Healthcare-Associated Infections 2010 Needs Assessment Report

Virginia Department of Health
Division of Surveillance and Investigation
Healthcare-Associated Infections Program
August 2010

Prepared by:
Andrea Alvarez, MPH
Healthcare-Associated Infections Epidemiologist

Dana Burshell, MPH, CPH
Council of State and Territorial Epidemiologists
Applied Epidemiology Fellow

Table of Contents

Executive Summary

Online needs assessments were sent to infection preventionists (IPs), quality improvement (QI) professionals, and administrators in Virginia acute care hospitals to describe current healthcare-associated infection (HAI) surveillance practices, infection prevention staff responsibilities and available resources, education and training needs, organizational culture, and relationships between IPs and QIs.

HAI Surveillance

The largest percentage of respondents conducted surveillance for methicillin-resistant *Staphylococcus aureus* (MRSA) (98%) or *Clostridium difficile* (*C. difficile)* infection (93%). With the exception of *C. difficile* infection (71%), almost all responding facilities (94-98%) used definitions from the National Healthcare Safety Network (NHSN) for a variety of HAIs. NHSN-defined denominator use was not as widespread, ranging from 67% for central line-associated bloodstream infections (CLABSIs) outside adult intensive care units (ICUs) (denominator = central line days) to 94% for surgical site infections (SSIs) following coronary artery bypass graft (CABG) surgery (denominator = surgical procedures). Despite relatively high levels of NHSN definition and denominator use, few facilities utilized NHSN for data entry of non-mandated infection types, with MRSA being entered most often (20%).

Infection Prevention Staff Responsibilities and Available Resources

On average, there were 1.41 infection preventionist full-time equivalents (range: 0.5 – 6.0) in facilities that responded to the infection prevention assessment.

Excluding CLABSI, which already has a legislative mandate for NHSN use in adult ICUs, over half of facilities reported that HAI surveillance currently takes less than 6 hours per week on average for each infection type captured by the needs assessment. For *C. difficile* infection and SSI following CABG, hip replacement, or knee replacement surgery, over half of facilities reported that over 5 hours of additional surveillance time per week would be necessary if NHSN use were mandated for data entry for that type of infection. *C. difficile* was the infection with the highest percentage of respondents indicating that more than 5 hours of additional time per week would be required if surveillance were mandated (63%).

Education and Training Needs

Among IP respondents, data management and reporting using NHSN was identified as a training need by 83%. QI initiatives related to infection prevention (74%), outbreak investigation (74%), and data management and reporting to other agencies (66%) were the other top IP training needs.

Among QI respondents, QI initiatives related to infection prevention was identified as a training need by 54%. Time management (39%), team building (39%), and data management and reporting to NHSN (36%) were other top QI training needs.

Organizational Culture

Administrators consistently characterized infection prevention resource capacity and culture in a more favorable light than IP or QI respondents. The three groups differed significantly in their perceptions of senior management's understanding of infection prevention activities (p=0.03) and physician involvement in infection prevention projects (p<0.001).

Background

Healthcare-associated infections (HAIs), also known as nosocomial infections, are a public health concern due to their prevalence, morbidity, mortality, and cost. In 2002, an estimated 1.7 million infections occurred, which were associated with approximately 99,000 deaths (Klevens et al. 2007). Each year, the excess direct medical healthcare costs of HAIs to United States hospitals is estimated to range between $28 to $45 billion (Scott 2009). Public and political interest in these infections has grown during the past decade nationally as well as in Virginia. The Virginia Department of Health (VDH) first conducted a needs assessment of acute care hospitals in 2004 to assess HAI surveillance efforts and measure infection prevention staff capacity (Edmond et al., 2005). Subsequently, legislation mandating public reporting of one type of HAI was passed; as of July 1, 2008, hospitals with an adult intensive care unit were required to report central line-associated bloodstream infections (CLABSIs) to VDH using the National Healthcare Safety Network (NHSN), a HAI surveillance system developed by the Centers for Disease Control and Prevention (CDC). Currently, 21 states have legislation that requires hospitals to report one or more types of HAIs using NHSN. These data are used by states to estimate and characterize state-specific HAI burden and by CDC to estimate the national burden of HAIs.

In fall 2009, VDH received American Recovery and Reinvestment Act (ARRA) funds to prevent healthcare-associated infections (HAIs). These funds were to be used to increase state health department capacity, enhance healthcare-associated infection surveillance, and build HAI prevention collaboratives. Although VDH has been involved with HAI prevention in a supportive role by analyzing CLABSI data, assisting with outbreak investigations, and providing education on reporting requirements and outbreak control measures, with the receipt of these federal funds, VDH now has a more formal role in HAI prevention. The VDH Office of Epidemiology - Division of Surveillance and Investigation was tasked with developing a HAI program and building the surveillance base to learn more about the magnitude of HAIs in Virginia and help target prevention and educational efforts.

