Virginia Department of Health Central Line-Associated Bloodstream Infection (CLABSI) 2010 Data Audit Project Protocol and Report

Virginia Department of Health
Division of Surveillance and Investigation
Healthcare-Associated Infections Program

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BACKGROUND

As of July 1, 2008, Virginia regulations state that all acute care hospitals shall collect and report data on central line-associated bloodstream infections (CLABSIs) in adult intensive care units (ICU) through the National Healthcare Safety Network (NHSN), a secure, internet-based surveillance system managed by the Division of Healthcare Quality Promotion at the Centers for Disease Control and Prevention (CDC). In the fall of 2009, VDH received American Recovery and Reinvestment Act (ARRA) funds to prevent healthcare-associated infections (HAIs) by increasing state health department capacity, enhancing HAI surveillance, and building HAI prevention collaboratives. Validating CLABSI data is a major component of enhancing HAI surveillance in an effort to measure the accuracy of current CLABSI case identification within and across facilities and recognize areas for improvement and education.

OBJECTIVES

1) To assess the accuracy and completeness of selected CLABSIs reported to the NHSN on patients in adult ICUs during the time period between January 1, 2010 and June 30, 2010

2) To identify issues leading to misclassification of CLABSIs

3) To evaluate current surveillance methods used to detect infections and associated denominators

4) To use the results to provide educational materials and lessons learned to infection preventionists (IPs) across the Commonwealth

METHODS

The CLABSI audit protocol was developed by the VDH HAI Team by reviewing recent protocols used by other states that have conducted similar CLABSI validation projects in conjunction with input from the Virginia chapter of the Association for Professionals in Infection Control and Epidemiology (APIC-VA), the Virginia Hospital & Healthcare Association (VHHA), the data validation specialists, and an external consultant.

Rationale

The audit methodology was developed to work with as many hospitals as possible within budgetary constraints. The validation was designed to investigate how the standardized CLABSI definitions from NHSN are being applied across the Commonwealth in order to reinforce good practices and improve identified gaps in knowledge or practice. The goal of this project was not to extrapolate results and quantify the "true" number of CLABSIs for this time period or the number of CLABSIs that were missed by surveillance. To reduce the potential for bias, an impartial outside consultant was hired to provide training for the validation specialists, consult on difficult cases during the validation process, and provide a definitive ruling when the CLABSI status differed between the validation specialist and the facility's infection prevention staff.

Staffing
Four validation specialists, who conducted many of the activities related to the validation project in conjunction with the VDH HAI Team, were funded through the ARRA grant and hired by the Virginia Hospital & Healthcare Association (VHHA). All of the validation specialists had experience in infection prevention and chart review and were responsible for coordinating and conducting site visits with participating healthcare facilities including chart reviews and interviews with IPs and other staff who are involved with CLABSI surveillance. Facilities were assigned to one of the four validation specialists based on geographic location and estimated number of chart reviews to evenly distribute validation specialists' responsibilities and minimize travel requirements. Additionally, if a validation specialist had previously worked in a facility, she was not eligible to review charts in that facility.

Mary Andrus, BA, RN, CIC was hired as an outside consultant to train the validation specialists on NHSN protocols, discuss difficult cases, and resolve discrepancies in CLABSI case status. Ms. Andrus is the 2010 recipient of APIC's Elaine Larson Lectureship Award that honors experts who have influenced public perception, attitudes, and awareness through their infection control and epidemiology experience. Ms. Andrus is currently a private infection prevention consultant in Georgia and is unaffiliated with the hospitals selected for validation. Previously, Ms. Andrus worked in the hospital setting as an IP and at the CDC as a nurse epidemiologist. At CDC, her duties included providing support and training for NHSN and subject matter expertise.

Hospital Selection
Seventy-three acute care or critical access hospitals submitted CLABSI data for the first and second quarter of 2010 (January 1 – June 30) and thus were eligible for participation in the validation project. Available funds from the 2009 American Recovery and Reinvestment Act (ARRA) provided for the review of approximately half the hospitals (n=37). Because Virginia had historically reported its CLABSI rates by bedsize category, it was important to ensure appropriate participation of small (200 licensed beds or fewer), medium (201-500 licensed beds), and large (>500 licensed beds) facilities for the project. Priority for review was given to hospitals that reported one or more CLABSIs to NHSN during this time period. Twenty-six hospitals fulfilled this criterion, including 11 small, 8 medium, and 7 large hospitals. Eleven other hospitals were randomly selected proportional to the number of remaining hospitals and the number in each bedsize category.

Small hospitals:
(31 small hospitals / 47 hospitals eligible for review) * 11 = 7 additional hospitals
11 with reported CLABSIs + 7 with no reported CLABSIs = 18 small hospitals audited

Medium hospitals:
(13 medium hospitals / 47 hospitals eligible for review) * 11 = 3 additional hospitals
8 with reported CLABSIs + 3 with no reported CLABSIs = 11 medium hospitals audited

Large hospitals:
(2 large hospitals / 47 hospitals eligible for review) * 11 = 1 additional hospital
7 with reported CLABSIs + 1 with no reported CLABSIs = 8 large hospitals audited

A conscious effort was made to select one large hospital that did not report any CLABSIs to see if there is anything different about this hospital compared to the other large hospitals that reported one or more infections during this time period.

An IP in each selected hospital was notified by telephone in early October 2010 about the project. Subsequently, an administrator in each selected hospital received a letter outlining the validation project (Appendix B), with an e-mail carbon copy disseminated to an IP in each of the facilities.

Chart Selection
Infection preventionists (IPs) in selected facilities were sent an e-mail outlining how charts would be selected (Appendix C). Each IP developed a line list of all positive blood cultures of adult ICU patients with a specimen collection date from January 1, 2010 to June 30, 2010 (Appendix D). Variables included medical record number, intensive care unit (ICU) type, specimen collection date, specimen collection time, and organism/skin contaminant identified.

Based on correspondence with a subset of Virginia IPs prior to the commencement of the validation project, it was estimated that during a six month time period, the following numbers of positive blood cultures may have been expected for each bedsize category, respectively: 20 in small hospitals, 44 in medium hospitals, and 200 in large hospitals.

The chart selection process is visually depicted by Figure 1. Each list of positive blood cultures was deduplicated and matched to a line list of CLABSIs entered in NHSN. VDH staff completed this deduplication so that data validation specialists remained blinded to which records had been entered in NHSN when completing their chart reviews. If a record was on the NHSN line list but not on the list of positive blood cultures, it was added to the list of eligible charts. All CLABSIs entered into NHSN were included on the line list of charts to be validated and subsequently, charts were randomly selected until the number of desired records was achieved. The number of charts sampled from the list of eligible charts was dependent on hospital bedsize category. In all, one-half of eligible charts from small hospitals, one-fourth of eligible charts from medium hospitals, and one-sixth of eligible charts from large hospitals were on the line list of charts to be audited.

Figure 1. Chart selection process
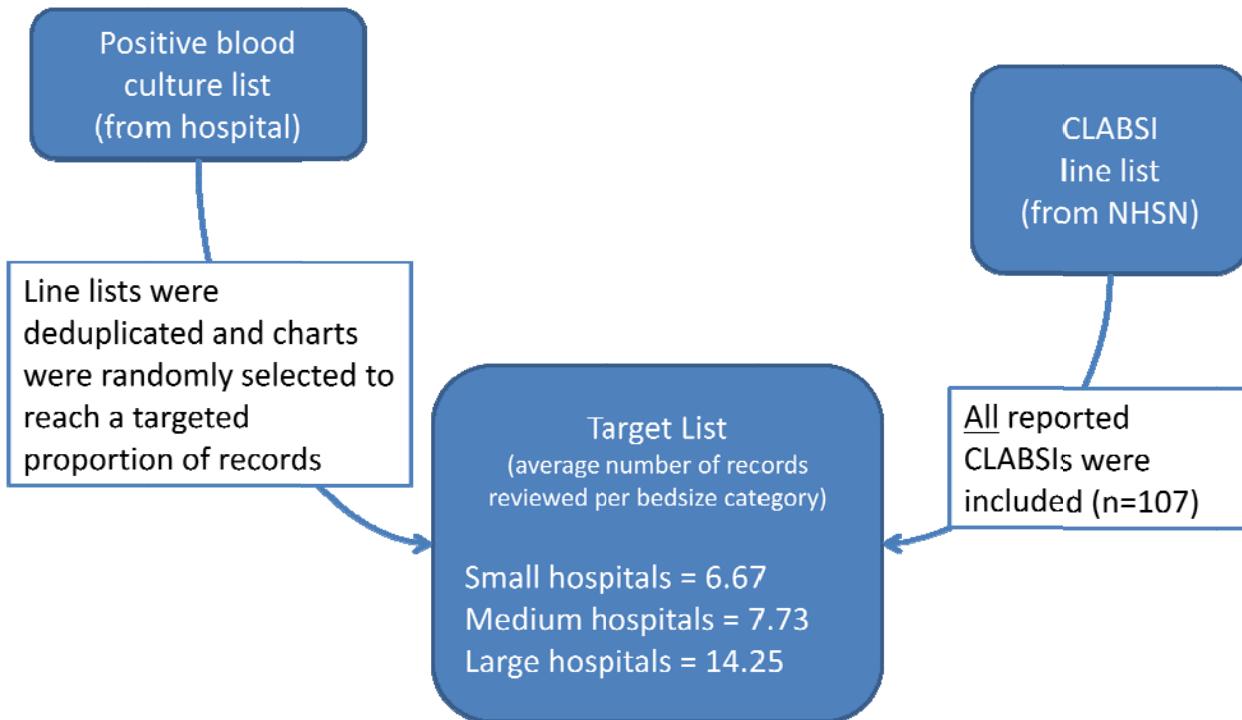
Estimated total number of charts reviewed:
Small hospitals: 20 positive blood cultures in each hospital x 0.5 sampling fraction x 18 hospitals = **180** records reviewed

