.

3). NHSN Baseline (i.e. national experience) – Represented by the solid line in each plot.

- The NHSN baseline is the number of predicted infections based on the national experience
- The NHSN baseline year may be different for each HAI:
    - The CLABSI and SSI baselines use data from 2006-2008
    - The CAUTI baselines use data from 2009
    - The MRSA and CDI LabID baselines use data from 2010-2011

4). HHS 5-Year Goal – Represented by the dotted line in each plot.

- Health and Human Services established a 5-year goal to reduce each HAI by a certain percentage
- If the upper confidence limit is below this dotted line, the facility has met the HHS 5-year goal.
- If the confidence interval crosses the dotted line, the number of infections at that facility does not differ from the 5 year goal.
- If the lower confidence limit is above this dotted line the facility has not met the 5 year goal.

APPENDICES

APPENDIX A. Definitions

Term	Definition
Aggregate data	Sum or total data. For example, aggregate NC HAI data refers to the sum, or total, of all hospital HAI data in NC
ASA Class	Anesthesiologist's pre-operative assessment of the patient's physical condition, using the American Society of Anesthesiologists' (ASA) Classification of Physical Status. 1. Normally healthy patient 2. Patient with mild systemic disease 3. Patient with severe systemic disease that is not incapacitating 4. Patient with an incapacitating systemic disease, constant threat to life 5. Patient not expected to survive for 24 hours with or without the operation
Beds	The number of staffed beds in a facility or patient care location. This may be different from the number of licensed beds.
Catheter days	A daily count of the number of patients with an indwelling urinary catheter. For example, one patient with an indwelling catheter in place for two days or two patients with indwelling catheters in place for one day each would both result in two catheter days. This number is used when presenting rates of catheter-associated urinary tract infections.
Catheter-associated urinary tract infection	Urinary tract infection (UTI) that occurs in a patient who had an indwelling urinary catheter in place within the 48-hour period before the onset of the UTI.
Central line	A catheter (tube) that doctors place in a large vein in the neck, chest, or groin ending in a large vein near the heart. It is used to give medication or fluids or to collect blood for medical tests. Also known as a central venous catheter.
Central line-associated bloodstream infection	A bloodstream infection (BSI) that occurs in a patient who had a central line within the 48-hour period before the onset of the BSI and is not related to an infection at another site.
Central line days	A daily count of the number of patients with a central line. For example, one patient with a central line in place for two days or two patients with central lines in place for one day each would both result in two central line days. This number is used when presenting rates of central line-associated bloodstream infections.
Device days	A daily count of the number of patients with a specific device (e.g., central line, umbilical catheter, or urinary catheter) in the patient care location. For example, one patient with a device in place for two days or two patients with devices in place for one day each would both result in two device days. This number is used when presenting rates of infections associated with the use of devices.
Full-time equivalent	The equivalent of one person working full time for one year: 8 hour per day at 5 days per week for 52 weeks per year = 2080 hours per year
Hand hygiene	A general term that applies to routine hand washing, antiseptic hand wash, antiseptic hand rub, or surgical hand antisepsis. *Routine hand washing* is the use of clean water and non-antimicrobial soap to remove germs, soil and other debris from the hands. *Antiseptic hand washing* is the use of water and antimicrobial soap to remove or kill germs on the hands. *Antiseptic hand rub* is the use of alcohol-based hand rubs to remove or destroy germs from the hands. Antiseptic hand rubs are less effective when hands are visibly dirty.