Conducting a needs assessment is a valuable way to measure the success of a public health surveillance system or program to assure that the program is achieving its objectives and to improve the program's quality, usefulness, and/or cost-effectiveness. To help VDH structure its new HAI program and to inform future public reporting legislation, needs assessments were administered to hospital administrators, infection preventionists, and quality improvement professionals in acute care hospitals across Virginia to assess current HAI surveillance activities, infection prevention staff responsibilities and available resources, education and training needs, organizational culture, and relationships between infection preventionists and quality improvement professionals. These three audiences all have key roles in the prevention of HAIs in the hospital setting. The findings of the needs assessments will be used to help VDH's HAI program accomplish its grant-mandated objectives and enhance the program's overall quality and effectiveness.

Methods

The assessments were designed by the Virginia Department of Health HAI Team with input from grant partners: Virginia Hospital & Healthcare Association (VHHA), VHQC (Virginia's quality improvement organization), and the Virginia chapter of the Association for Professionals in Infection Control and Epidemiology (APIC-VA).

With the assistance of VHHA, VHQC, APIC-VA, and the Office of Licensure and Certification, contact information was obtained for infection preventionists (IPs), quality improvement professionals (QIs), and administrators in Virginia acute care facilities. The needs assessments were available online for three weeks between February 2010 and March 2010. A link to the appropriate SurveyMonkey assessment was sent to one IP, QI, and administration contact at each acute care facility (n=74).

The QI and administration needs assessments contained a subset of questions from the IP needs assessment. The assessments covered topics including current HAI surveillance and prevention practices, infection control capacity, educational and training needs, organizational culture, information technology capacity, and support needs.

Analyses were completed using SAS 9.2 (Cary, NC) with $\alpha = 0.05$ for all tests of significance. Chi-square analyses were used to assess the significance of differences between the three types of respondents for the organizational culture questions. Odds ratios were used to quantify the association between variables pertaining to the IP-QI relationship. Intrahospital analyses were conducted on hospitals where both an infection preventionist and quality improvement professional responded. Hospitals were matched on hospital name and responses on common questions were compared to see if perceptions of relationships, knowledge, and organizational culture were concordant. For the relationship questions, answers were concordant if both respondents answered "very positive" or "somewhat positive" *or* if both answered "neutral", "somewhat negative", or "very negative." For the knowledge questions, answers were concordant if both respondents answered "very knowledgeable" or "somewhat knowledgeable" *or* if both answered "neutral", "somewhat knowledgeable", or "very knowledgeable." For the organizational culture questions, answers were concordant if both respondents answered "strongly agree" or "agree" *or* if both answered "neutral," "disagree", or "strongly disagree." Due to a low response rate for the administration assessment, differences in responses among all three audiences within the same facility could not be investigated.

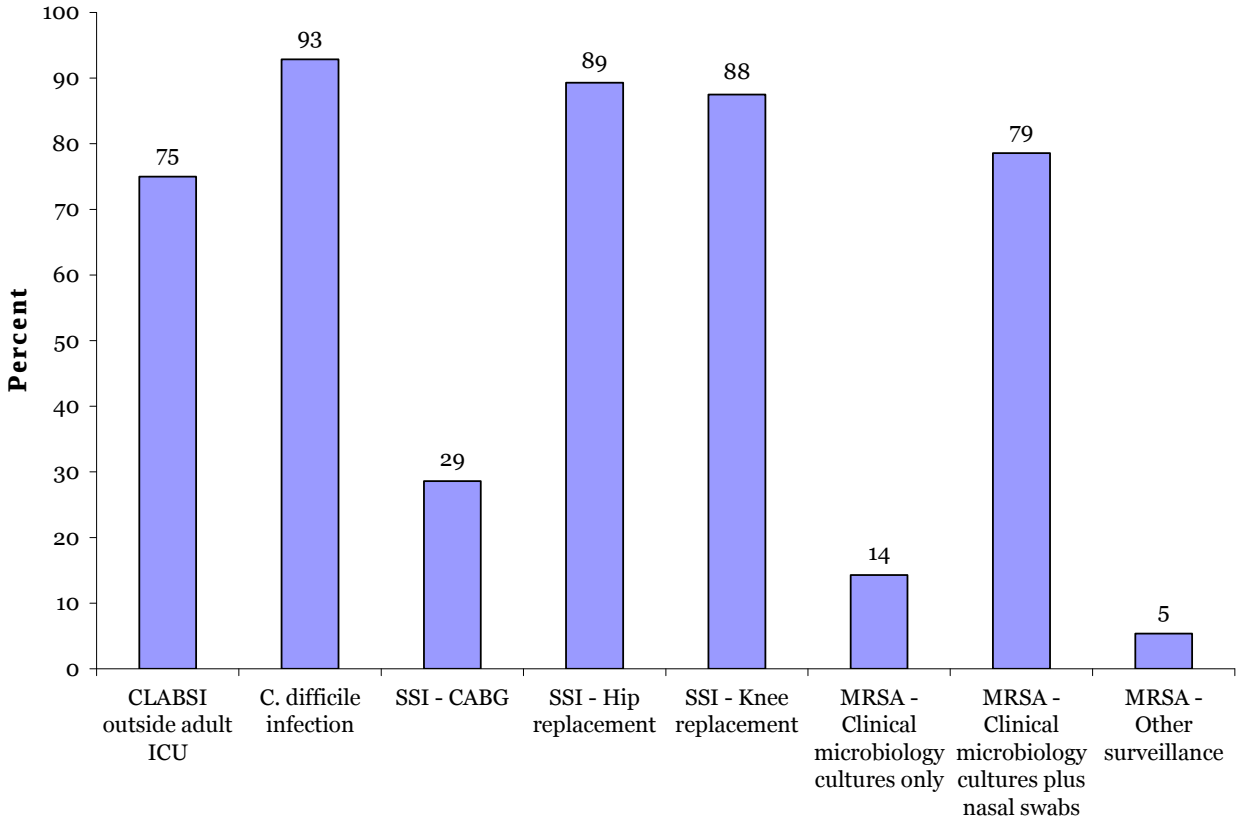
Results from the Infection Prevention Needs Assessment