Medium hospitals: 44 positive blood cultures in each hospital x 0.25 sampling fraction x 11 hospitals = **121** records reviewed

Large hospitals: 200 positive blood cultures in each hospital x 0.167 sampling fraction x 8 hospitals = **267** records reviewed

Overall estimate = 180 + 121 + 267 = 568 records estimated for review

In actuality, there were fewer charts to review than were estimated.
Small hospitals: 120 records reviewed (average of 6.67 records per facility)
Medium hospitals: 85 records reviewed (average of 7.73 records per facility)
Large hospitals: 114 records reviewed (average of 14.25 records per facility)

Overall total = 120 + 85 + 114 = 319 records reviewed

In one facility, there were no positive blood cultures during the time period of interest, but this did not exclude the hospital from the project. The data validation specialist conducted a site visit to administer the survey with the infection preventionist and other staff members who were involved with CLABSI data collection.

Site Visit
Prior to the site visit, facilities were sent an e-mail describing the on-site audit process (Appendix E) and a scheduling form on which they indicated their availability for an on-site audit (Appendix F). Each facility designated an Audit Liaison who had the following responsibilities:

- Handling the logistics of the audit including scheduling the site visit
- Greeting the data validation specialist upon arrival at the hospital
- Facilitating physical access to medical records and assuring that the data validation specialist signs appropriate data confidentiality documents
- Arranging for the data validation specialist to interview key staff involved in the collection of CLABSI numerator and denominator data

Although it was recommended that the facility designate an Audit Liaison who was not the IP in order to help share the responsibilities of preparing for the audit and engage more staff in the process, most facilities elected to have an IP serve as the Audit Liaison.

Data validation specialists worked with their assigned facilities to determine if electronic medical records would be copied onto paper or viewed directly on a computer. Once a site visit date had been arranged between the Audit Liaison and data validation specialist, a letter was sent to the facility indicating which medical records were to be reviewed (Appendix G). Site visits were scheduled to allow for sufficient time to pull the charts and obtain necessary data use agreements and complete other applicable paperwork to enable access to medical records.

To address questions related to data protection and confidentiality, a letter was prepared and signed by the state health commissioner, describing the authority to review medical records and the responsibility of the data validation specialists to protect patient and provider confidentiality. A copy of the letter was given to the facility in advance if requested and made available during the audit (Appendix H).

On the day(s) of the site visit, the data validation specialist reviewed charts, applied NHSN CLABSI case definitions, and abstracted data. A standard data collection form, developed by the VDH HAI Team, was used to abstract the data (Appendix I). If the data validation specialist had a question about a difficult/ambiguous case, she conferred with the consultant, Mary Andrus, to make a final determination. The data validation specialist also interviewed appropriate facility personnel to assess denominator collection practices, including how patient days, central lines, and central line days are collected (Appendix J). Prior to the site visit, the data validation specialist was given a list of the facility's NHSN-defined locations to assure that the facility's locations were appropriately mapped to CDC locations. Interview attendees used a standardized sign-in sheet to note participation in the on-site interview (Appendix K). When applicable, data validation specialists provided just-in-time education based on responses to the in-person interview.

Resolution of Discrepant Cases
VDH staff compared CLABSIs that were identified by the data validation specialists with CLABSIs that were entered in NHSN. If a discrepancy occurred, a VDH staff member communicated the information to the data validation specialist and hospital. Each hospital received a letter outlining the process to resolve case discrepancies (Appendix L) and a summary of findings that listed the number of agreements and discrepancies between the

hospital and data validation specialist (Appendix M). Subsequently, as needed, the data validation specialist and hospital staff discussed disagreements (CLABSIs identified by data validation specialist but not reported by hospital or CLABSIs reported by hospital but not confirmed by data validation specialist). The consultant was available to resolve discrepancies if the data validation specialist and hospital staff could not agree upon a ruling and the consultant's determination served as the final case classification. If reporting discrepancies remained at the end of the CLABSI case resolution process, hospitals were asked to add or delete these infections in NHSN as appropriate.

Responsibilities of Infection Preventionists
- Designate an Audit Liaison to be responsible for:
  - Handling the logistics of the audit including scheduling the site visit
  - Greeting the data validation specialist upon arrival at the hospital
  - Facilitating physical access to medical records and assuring that the data validation specialist signs appropriate data confidentiality documents
  - Arranging for the data validation specialist to interview key staff involved in the collection of CLABSI numerator and denominator data
- Work with the microbiology laboratory to produce a line list of positive blood cultures on adult ICU patients
- Complete an interview with the validation specialist and any other staff involved with CLABSI surveillance during the on-site visit
- Discuss CLABSI case classification when there is a discrepancy between the data validation specialist and what is entered in NHSN

Responsibilities of Data Validation Specialists
- Attend training on NHSN protocols, CLABSI definitions, and validation project overview
- Contact the IP in assigned facilities to discuss submission of line list of positive blood cultures and how to share NHSN CLABSI data
- Send assigned facilities a list of medical record numbers and collection dates for records to be reviewed
- Work with assigned facilities to schedule site visits
- Sign any relevant data confidentiality documents
- Conduct site visits including reviewing charts, interviewing staff, and conferring with the consultant on difficult/ambiguous cases
- Resolve discrepancies in CLABSI case classification with assigned facilities and consultant, as necessary
- Provide input into training on lessons learned from validation project

Responsibilities of VDH Healthcare-Associated Infections Program
- Develop methodology
- Hire data validation specialists and consultant
- Coordinate training for data validation specialists
- Deduplicate line lists of positive blood cultures
- Compare positive blood culture list with NHSN CLABSI list for each facility and draw sample of records to be reviewed
- Work with data validation specialists throughout the project

- Identify CLABSI case status discrepancies between data validation specialists and facilities
- Compose letters outlining the number of concordant and discordant charts for each facility
- Develop training and/or resource materials to share lessons learned
- Write a report and disseminate results

Data Analyses
Analyses were completed using a combination of Excel, Access, and SAS 9.2 (Cary, NC) with α = 0.05 for all tests of significance.

RESULTS

Results from Chart Reviews
Chart audits were completed between November 2010 and January 2011. Most audits took one day but the length of audit ranged from one day to three days.

Results from the chart reviews are summarized in Table 1. Of the 319 total records, the auditors reviewed 107 positive blood cultures that were reported to NHSN by the hospitals as a CLABSI; all of these reports were confirmed by the auditors. The auditors also reviewed 212 positive blood cultures that were not reported to NHSN by the hospitals as a CLABSI; only 3 of these (<1%) were misclassified and identified by the auditors as being CLABSIs.

Table 1. Comparison of CLABSIs Identified by Hospital IP Staff Reported to NHSN and Virginia Audit

		Audit CLABSI	Audit no CLABSI	Total
Hospital Reporting	Reported CLABSI	107	0	107
	Reported no CLABSI	3	209	212
	Total	110	209	319

In summary, there were three reporting errors, all of which were infections that were under-reported. All three of these infections came from different hospitals (two small, one medium). One of the cases had been identified by the hospital infection preventionist as a secondary bloodstream infection when it actually met the criteria for a CLABSI. The other two cases appeared to have been overlooked.