Term	Definition
	Surgical hand antisepsis is the use of water and antimicrobial soap to remove or kill germs and takes 2-6 minutes to complete as both hands and forearms are cleaned. Water and non-antimicrobial soap can also be used but must be followed with an alcohol-based surgical hand scrub.
Healthcare-associated infections	Healthcare-associated infections (HAI) are infections caused by a wide variety of common and unusual bacteria, fungi, and viruses during the course of receiving medical care.
Intensive care unit	A nursing care area that provides intensive observation, diagnosis, and therapeutic procedures for adults and/or children who are critically ill. Also referred to as critical care unit.
Medical affiliation	Affiliation with a medical school. There are four categories*:* *Major teaching* – Hospital is an important part of the teaching program of a medical school and the majority of medical students rotate through multiple clinical services. *Graduat*e – Hospital used by the medical school for graduate training programs only (i.e., residency and/or fellowships). *Limited* – Hospital used in the medical school's teaching program to a limited extent. *No* – Hospital not affiliated with a medical school.
Patient days	A daily count of the number of patients in the patient care location during a specified time period.
Rate	Describes the speed with which disease or events occur. The number of diseases or events per unit of time.
Standardized infection ratio	A ratio of observed to expected (or predicted) numbers of events that is adjusted for selected risk factors.
Surgical site infection	Infection that occurs after surgery, in the part of the body where the surgery took place.
Umbilical catheter	Long, thin plastic tubes that travel from the stump of a newborn baby's umbilical cord into the large vessels near the heart
Urinary catheter	A drainage tube that is inserted into the urinary bladder through the urethra, is left in place, and is connected to a closed collection system.
Validity (data)	The extent to which reported cases of a disease or event correspond accurately to cases of a disease event that actually occurred.

APPENDIX B. Acronyms

ACH	Acute care hospital (short-term)
ACL	Adult Care Licensure
APIC-NC	Association for Professionals in Infection Control and Epidemiology, NC Chapter
ASA	American Society of Anesthesiologists
BSI	Bloodstream infection
CAUTI	Catheter-associated urinary tract infection
CCME	Carolinas Center for Medical Excellence
CCU	Critical care unit
CDB	Communicable Disease Branch
CDC	Centers for Disease Control and Prevention
C. diff	*Clostridium difficile*
CDI	*Clostridium difficile* infection
CI	Confidence interval
CMS	Centers for Medicare and Medicaid Services
CLABSI	Central line-associated bloodstream infections
CRE	Carbapenem-resistant Enterobacteriaceae
CUSP	Comprehensive Unit-based Safety Program
DHHS	Department of Health and Human Services
DHSR	Division of Health Services Regulation
DPH	Division of Public Health
ED	Emergency department
FTE	Full-time equivalent
G.S.	General statute
HAI	Healthcare-associated Infection
HRET	American Hospital Associations' Health Research and Trust
ICU	Intensive care unit
IPs	Infection preventionists
IRF	Inpatient rehabilitation facility
LTAC	Long-term acute care hospital
MRSA	Methicillin resistant *Staphylococcus aureus*
NCHA	North Carolina Hospital Association
NC SPICE	North Carolina Statewide Program for Infection Control and Epidemiology
NCQC	North Carolina Quality Center
NHLC	Nursing Home Licensure and Certification

APPENDIX B. Acronyms (continued)

NHSN	National Healthcare Safety Network
NICU	Neonatal intensive (critical) care unit
QIO	Quality improvement organization
SIR	Standardized infection ratio
SSI	Surgical site infection
VAST	Vascular Access Safety Team
VRE	Vancomycin-resistant *Enterococcus*

APPENDIX C. Healthcare-Associated Infections Prevention Tips

Appendix C1. Catheter (Central Line)-Associated Bloodstream Infections

Appendix C2. Catheter-Associated Urinary Tract Infections

Appendix C3. Surgical Site Infections

Appendix C4. Methicillin-resistant *Staphylococcus aureus* LabID Events

Appendix C5. *Clostridium difficile* LabID Events

Appendix D. Healthcare-Associated Infections (HAI) Advisory Group

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Appendix E. Healthcare Facility Groupings, 2015 National Healthcare Safety Network Annual Hospital Survey

Appendix E1 Healthcare Facility Group: Short-term Acute Care Hospitals

Hospital Group	Hospital Name	Number of Beds
1-99 beds	Wake Forest Baptist Health-Davie Medical Center	0
	Central Regional Hospital	0
	Firsthealth Moore Regional Hospital - Hoke Campus	8
	Carolinas Healthcare System Anson	15
	North Carolina Specialty Hospital	18
	Cherokee Indian Hospital	18
	Novant Health Medical Park Hospital	22
	Cape Fear Valley Hoke Hospital	29
	Murphy Medical Center	31
	McDowell Hospital	38
	Person Memorial Hospital	38
	Martin General Hospital	49
	Betsy Johnson Regional	50
	Johnston Health Clayton	50
	Wakemed North Family Health & Women's Hospital	50
	Annie Penn Hospital	53
	Granville Medical Center	62
	Sandhills Regional Medical Center	64
	Kings Mountain Hospital	65
	Columbus Regional Healthcare System	70
	Caldwell Memorial Hospital	72
	Novant Health Brunswick Medical Center	74
	Firsthealth Moore Regional Hospital - Richmond Campus	79