The infection preventionist needs assessment response rate was 76% (n=56). Ninety-two percent (n=52) of respondents completed the entire assessment. Three-fourths of respondents worked in a facility that is part of a hospital corporation. More than half of respondents (60%) worked in a facility with 200 licensed beds or fewer. Ten percent worked in a facility with over 500 licensed beds.

Infection Surveillance

Three-quarters of respondents reported that they monitor central line-associated bloodstream infections (CLABSIs) outside the adult intensive care unit (ICU). All indicated that they conduct surveillance for some type of surgical site infection (SSI), although this varied depending on which surgical procedures were performed at the facility. Only 20 acute care hospitals perform coronary artery bypass graft (CABG) surgery, which explains why approximately one-fourth of respondents (29%) conducted surveillance for that surgical procedure. Among hospitals that responded to the assessment and performed CABG surgeries, all conducted SSI surveillance following CABG surgeries. Almost all respondents said that they monitor *Clostridium difficile* (*C. difficile)* infection (93%) or do some form of surveillance for methicillin-resistant *Staphylococcus aureus* (MRSA) (98%) (Figure 1).

Figure 1. Percent of acute care facilities that conduct surveillance on selected types of healthcare-associated infections, Virginia acute care hospitals, 2010



Use of NHSN Definitions, Denominators, and Software

- Table 1 describes the use of NHSN for infection definitions, denominators, and data entry by infection and surgical procedure type.
    - With the exception of *C. difficile* infection (71%), responding facilities consistently used NHSN definitions for a variety of HAIs.
    - NHSN denominator use was not as widespread, ranging from 67% for CLABSIs outside adult ICUs to 94% for CABG SSIs.
    - Despite relatively high levels of NHSN definition and denominator use, few facilities utilized NHSN for data entry of non-mandated infection types, with MRSA (20%) and CLABSI outside adult ICU (19%) being entered most often.

Table 1. Use of NHSN by HAI type, Virginia acute care hospitals, 2010

Healthcare-associated infection type (number of facilities)	**Use NHSN definition (%)**	**Use NHSN denominator* (%)**	**Enter data into NHSN (%)**
CLABSI outside adult ICU (n=42)	98	67	19
Clostridium difficile infection (n=52)	71†	83	10
SSI - CABG (n=16)	94	94	13
SSI - Hip replacement (n=50)	98	86	8
SSI - Knee replacement (n=49)	98	86	8
MRSA (n=55)	N/A	N/A	20
All infection types‡ (excluding MRSA) (n=209)	91	82	11

* NHSN denominator depends on type of infection or surgical procedure

† n=50 for this calculation because two facilities skipped this question

N/A = these questions were not asked for this infection type

‡ percentages are the sum of all facilities that use the NHSN definition for each infection type divided by the sum of all facilities that conduct surveillance for each infection type