Another way to measure the validity of CLABSI case classification by the hospital IPs is to calculate sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) (Table 2). Sensitivity is the probability that an individual with a true CLABSI is accurately reported by the hospital as a CLABSI while specificity is the probability that an individual who does **not** have a CLABSI is accurately reported by the hospital as **not** a

CLABSI. PPV is the probability that a person has a CLABSI given that a CLABSI is reported and NPV is the probability that a person does **not** have a CLABSI given that a CLABSI is **not** reported. Values of all of these measures were extremely high (97% - 100%).

Table 2. Indices of Validity

	Estimated Value
Sensitivity	97%
Specificity	100%
Positive Predictive Value (PPV)	100%
Negative Predictive Value (NPV)	98.5%

Results from Interviews

Intensive Care Units
The majority of hospitals (62%, n=23) had one ICU. Approximately one-quarter (n=9) reported 2-5 ICUs and the remainder (14%, n=5) reported 6 ICUs. The most common types of ICUs were medical/surgical (81%, n=30), medical cardiac (32%, n=12), and surgical cardiothoracic (30%, n=11).

Denominator Data Collection – Who, When, and How
About half of audited hospitals (n=17) used a combination of electronic and manual methods to collect central line days and patient days and approximately one-third (n=12) used only manual methods (Figure 2).

Figure 2. Method of Data Collection for Central Line Days and Patient Days
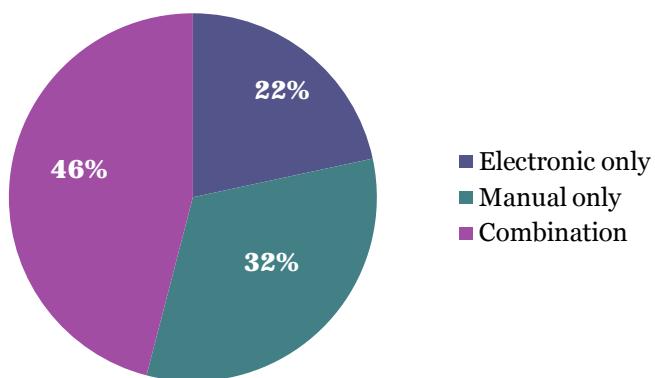
Approximately one-third (n=12) of facilities used the *Denominator for Intensive Care Unit* form from NHSN, nearly one-quarter (n=9) used a modified version of the NHSN form or a

customized form based on NHSN, and 43% (n=16) used another type of form to collect denominator data for CLABSI surveillance.

All but two facilities indicated there was a system in place to count patient days and central line days when the regular data collector was not working. Cross-training to assure that multiple people know how to do the data collection has proved helpful. If a gap in data collection coverage occurs, some facilities noted that their staff review charts retrospectively to acquire the necessary information.

Patient Days
NHSN protocols indicate that patient days should be counted by logging the number of patients on the unit at the same time each day. All but two hospitals (95%) said they counted patient days in this manner.

Half of the hospitals (49%, n=18) collected patient days using only electronic methods. Nearly one-third of the hospitals (35%, n=13) used only manual methods and the remainder (16%, n=6) used a combination of electronic and manual methods.

Among the 19 hospitals that used manual methods to collect patient days, in approximately half the hospitals (47%, n=9), the IP was assigned to this task. Other roles responsible for this manual data collection included Charge Nurse (n=5), ICU Nurse (n=3), ICU Manager (n=3), Secretary (n=2), Accounting/Finance (n=1), and Quality (n=1).

Central Line Days
Facilities were asked five questions to assess how accurately they counted central lines. Nearly three-quarters (73%, n=27) answered all of the questions correctly.
- All facilities accurately responded that peripheral IVs are not counted as central lines.
- Three facilities (8%) inaccurately noted that they count two lines if a patient has two separate lines.
- One facility said it would count two central line days if the patient had a temporary central line and a permanent central line. In this instance, only one central line (the temporary) should be counted.
- NHSN protocols dictate that central lines are to be counted at the same time each day by tallying the number of patients on the unit with one or more central lines. Eighty-six percent (n=32) of facilities noted that they used this method to count their central line days. Five facilities (14%) responded inaccurately, indicating they <u>would</u> count a line if it was in place on the day but removed prior to the time of the central line count.
- Lastly, facilities were asked if they would count a permanent central line that had not been accessed since admission. Two facilities (6%) responded inaccurately, indicating they <u>would</u> count the central line.

Approximately one-fifth (22%, n=8) collected central line days using only electronic methods. Nearly two-thirds of the hospitals (62%, n=23) used only manual methods and the remainder (16%, n=6) used a combination of electronic and manual methods.

Among the 29 hospitals that collected central line days manually, an IP or charge nurse was most commonly assigned to this task (n=11, 42% for each). It was noted that charge nurses

usually collected the information while the IPs were more often involved with tallying information or retrieving data that had already been collected. Other roles responsible for this manual data collection included ICU nurse (n=8), secretary (n=3), nursing manager/administrator (n=2), ICU director (n=1), nurse tech (n=1), performance improvement (n=1), and clinical specialist (n=1).

The majority of facilities (78%, n=29) indicated that they keep a line list of patients with a central line. Of the facilities that keep a line list, less than half (41%, n=12) do so for all inpatients.

Data Entry and Decision-Making
Infection Preventionists were responsible for entering numerator (CLABSI event) and denominator data (patient days and central line days) into NHSN in 92% (n=34) of the facilities. Other staff involved in the entry of these data included performance improvement directors, administrative assistants, and the Vice President of Clinical Services.

In 84% of the facilities (n=31), an IP or infection prevention team was involved in making the final decision regarding the determination of whether an infection is a CLABSI (in cases of ambiguity). One in five facilities (19%, n=7) consulted infection preventionists from other facilities to help determine if an infection was a CLABSI. In nearly one-quarter of the facilities (22%, n=8), an infectious disease physician or department was consulted to aid in the determination of CLABSIs while 13% of the facilities utilized epidemiologists (n=5).

Process for Detecting Positive Blood Cultures on Patients with Central Lines
All audited hospitals reviewed laboratory reports to detect positive blood cultures, but 70% (n=26) did so on a daily basis. Some viewed every laboratory report or all cultures, while the majority reviewed only those cultures or reports with positive results. Other methods used in conjunction with laboratory report review included chart review (n=3) to identify central lines, time in ICU prior to infection, and capture final results for patients who were discharged or transferred and surveillance rounds (n=3). Some facilities with laboratory reports available electronically noted that their software vendor allowed the IP to design and customize the reports to pull the data as needed.

Quality Assurance and Ongoing Training
Some facilities described their quality assurance strategies. Approximately one-third of facilities (35%, n=13) had multiple people review the same data. One-fifth (22%, n=8) collected data in several ways; most of these validated their electronic data by collecting denominator data manually to compare findings. One facility mentioned its IP reviews a line list of patients with a central line daily to verify if the patient needs a line, to make sure the line is counted appropriately, and follows up with the unit as necessary.

Other quality improvement techniques included root cause analysis, data feedback, and using bundles or checklists. Several facilities (16%, n=6) described the use of root cause analyses or gap analyses as a means to learn from the infections and identify how the CLABSI could have been prevented. Six facilities (16%) indicated that they feed data to stakeholder groups or

units for quality improvement purposes. Five facilities (14%) discussed bundle compliance, use of a checklist, or participation in prevention collaboratives.

There are numerous strategies currently employed by facilities to conduct training for staff involved in CLABSI data collection and reporting. These included annual competency skills review, staff orientation, ongoing staff education (on topics such as collection and criteria for patient days and central lines, hospital or clinical updates, and nursing documentation), use of NHSN materials, corporate webinars, and APIC (Association for Professionals in Infection Control and Epidemiology, Inc.) webinars (Table 3). Nearly one-quarter of facilities (24%, n=9) indicated they did not have ongoing or periodic training for staff involved in CLABSI data collection. Of these facilities, two said no training was done because the data are collected electronically, and two noted there are plans to have training in the future.