Hospital Group	Hospital Name	Number of Beds
	Vidant Duplin Hospital	80
	Novant Health Charlotte Orthopedic Hospital	80
	Hugh Chatham Memorial Hospital	81
	Vidant Beaufort Hospital	84
	Randolph Hospital	85
	Wake Forest Baptist Health-Lexington Medical Center	85
	Dlp - Harris Regional Hospital	86
	Novant Health Huntersville Medical Center	91
	Halifax Regional Medical Center	96
	Sentara Albemarle Medical Center	97
100-199	Carolinas Medical Center-University	100
	Haywood Regional Medical Center	100
	Northern Hospital Of Surry County	100
	Maria Parham Medical Center	101
	Carolinas Healthcare System Lincoln	101
	Scotland Memorial Hospital	104
	Morehead Memorial Hospital	108
	Stanly Regional Medical Center	109
	Vidant Roanoke Chowan Hospital	114
	Sampson Regional Medical Center	116
	Central Carolina Hospital	116
	ARHS-Watauga Medical Center	117
	Vidant Edgecombe Hospital	117
	Lake Norman Regional Medical Center	123
	Rutherford Regional Medical Center	125

Hospital Group	Hospital Name	Number of Beds
200-399 beds	Davis Regional Medical Center	130
	Wilkes Regional Medical Center	130
	Women's Hospital	134
	Carteret General Hospital	135
	Pardee Hospital	138
	Lenoir Memorial Hospital	138
	Wilson Medical Center	138
	Carolinas Healthcare System Blue Ridge	139
	Novant Health Matthews Medical Center	146
	Novant Health Thomasville Medical Center	149
	Wesley Long Hospital	150
	WakeMed Cary Hospital	156
	Frye Regional Medical Center	159
	Carolinas Medical Center-Mercy	160
	Onslow Memorial Hospital	162
	Duke Raleigh Hospital	170
	Johnston Health	172
	Carolinas Medical Center-Union	182
	Catawba Valley Medical Center	190
	Iredell Memorial Hospital	199
	Carolinas Medical Center-Pineville	206
	Cherry Hospital	208
	Nash Health Care Systems	212
	Duke Regional Hospital	223
	Alamance Regional Medical Center	238
	Carolinas Healthcare System Cleveland	241
	Wayne Memorial Hospital	242
	Southeastern Regional Medical Center	246
	Novant Health Rowan Medical Center	268
	Broughton Hospital	297

Hospital Group	Hospital Name	Number of Beds
400+ beds	High Point Regional Health System	300
	CarolinaEast Medical Center	350
	FirstHealth Moore Regional Hospital	376
	Gaston Memorial Hospital	435
	Moses Cone Hospital	443
	Carolinas Medical Center-Northeast	457
	Cape Fear Valley Health System	603
	Novant Health Presbyterian Medical Center	617
	WakeMed	618
	Rex Healthcare	665
	New Hanover Regional Medical Center	682
	Mission Hospital	736
	Novant Health Forsyth Medical Center	921
Primary Medical School Affiliation	Carolinas Medical Center	880
	Wake Forest University Baptist Medical Center	885
	Vidant Medical Center	909
	UNC Health Care	914
	Duke University Hospital	952

Appendix E2 Healthcare Facility Group: Long-term Acute Care Hospitals

Facility Name
Carolinas Continuecare Hospital At Kings Mountain
Select Specialty Hospital-Greensboro
Select Specialty Hospital-Durham
Asheville Specialty Hospital
Carolinas Specialty Hospital
Select Specialty Hospital-Winston Salem
Kindred Hospital-Greensboro
Highsmith Rainey Specialty Hospital

Appendix E3 Healthcare Facility Group: Inpatient Rehabilitation Facilities

Facility Name
Carolinas Rehabilitation
CarePartners Health Services
Carolinas Rehabilitation Mount Holly
Carolinas Rehabilitation North East
Bryant T. Aldridge Rehabilitation Center
CHS Pineville Rehabilitation
Cape Fear Valley Rehabilitation Center