Table 3. Methods of Training for Data Collectors
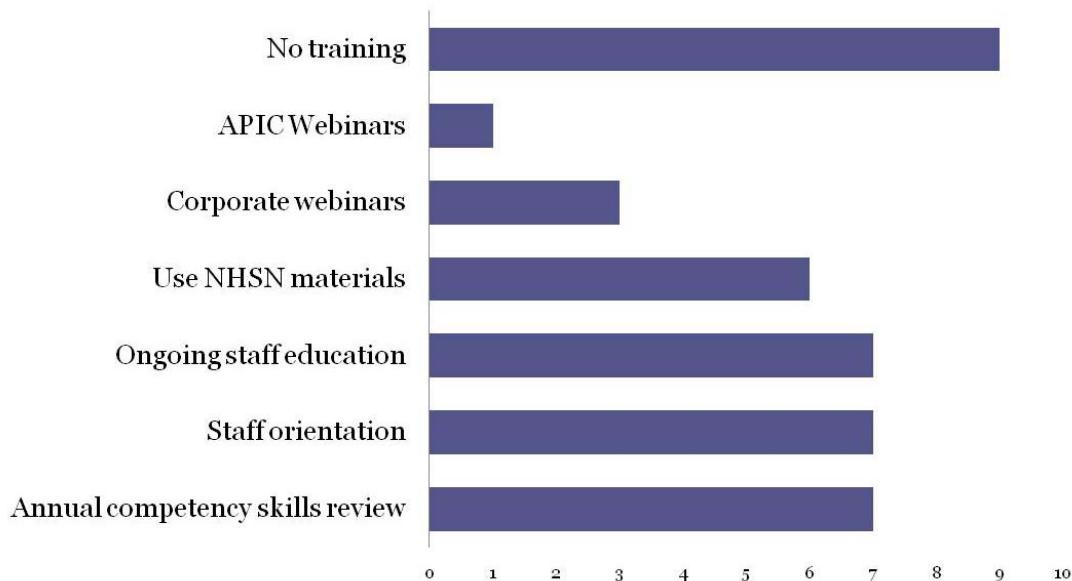
Consistency of Applying Definitions and Surveillance Burden
The majority of facilities (88%) reported that their staff apply the CLABSI definitions consistently or very consistently. On a scale of 1 to 5, with 5 being the most burdensome, nearly all (92%, n=34) of the audited facilities characterized CLABSI surveillance as very unburdensome (1) or somewhat unburdensome (2).

Ways to Improve CLABSI Surveillance
Nearly half (43%, n=16) of audited facilities thought electronic medical records (EMR) could help improve CLABSI surveillance in their facility. Depending on the facility's current EMR status, IPs identified the need for EMR capability, to obtain new software for their current EMR to include more of their needs, to update their current system, and/or to automate reports. It was also noted that EMR could improve access to denominator information (patient days, line placement, tracking of central lines). Fourteen percent (n=5) of respondents identified additional personnel support as a way to improve CLABSI surveillance, providing for data collection and/or entry support that would allow the IP to conduct more surveillance rounds. Other ideas of how to improve CLABSI surveillance

included more real-time surveillance and better documentation of infectious disease signs and symptoms.

Challenges in Preparing for the CLABSI Audit
Generally, preparing for the CLABSI audit was a smooth process for the hospitals; two-thirds (68%, n=25) reported no difficulties obtaining the positive blood culture data. Of those who indicated challenges, three-fourths (n=9) identified laboratory systems and coordination with laboratories as being limitations. Specific facility obstacles included retrieval of missing culture information lost in a hospital move, medical record numbers not permanently assigned to patients, and a new IP in the facility. Other challenges cited were obtaining the medical records, having a mixture of paper-based and electronic records, securing computer access and clearance for the data validation specialist, and finding the physical space for the data validation specialist.

STRENGTHS/LIMITATIONS

Strengths
The CLABSI audit methodology had several strengths. We were able to assess the accuracy of reported CLABSIs from 2010Q1 and Q2 (January 1 – June 30). All reported CLABSIs were reviewed, so we were able to identify any potential issues with over-reporting. We were able to calculate the positive predictive value for the entire state. A recent time period was selected to try to capitalize on electronic laboratory or medical record capabilities and to not assess hospitals' reporting during the initial learning curve associated with becoming comfortable with CLABSI case definitions and the NHSN reporting system.

The on-site audit and interview process served as teachable moments for nearly half of Virginia facilities. With this approach, we were able to maximize educational opportunities and give a personal introduction to the VDH HAI program. The follow-up webinar training served as a good forum to quickly disseminate information to a wide audience.

The choice to sample by hospital instead of by intensive care unit permitted the assessment of hospital-wide infection surveillance and prevention practices as well as the identification of any potential variation in practices between ICUs within the same facility.

Limitations
Available resources prohibited the review of all positive blood cultures in all reporting facilities during the designated time period; therefore, the project is subject to a few limitations. The whole universe of potential CLABSIs was not able to be investigated due to only looking at positive blood cultures sent to the laboratory from the adult ICU and the sampling of those positive blood cultures. Because we were not able to capture all "missed" CLABSIs in the state, we cannot estimate the "true" number of CLABSIs in Virginia during this time period. Our calculations of sensitivity, specificity, and negative predictive value are for our sample of audited facilities and may not be completely representative of all facilities in the state. It is possible that we missed some issues of under-reporting by sampling rather than reviewing the entire list of blood cultures; however, we believe that by reviewing records from 11 hospitals that reported no CLABSIs, we were able to capture the large, common surveillance practices and any systematic errors in under-reporting.

Ideally, each patient record should have been reviewed by two separate individuals; however, existing resources did not allow for this level of analysis. The Infection Prevention Consultant was available to resolve discrepancies and to answer questions from the data validation specialists as they arose.

In addition, our methodology slightly over-represented large hospitals (>500 beds). Large hospitals represented 9/73 (12.3%) of all eligible hospitals and 8/37 (21.6%) of all audited hospitals. Eight of 9 large hospitals (88.9%) were selected for audit. Medium hospitals (201-500 beds) represented 21/73 (28.8%) of all eligible hospitals and 11/37 (29.7%) of all audited hospitals. Eleven of 21 medium hospitals (52.4%) were selected for audit. Small hospitals (200 or fewer beds) represented 43/73 (58.9%) of all eligible hospitals and 18/37 (48.6%) of all audited hospitals. Eighteen of 42 small hospitals (41.9%) were selected for audit. Overall, large hospitals comprised 35.7% (114/319) of infections reviewed. Because large hospitals have more blood cultures, more reported CLABSIs, and are more diverse both in patient population and ICU types, we thought it was appropriate to allow an over-representation in this project. Although small hospitals account for a smaller percentage of infections in the state than large hospitals, a greater number of hospitals (18) were engaged in the audit process. If CLABSI misclassification issues are dependent on hospital bedsize, results may not be representative to the smaller facilities; however, we do not believe this to be the case.

DISCUSSION

Results from the audit indicated that Virginia's hospitals apply central line-associated bloodstream infection event definitions accurately and consistently. Only 3 out of 319 positive blood cultures were misclassified and all three of these misclassifications were CLABSIs that were under-reported and have since been entered into NHSN. There were no common reasons to account for why these CLABSIs were under-reported. It is recommended that IPs stay up-to-date with any changes to the NHSN CLABSI definitions and continue to apply these definitions within their facility.

Areas for improvement included quality assurance methods and education on denominator data collection. Nearly 1/3 of hospitals did not indicate that they conducted quality assurance of their data. Reports are available in NHSN to perform some types of data quality checks. The HAI Epidemiologist can assist facilities that have questions about how to optimize the use of this functionality. Using multiple people to review data can be helpful to make sure the counts of patient days and central line days are added correctly but does not help to identify quality control issues. It is suggested that facilities periodically internally validate denominator data using multiple methods (i.e. manual and electronic). When a new electronic system or type of infection prevention software is used to collect data, validation is especially important to make sure the information is accurate and defined in a way that meets the requirements of the NHSN definitions. NHSN suggests that when denominator data are available from electronic databases, these sources may be used as long as the counts are not substantially different (+/- 5%) from manually collected counts.

Audited facilities were clear on how to count peripheral lines but not all demonstrated knowledge of how to accurately count patients with multiple lines, patients with temporary and permanent lines, or patients that had lines that were removed earlier in the day. Central

lines should be counted <u>at the same time each day</u> and if a line is not in place at the time of the count, it should not be tallied, even if it was in place earlier in the day. One suggestion for assuring that all staff involved with CLABSI surveillance are aware of these rules is to include central line definitions and data collection procedures as part of annual skills review.

Education is important for new as well as more experienced infection prevention staff. Training should be given upon new staff hire and the infection prevention program should have a plan for cross-education so that there will be coverage when a staff member dedicated to data collection and/or entry is not working or when the staff member changes positions. Continued education is also important when NHSN definitions change, when electronic reporting systems are implemented or modified, or when new functionality (such as new queries to monitor data quality) becomes available in NHSN.

Another area for education noted by the validation specialists regarded how to know when a positive blood culture for a common commensal (i.e., diphtheroids [*Corynebacterium* spp. not *C. diphtheriae*], *Bacillus* spp. [not *B. anthracis*] , *Propionibacterium* spp., coagulase-negative staphylococci [including *S. epidermidis*], viridans group streptococci, *Aerococcus* spp., *Micrococcus* spp.) meets the case definition for a laboratory-confirmed bloodstream infection (LCBI) and is not a "contaminated" specimen. In January 2011, there were slight changes to the LCBI reporting criteria. There is no longer a requirement for the antibiogram of common commensals to match. The requirement that the organism must match by available genus and species information remains. Organisms are the same if the organism from one culture is identified to both genus and species level and the companion culture identifies *only* the genus with or without other attributes. The changes to the definition did not affect the audit time period, but does apply to infections identified in January 2011 and onward.

Facilities that were audited reported that they enjoyed the opportunity to ask questions of the data validation specialists and obtain greater confidence in their surveillance practices. The findings validate the standardized infection ratio (SIR) reported by the CDC in two recent reports that noted Virginia's state-specific SIR to be 0.83 for January – June 2009 and 0.80 for July – December 2009.

ARRA grant funds were used for the CLABSI audit, which contributed to one of the grant's goals of enhancing healthcare-associated infection surveillance activities. The VDH HAI Program is very proud of the outcomes of this audit, as they instill greater confidence in the quality of CLABSI data reported to NHSN and available to the public on the VDH website. This project has helped reinforce the respect and partnership with IPs throughout the state for their hard work and dedication in helping prevent infections. With future funding, additional validation efforts and education will be considered to ensure that HAI surveillance in Virginia is conducted accurately, consistently, and in a timely manner.

Resources and Appendices

RESOURCES

- National Healthcare Safety Network (NHSN) Device-Associated Module (http://www.cdc.gov/nhsn/psc_da.html) – contains protocol and instructions, training, webinars, and forms
    - o CLABSI Event Protocol (January 2012): http://www.cdc.gov/nhsn/PDFs/pscManual/4PSC_CLABScurrent.pdf
    - o CLABSI Event Form (January 2012): http://www.cdc.gov/nhsn/forms/57.108_PrimaryBSI_BLANK.pdf
    - o Denominator Form for Intensive Care Unit/Other Locations (not Neonatal Intensive Care Unit or Specialty Care Area): http://www.cdc.gov/nhsn/forms/57.118_DenominatorICU_BLANK.pdf
    - o CLABSI Reporting Through NHSN: Tips, Tricks, and Best Practices (July 2011): http://www.hsag.com/App_Resources/Documents/CLABSIandSSI_Surveillance_July2011_finalweb.pdf (slides; see NHSN website for audio recording)

- CDC NHSN HAI Summary Data Reports: http://www.cdc.gov/HAI/surveillance/statesummary.html

- Guidelines for the Prevention of Intravascular Catheter-Related Infections, 2011 – Healthcare Infection Control Practices Advisory Committee (HICPAC): http://www.cdc.gov/hicpac/pdf/guidelines/bsi-guidelines-2011.pdf

APPENDICES

- A. General Timeline of Validation Project
- B. Letter to Administrators Announcing CLABSI Audit
- C. E-mail to Infection Preventionists Regarding Positive Blood Culture Data Reporting
- D. Positive Blood Culture List for All Patients in All Adult ICUs: January 1, 2010 to June 30, 2010
- E. E-mail to Infection Preventionists Regarding the Scheduling of On-Site Hospital Audits
- F. Scheduling Form for On-Site CLABSI Chart Audit
- G. Letter Scheduling Site Visit and Requesting Charts for Review
- H. Letter Describing Data Protection
- I. CLABSI Case Report Form
- J. Survey on CLABSI Data Collection Practices
- K. Sign-In Sheet for On-Site Interview
- L. Letter Summarizing CLABSI Data Audit Results
- M. Central Line-Associated Bloodstream Infection (CLABSI) Summary of Findings

Appendix A. General Timeline of Validation Project

- IPs sent letter outlining overview of validation and eliciting comments prior to facility notification of selection – **September 22, 2010**
- IPs in facilities that have been selected for validation notified – **early October 2010**
- Validation specialists trained - **October 12, 2010**
- Letter sent to each selected facility's administrator (with a carbon copy to IP) outlining the validation project - **mid October 2010**
    - VHHA will also e-mail letter to administrator
- Validation specialist assigned to facility contacted IP to discuss submission of line list of positive blood cultures and how to share NHSN CLABSI data - **late October 2010**
    - Line list of positive blood cultures from 1/1/10 - 6/30/10 included:
        - medical record number
        - ICU type
        - specimen collection date
        - specimen collection time
        - results for all pathogens and common skin contaminants
    - If one or more CLABSIs has been reported to NHSN, the facility either:
        - Generated a separate line list for NHSN CLABSIs if VDH was not able to view patient identifiers from the facility *OR*
        - Changed VDH's group rights to the CLABSI data to include patient identifiers
            - HAI Program Coordinator Andrea Alvarez worked with hospitals as necessary to change group rights
- IPs worked with their microbiology lab to generate line list and send to VDH for sampling; NHSN CLABSI data also was shared at this time through a line list or a change in group rights - **early to mid November 2010**
- VDH pulled sample and gave validation specialist a list of records to be audited for each facility - **mid November 2010**
    - List included medical record number and event/specimen collection date
    - Validation specialists were blinded to whether patient was identified as having a CLABSI in NHSN
- Validation specialist worked with IP to set up a date for site visit far enough in advance so that desired records were available electronically or by paper copy and IP was available - **November 2010 to January 2011**
    - Any necessary data confidentiality forms were signed by validation specialist
- Site visits were held - **November 2010 to January 2011**
- VDH staff compared CLABSI status of audited charts with CLABSI status in NHSN – **January to February 2011**
- Summary of findings sent back to facilities – **February 2011**
- Validation specialists and infection preventionists resolved discrepancies as necessary – **February 2011**
- VDH staff worked with validation specialists and consultant to develop webinar training for all infection preventionists – **March to April 2011**
- VDH conducted a webinar to share findings and next steps – **May 20, 2011**

Appendix B. Letter to Administrators Announcing CLABSI Audit

October 20, 2010

Dear Administrator:

Later this month, the Virginia Department of Health (VDH), in partnership with the Virginia Hospital & Healthcare Association (VHHA), will begin work to conduct an on-site chart audit of the central line-associated bloodstream infection (CLABSI) data reported by your hospital to the National Healthcare Safety Network (NHSN) for the six-month period January 1, 2010 – June 30, 2010. The purposes of the audit are to: (1) determine whether reported CLABSIs meet case criteria; (2) identify issues leading to misclassification of CLABSIs; (3) evaluate current surveillance methods used to detect infections and associated denominators; and (4) use the results to provide educational materials and lessons learned to infection preventionists across the Commonwealth.

Background

As you know, the Virginia General Assembly enacted legislation that requires reporting of central line-associated infections in adult intensive care units as of July 1, 2008. To fulfill this mandate, hospitals are required to submit data through the NHSN, a secure, internet-based surveillance system with components addressing patient and healthcare personnel safety managed by the Centers for Disease Control and Prevention (CDC). All Virginia hospitals with adult intensive care unit (ICU) beds have been reporting their CLABSI events and central line days on a quarterly basis to NHSN and have conferred rights to the data to the Virginia Department of Health.

Overview: Central Line-Associated Bloodstream Infection (CLABSI) On-Site Chart Audit

To ensure the accuracy and completeness of this information, the Virginia Department of Health will conduct an on-site chart review and will interview staff who collect CLABSI data (i.e., infections, patient days, and central line days) for the adult ICU(s). A sample of positive blood cultures from 37 of the 73 eligible hospitals (i.e., that have adult ICUs and reported CLABSI data for the first six months of 2010) will be reviewed by a data validation specialist. VDH has partnered with VHHA to perform the on-site audit by hiring data validation specialists who are infection preventionist professionals with significant experience in HAI prevention, detection, and surveillance. The on-site chart review plan, which has been developed with assistance from the Virginia chapter of the Association for Professionals in Infection Control and Epidemiology (APIC-VA), will include the review of medical record charts of adult ICU patients treated in your hospital who had a positive blood culture.

The data validation specialists are working as agents of the Virginia Department of Health and as such have the authority to review medical records according to §32.1-40 of the

VDH VIRGINIA DEPARTMENT OF HEALTH
Protecting You and Your Environment
www.vdh.virginia.gov

Code of Virginia. They will also be obligated to maintain the anonymity of identities of patients and providers in accordance with Code section §32.1-41. The validation specialists will have training on confidentiality and will sign a confidentiality statement specific to this public health surveillance project. The CLABSI data and audit results will not be available until the audit has been completed and each hospital has been given the opportunity to review and comment on the results. The report will include aggregate numbers and will not identify or have information that could be linked to the identification of individual patients and/or facilities.

Next Steps and Timeline

Your hospital has been selected for an on-site chart review. The data validation specialist assigned to your hospital will contact your hospital infection preventionist (IP), via telephone, to request submission of a list of positive blood cultures (laboratory data) drawn from adult ICU patients with selected data elements for the time period under review (i.e., January 1, 2010 – June 30, 2010). VDH requests that the laboratory data be submitted by November 8, 2010. Detailed information on laboratory data elements to be reported and transmission requirements will be forwarded to your IP. Pending review and analysis of hospital lab data submissions and selection of medical records to be reviewed, the data validation specialist will schedule an on-site review between November 2010 and January 2011. We anticipate 1-2 days for the completion of chart reviews and interview in each hospital; however, this will be dependent on the number of charts to be reviewed and the complexity of each case. Subsequently, VDH staff will compare the CLABSI status of audited charts with CLABSIs identified in NHSN. A summary of each facility's results will be shared with infection prevention staff with an opportunity to resolve discrepancies as necessary. Upon completion of the project, lessons learned will be communicated to infection preventionists statewide through training and distributing other educational materials.

If you have any questions regarding the CLABSI chart review process, please contact me (804-864-8141) or Andrea Alvarez (804-864-8097). We look forward to working with you and your staff to ensure that the HAI data that we report are accurate and meaningful.

Sincerely,
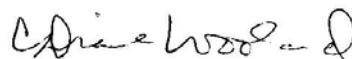
C. Diane Woolard, PhD, MPH
Director, Division of Surveillance and Investigation
Virginia Department of Health

cc: Hospital Infection Preventionists

Appendix C. E-mail to Infection Preventionists Regarding Positive Blood Culture Data Reporting

To: Infection Preventionists in Facilities Selected for CLABSI Audit
Date: October 25, 2010
Subject: Format and Instructions for Submitting Positive Blood Culture Data for CLABSI Audit

Attachment: PositiveBloodCultureFileFormat.xls

Dear Infection Preventionist,

This message will provide you and your laboratory staff with more information on the requirements for submitting a line list of positive blood cultures to the Virginia Department of Health as part of an audit of the central line-associated bloodstream infection (CLABSI) data reported by your facility.

The first step in the audit process will include a review of all positive blood cultures from patients in your hospital's adult ICU(s). Therefore, we are requesting that you submit a list of **all positive blood cultures drawn from patients in the adult ICU(s)** for the time period under review (**specimen collection date January 1, 2010 – June 30, 2010**) irrespective of whether they are considered hospital-associated or the patient had a central line. The list should be submitted in electronic Excel spreadsheet or similar format and should include:
- patient medical record number
- type of ICU
- specimen collection date
- specimen collection time
- test results (include pathogens and common skin contaminants)

The Positive Blood Culture Data File Format with variable specifications is attached for your information. The deadline for the submission of these data is **November 8, 2010** to permit a two week turnaround period for this data collection activity.

To ensure protection of confidentiality, data may be transmitted to Andrea Alvarez (contact information below) via paper copy, facsimile, or compact disc sent through the US Postal Service, but electronic submission is strongly preferred.

Pending review and analysis of your positive blood culture data and CLABSI data, we plan to begin scheduling on-site reviews in November 2010 and we anticipate 1-2 days for completion of chart reviews in each facility; however, this will be dependent on the number of charts to be reviewed and the complexity of each case.

If you have any questions regarding the CLABSI chart review process or clarification of which records we are requesting, please contact me or your data validation specialist. We look forward to working with you on this important project.

Sincerely,

Andrea Alvarez, MPH
Healthcare-Associated Infections Program Coordinator

Appendix D. Positive Blood Culture List for All Patients in All Adult ICUs: January 1, 2010 to June 30, 2010

Medical Record Number[1]	ICU Type[2]	Specimen Collection Date (mmddyyyy)[3]	Specimen Collection Time (hhmm)[4]	Test Result/Organism[5]

[1] The Medical Record Number must be the patient identifier used for NHSN data reporting. The unique medical record number is assigned permanently to the patient and may not change regardless of the number of admissions for that particular patient during the patient's lifetime.
[2] ICU Type refers to the specific intensive care unit the patient was in at the time of the specimen collection (e.g., CCU, MSICU).
[3] The Specimen Collection Date is the date the specimen was taken from the patient. Enter the month, day and year for each culture as mmddyyyy.
[4] The Specimen Collection Time is the time the specimen was taken from the patient. Enter the time using the military (24-hour) clock. (OPTIONAL but recommended)
[5] The test result/organism is the recognized pathogen or common skin contaminant identified as a result of the blood draw.

Appendix E. E-mail to Infection Preventionists Regarding the Scheduling of On-Site Hospital Audits

To: Infection Preventionists in Facilities Selected for CLABSI Audit
Date: **XX/XX/XXXX**
Subject: Scheduling Site Visits to Conduct the Central Line-Associated Bloodstream Infection (CLABSI) On-Site Chart Audit

Over the past several weeks, the Virginia Department of Health (VDH) and Virginia Hospital & Healthcare Association (VHHA) have been working with Virginia hospitals to prepare for the on-site chart audit of the central line-associated bloodstream infection (CLABSI) data reported for the six-month period of January 1, 2010 to June 30, 2010. The on-site chart review plan, which has been developed with assistance from the Virginia chapter of the Association for Professionals in Infection Control and Epidemiology (APIC-VA), will include the review of selected medical record charts of ICU patients treated in your hospital. We thank you for your assistance in providing data on positive blood cultures drawn from ICU patients at your hospital for the reporting period. I am writing to provide information concerning scheduling of the site visits for the on-site chart reviews.

Scheduling of Site Visits
On-site chart reviews will be conducted by your assigned validation specialist who has prior experience in infection prevention as well as HAI surveillance and CLABSI definitions. VDH would like to schedule a site visit at your facility on one of the following days:

<div align="center">

XX/XX/XXXX
XX/XX/XXXX
XX/XX/XXXX
XX/XX/XXXX

</div>

Please use the enclosed form to indicate all of the days that your hospital would be available for the on-site CLABSI audit. We will attempt to schedule your on-site visit on a date that is convenient for you and your staff. Your hospital should designate a staff person to serve as the Audit Liaison; this person is suggested to be someone other than the infection preventionist. The Audit Liaison will be responsible for handling the logistics of the audit, greeting the data validation specialist upon arrival at the hospital, facilitating access to medical records, and arranging for the data validation specialist to interview key staff involved in the collection of CLABSI numerator and denominator data. Although the audit may not take a full day, you should still plan for the data validation specialist to be on-site for one or two full days.

Once the site visits have been scheduled, additional information and a more detailed schedule will be provided to each hospital. The data validation specialist will take a break for lunch, as required, using public food services available at the hospital.

We would appreciate it if you could return the enclosed form no later than **XX/XX/XXXX**.

One of the data validation specialists will contact each hospital regarding the site visit schedule and requirements in the next week. If you have questions, please contact me at 804-864-8097 or Andrea.Alvarez@vdh.virginia.gov.

We look forward to working with you on the CLABSI audit project.

Sincerely,

Andrea Alvarez, MPH
Healthcare-Associated Infections Program Coordinator

Appendix F: Scheduling Form for On-Site CLABSI Chart Audit

Hospital Name:

Name and Title of Audit Liaison:

Telephone:

Fax:

E-mail:

Indicate below **all** *times that your hospital would be available for the on-site CLABSI audit.*

MONTH

Day	Date Available	Date NOT Available
XX/XX/XXXX		
XX/XX/XXXX		
XX/XX/XXXX		
XX/XX/XXXX		
XX/XX/XXXX		
XX/XX/XXXX		
XX/XX/XXXX		
XX/XX/XXXX		

Please fax the completed form to [data validation specialist] at XXX-XXX-XXXX or call XXX-XXX-XXXX.

Your response by XX/XX/XXXX would be appreciated.

Appendix G: Letter Scheduling Site Visit and Requesting Charts for Review

COMMONWEALTH *of VIRGINIA*
Department of Health

| KAREN REMLEY, MD, MBA, FAAP | P O BOX 2448 | TTY 7-1-1 OR |
| STATE HEALTH COMMISSIONER | RICHMOND, VA 23218 | 1-800-828-1120 |

XX/XX/XXXX

Hospital Audit Liaison
Hospital Name
Hospital Address
Hospital City, VA XXXXX

Dear [Hospital Audit Liaison]:

As you are aware, the Virginia Department of Health (VDH) has partnered with the Virginia Hospital & Healthcare Association (VHHA) to perform an on-site chart review of the central line-associated bloodstream infection (CLABSI) data submitted through the NHSN surveillance system for the period January 1, 2010 to June 30, 2010. This letter is written to provide you with necessary information regarding the audit process.

Your on-site visit has been scheduled for **XX/XX/XXXX**. **[Name]** is the data validation specialist who has been assigned to your facility; she will contact you in advance to make final arrangements for the site visit, including start time and meeting location and parking. Please note that the audit will include the review of a sample of patient records from your adult ICU(s) and conclude with an interview with all individuals from your facility who collect CLABSI data (i.e., infections, patient days, and central line days) for the adult ICU(s). The purpose of the interview is to collect information on CLABSI data collection practices at your facility.

The CLABSI audit will include a review of the patient records listed below. We have also provided the specimen collection date or date the CLABSI was identified to assist you in pulling the targeted records. VDH does not have access to the date the patient was discharged from the hospital. It is estimated that this chart review will take one full day but may be less or more depending on the number of records to be reviewed and the complexity of the cases.

M.R. Number	Date (Event or Specimen Collection)
xxxxxxx	xx/xx/2010
xxxxxxx	xx/xx/2010
xxxxxxx	xx/xx/2010
xxxxxxx	xx/xx/2010
xxxxxxx	xx/xx/2010

As stated previously, the data validation specialist will conduct an interview with the hospital staff that collect CLABSI data on a regular basis. An appropriate location (e.g., classroom or conference room) should be available for the interview. The IP staff and individuals who collect data on patient days and

central line days should be included in the interview. Others from the hospital may be included at your discretion. We anticipate that the interview process will last approximately one hour.

As you know, the purpose of this chart review is to ensure the accuracy of the CLABSI data that is currently reported by hospitals to VDH through the National Healthcare Safety Network. VDH will not publicly report your hospital's CLABSI data until this audit is complete and each hospital has been given the opportunity to review and comment on the results.

If you have any questions about the on-site audit, please call or e-mail me (804-864-8097 or andrea.alvarez@vdh.virginia.gov). Thank you for your efforts and continued cooperation in this important initiative.

Sincerely,

Andrea Alvarez, MPH
Healthcare-Associated Infections Program Coordinator

Appendix H: Letter Describing Data Protection

COMMONWEALTH *of* VIRGINIA
Department of Health

KAREN REMLEY, MD, MBA, FAAP   P O BOX 2448   TTY 7-1-1 OR
STATE HEALTH COMMISSIONER   RICHMOND, VA 23218   1-800-828-1120

December 3, 2010

Dear Hospital Administrator / Infection Preventionist:

Thank you for agreeing to participate in the Virginia Department of Health's (VDH) audit of central line-associated bloodstream infection (CLABSI) data from adult intensive care units. This audit is part of the CLABSI surveillance required in 12VAC5-90-80 (Regulations for Disease Reporting and Control). Last month you received a letter from Diane Woolard, PhD, Director of the VDH Division of Surveillance and Investigation, that provided an overview of this project and outlined its purposes. As data collection begins in your facility, I would like to provide you information about how your facility's data will be protected during this project.

As you know, HIPAA allows healthcare providers to share information with public health for surveillance purposes. Infection preventionists hired for this project are conducting the on-site chart audits and interviews with facility staff on behalf of VDH; and as such, they are acting as my designees with the right to examine medical records according to § 32.1-40 of the Code of Virginia. They have an obligation to preserve the anonymity of patients and practitioners whose records they review, as required by § 32.1-41. The four experienced infection preventionists performing the audits will turn over all the data to the VDH Division of Surveillance and Investigation for analysis.

After the on-site chart audits and interviews, VDH staff will compare the CLABSI status of audited charts with CLABSIs identified by your facility. These results will be shared with your infection prevention staff to provide an opportunity to resolve discrepancies as necessary. Subsequently, a summary report will be disseminated to administrators and infection prevention staff and lessons learned will be communicated to infection preventionists through a statewide training. The report will include aggregate numbers and will not have information that identifies individual patients or facilities.

We thank you for your cooperation with this project and are looking forward to learning much about how to ensure accuracy and consistency in the information we collect about healthcare-associated infections in Virginia. If you have questions, please feel free to contact Dr. Diane Woolard at (804) 864-8141. Thank you for your assistance.

Sincerely,

Karen Remley, MD, MBA, FAAP
State Health Commissioner

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Appendix I. CLABSI Case Report Form

NHSN
National Healthcare
Safety Network

Primary Bloodstream Infection (BSI)
Page 1 of 2

Facility ID:	
*Patient ID:	
*Gender: F M	*Date of Birth:
*Event Type: BSI	*Date of Event:
*Date Admitted to Facility:	*Location:

Risk Factors

*If ICU/Other locations, Central line: Yes   No   Location of Device Insertion: _____
(Central line at the time of or within
previous 48 hours of blood culture)   Date of Device Insertion: ___/___/_____

Event Details

*Specify Criteria Used:

Signs & Symptoms (check all that apply)   Laboratory (check one)

Any patient   ≤1 year old

☐ Fever   ☐ Fever   ☐ Recognized pathogen from one or more blood cultures

☐ Chills   ☐ Hypothermia   ☐ Common skin contaminant from ≥2 blood cultures

☐ Hypotension   ☐ Apnea

          ☐ Bradycardia

Comments

_____
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NHSN
National Healthcare Safety Network

Primary Bloodstream Infection (BSI)
Page 2 of 2

Pathogen #	Gram-positive Organisms									
_____	Coagulase-negative staphylococci (specify): _____	**VANC** S I R N								
_____	_Enterococcus faecalis_	**AMP** S I R N	**DAPTO** S I R N	**LNZ** S I R N	**PENG** S I R N	**VANC** S I R N				
_____	_Enterococcus faecium_	**AMP** S I R N	**DAPTO** S I R N	**LNZ** S I R N	**PENG** S I R N	**QUIDAL** S I R N	**VANC** S I R N			
_____	_Staphylococcus aureus_	**CLIND** S I R N	**DAPTO** S I R N	**ERYTH** S I R N	**GENT** S I R N	**LNZ** S I R N	**OX** S I R N	**QUIDAL** S I R N	**RIF** S I R N	**TMZ** S I R N **VANC** S I R N

Pathogen #	Gram-negative Organisms										
_____	_Acinetobacter spp. (specify)_ _____	**AMK** S I R N	**AMPSUL** S I R N	**CEFEP** S I R N	**CEFTAZ** S I R N	**CIPRO** S I R N	**GENT** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N	**PIPTAZ** S I R N **TOBRA** S I R N
_____	_Escherichia coli_	**AMK** S I R N	**CEFEP** S I R N	**CEFOT** S I R N	**CEFTAZ** S I R N	**CEFTRX** S I R N	**CIPRO** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N	
_____	_Enterobacter spp. (specify)_ _____	**AMK** S I R N	**CEFEP** S I R N	**CEFOT** S I R N	**CEFTAZ** S I R N	**CEFTRX** S I R N	**CIPRO** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N	
_____	_Klebsiella oxytoca_	**AMK** S I R N	**CEFEP** S I R N	**CEFOT** S I R N	**CEFTAZ** S I R N	**CEFTRX** S I R N	**CIPRO** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N	
_____	_Klebsiella pneumoniae_	**AMK** S I R N	**CEFEP** S I R N	**CEFOT** S I R N	**CEFTAZ** S I R N	**CEFTRX** S I R N	**CIPRO** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N	
_____	_Serratia marcescens_	**AMK** S I R N	**CEFEP** S I R N	**CEFOT** S I R N	**CEFTAZ** S I R N	**CEFTRX** S I R N	**CIPRO** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N	
_____	_Pseudomonas aeruginosa_	**AMK** S I R N	**CEFEP** S I R N		**CEFTAZ** S I R N	**CIPRO** S I R N	**IMI** S I R N	**LEVO** S I R N	**MERO** S I R N	**PIP** S I R N	
_____	_Stenotrophomonas maltophilia_	**TMZ** S I R N									

Pathogen #	Other Organisms									
_____	Organism 1 (specify) _____	____ Drug 1 S I R N	____ Drug 2 S I R N	____ Drug 3 S I R N	____ Drug 4 S I R N	____ Drug 5 S I R N	____ Drug 6 S I R N	____ Drug 7 S I R N	____ Drug 8 S I R N	____ Drug 9 S I R N
_____	Organism 2 (specify) _____	____ Drug 1 S I R N	____ Drug 2 S I R N	____ Drug 3 S I R N	____ Drug 4 S I R N	____ Drug 5 S I R N	____ Drug 6 S I R N	____ Drug 7 S I R N	____ Drug 8 S I R N	____ Drug 9 S I R N
_____	Organism 3 (specify) _____	____ Drug 1 S I R N	____ Drug 2 S I R N	____ Drug 3 S I R N	____ Drug 4 S I R N	____ Drug 5 S I R N	____ Drug 6 S I R N	____ Drug 7 S I R N	____ Drug 8 S I R N	____ Drug 9 S I R N

Drug Codes:
AMK = amikacin
AMP = ampicillin
AMPSUL= ampicillin/sulbactam
CEFEP = cefepime
Result Codes:
S = Susceptible   I = Intermediate   R = Resistant

CEFOT = cefotaxime
CEFTAZ = ceftazidime
CEFTRX = ceftriaxone
CIPRO = ciprofloxacin
CLIND = clindamycin

DAPTO=daptomycin
ERYTH=erythromycin
GENT=gentamicin
IMI = imipenem
LEVO = levofloxacin

LNZ = linezolid
MERO = meropenem
OX = oxacillin
PENG = penicillin G
PIP = piperacillin

N = not tested

PIPTAZ = piperacillin/tazobactam
QUIDAL= quinupristin/dalfopristin
RIF = rifampin
TMZ =trimethoprim/sulfamethoxazole
TOBRA = tobramycin
VANC = vancomycin

Appendix J. Survey on CLABSI Data Collection Practices

Virginia Department of Health
Survey on CLABSI Data Collection Practices

Site Visit Date: ____/____/_____

Hospital Name: _____

Data Validation Specialist: _____

ICU DEMOGRAPHICS
1. Description of Adult ICUs in Hospital

NHSN ICU Type	ICU Name	Number of Staffed Beds as of January 1, 2010	Number of Staffed Beds as of June 30, 2010

2. Were there any changes in the number and/or organization of ICUs during the reporting period? If yes, please describe and indicate how those changes were reflected in reporting to NHSN.

DATA COLLECTION AND ENTRY
3. Which staff members are involved with the collection of ICU **patient days**?

4. Identify the method used to collect ICU **patient days**:
   ___ At the same time each day, count the number of patients on the unit
      (e.g. midnight census)
   ___ Count the total number of patients that were cared for in the ICU on a given day
   ___ Count the number of admissions for the day
   ___ Other (specify):

   Comments:

5. How are ICU **patient days** collected?
   ___ Electronically – collected by electronic medical record
   ___ Manually collected by Infection Prevention staff
   ___ Manually collected by staff in ICU location
   ___ Other (specify)

   Comments:

6. Which staff members are involved with the collection of ICU **central line days**?

7. Identify the method used to collect ICU **central line days**:
   ___ At the same time each day, count the number of patients on the unit with one or
       more central lines
   ___ Count the total number of central lines that were maintained in the ICU that day
   ___ Other (specify):

   Comments:

8. How are ICU **central line days** collected? (verify documentation):
   ___ Electronically – collected by electronic medical record
   ___ Manually collected by Infection Prevention staff
   ___ Manually collected by staff in ICU location
   ___ Other (specify)

   Comments:

9. Are peripheral IVs counted as central lines?

10. If a patient has two separate central lines, how many central line days are counted?

11. If a patient has a temporary central line and a permanent central line, how many central line days are counted?

12. If, at the time central lines are counted, you know that a patient had a line removed earlier in the day, will you count the patient as having a central line?

13. If a patient has only a permanent central line (e.g., port-a-cath) and the line has not been accessed since admission, is it counted in the central line days?

14. Does your facility keep a line list of patients with a central line? If yes, is this for all patients or just those in the ICU?

15. Does your facility use the NHSN "Denominators for Intensive Care Unit" form to log denominator data? If not, is another form used to log the denominator data for each month?

16. Who counts patient days and central line days when the "regular" data collector(s) is/are not working?

17. What do you do if no one collected this information over a weekend/holiday or for another reason?

18. Which staff member(s) is/are responsible for entering CLABSI event data into NHSN?

19. Which staff member(s) is/are responsible for entering ICU patient days and central line days data into NHSN?

20. In cases of ambiguity, who makes the final decision regarding the determination of whether an infection is a CLABSI?

QUALITY CONTROL AND TRAINING
21. What data quality control activities are performed on the CLABSI event and/or denominator data?

22. Who is responsible for correcting NHSN data that are found to be incorrect?

23. Do you provide any ongoing or periodic training for staff involved in CLABSI data collection and reporting? If so, describe the training activities.

SURVEILLANCE PRACTICES
24. Briefly describe your usual process for detecting positive blood cultures on patients with central lines.

25. Overall, how consistently do you think your facility applies the NHSN CLABSI definitions? (very inconsistently → inconsistently → neutral → consistently → very consistently)

26. In your facility, how burdensome is conducting surveillance for CLABSIs in the adult ICU(s) on a scale of 1 to 5, with 5 being most burdensome?

27. In what ways do you think your CLABSI surveillance processes can be improved? What would be required to make these improvements happen?

AUDIT CHALLENGES
28. In preparing for this audit, what challenges (if any) did you face in obtaining the positive blood culture data for submission to the Virginia Department of Health?

29. Were there any other challenges in preparing for this audit?

Appendix K. Sign-In Sheet for On-Site Interview

CLABSI Interview Attendance Sheet

Hospital Name: _____

Date: _____

Name	Title

Appendix L: Letter Summarizing CLABSI Data Audit Results

COMMONWEALTH *of* VIRGINIA
Department of Health

KAREN REMLEY, MD, MBA, FAAP   P O BOX 2448   TTY 7-1-1 OR
STATE HEALTH COMMISSIONER   RICHMOND, VA 23218   1-800-828-1120

XX/XX/XXXX

Hospital Infection Preventionist
Hospital Name
Hospital Address
Hospital City, VA XXXXX

Dear [Infection Preventionist]:

As you know, the Virginia Department of Health (VDH) recently conducted an on-site chart review of the central line-associated bloodstream infection (CLABSI) data submitted through the NHSN surveillance system for the period January 1, 2010 through June 30, 2010. The chart reviews have been completed and the results for your hospital are included in the attached *CLABSI Summary of Findings* form.

The *CLABSI Summary of Findings* form highlights any discrepancies found by the data validation specialist and includes a detailed description of the discrepancies under the Comments section. Your data validation specialist is available to resolve CLABSI case discrepancies as necessary. If, after a discussion with the data validation specialist, the hospital and validation specialist still do not agree, Mary Andrus, BA, RN, CIC of Surveillance Solutions Worldwide will make a final CLABSI case determination. If any reporting discrepancies (either CLABSIs incorrectly reported or unreported CLABSIs) remain at the end of this case status resolution process, please add or delete these entries through the NHSN system by **March 15, 2011**.

These changes can be made in the same manner you add or delete new CLABSIs in NHSN. The VDH appreciates the level of cooperation received from hospitals throughout this data review process. We have gained a better understanding of the issues surrounding CLABSI data collection and we believe this project will significantly enhance the overall quality of the data as we move forward with public reporting of this important information.

If you have any feedback or questions, please contact me at 804-864-8097 or Andrea.Alvarez@vdh.virginia.gov.

Sincerely,

Andrea Alvarez, MPH
Healthcare-Associated Infections Program Coordinator

Appendix M. Central Line-Associated Bloodstream Infection (CLABSI)
Summary of Findings

XX/XX/XXXX

Hospital Name:

Data Validation Specialist:

Date of Audit:

Number of Records Reviewed:

Findings:

Discrepancies:
CLABSIs identified by data validation specialist but not reported by hospital   XX
CLABSIs reported by hospital but not confirmed by data validation specialist   XX

Agreements:
CLABSIs reported by hospital and confirmed by data validation specialist   XX
Records with no CLABSI reported and confirmed by data validation specialist   XX

Comments:

This audit did not find any discrepancies between the data that were reviewed on the above date and the events that you reported to NHSN during the time period of January 1, 2010 through June 30, 2010.

Thank you for your cooperation with the Virginia Department of Health in making this effort successful.