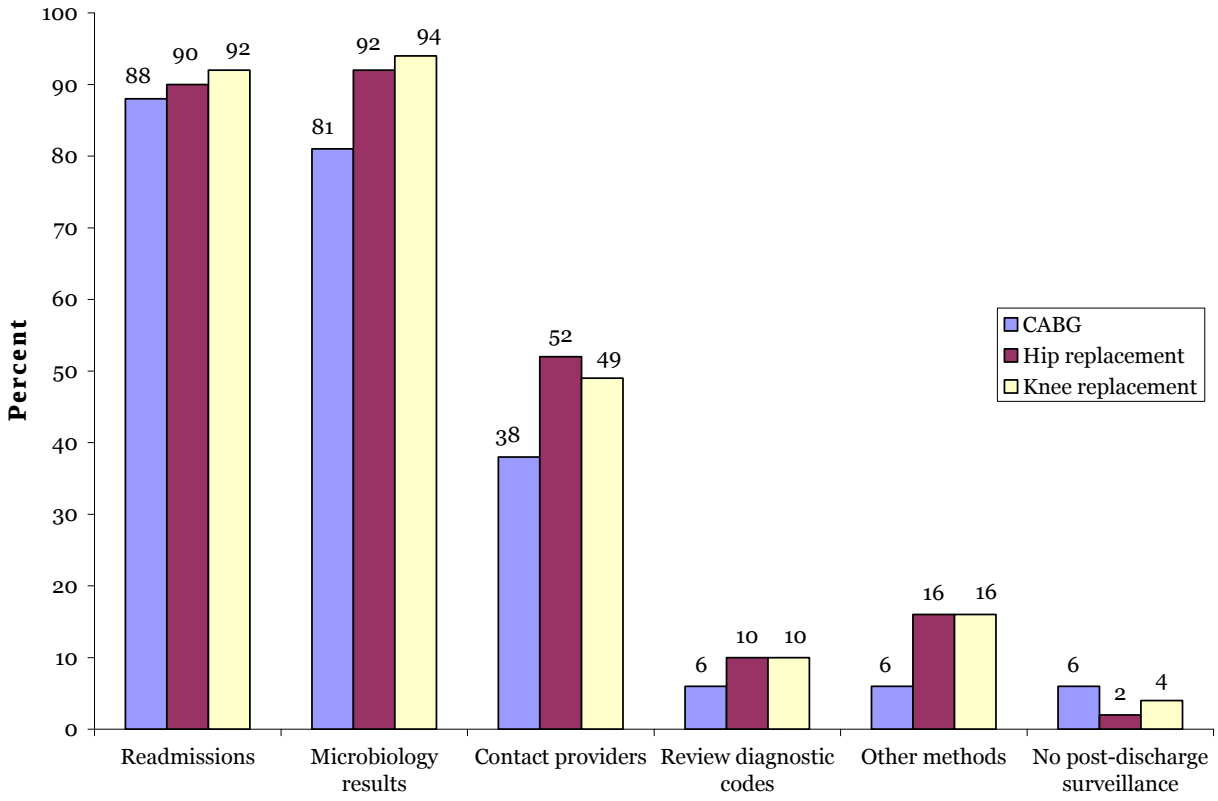
CLABSI Surveillance Outside the Adult ICU

- All respondents said that they did continuous surveillance for CLABSI outside the adult ICU.
- Of those who conducted surveillance for CLABSIs outside the adult ICU, 91% conducted surveillance whole-house (in all inpatient units). The medical ward (10%) and surgical ward (5%) were the other most common locations for surveillance.
- The majority of respondents (67%) used central line days as the CLABSI denominator (NHSN standard), but patient days were used by 26% of respondents, and 12% of respondents did not calculate CLABSI rates.
- One in seven facilities (14%) that conducted surveillance of CLABSI outside the adult ICU indicated that they entered CLABSI data from another type of ICU into NHSN. One in ten facilities that conducted CLABSI surveillance indicated that they entered whole-house CLABSI data into NHSN.
- Less than 5% of facilities that conducted CLABSI surveillance currently entered data into the NHSN Central Line Insertion Practices (CLIP) module.

SSI Surveillance

- Among the facilities that conducted SSI surveillance, all facilities conducting CABG surveillance, 96% of hip replacement facilities, and 98% of knee replacement facilities conducted surveillance continuously.
- The majority of facilities doing surveillance for CABG (94%), hip replacement (86%), and knee replacement (86%) used surgical procedures as the denominator (NHSN standard), but 6% of CABG facilities, 10% of hip replacement facilities, and 10% of knee replacement facilities used patients as the denominator.
- Among the facilities that conducted SSI surveillance for CABG, hip replacement, or knee replacement surgical procedures, the majority performed some type of post-discharge surveillance (Figure 2).
    - Readmissions and microbiology results were most commonly used to identify post-discharge SSIs for all three types of surgical procedures.
    - Providers were routinely contacted by approximately half of facilities for both types of joint replacement surgery.

Figure 2. Percent of facilities conducting post-discharge SSI surveillance, by identification method and surgical procedure, Virginia acute care facilities, 2010



C. difficile Infection Surveillance

- Over half of facilities who did *C. difficile* infection surveillance (56%) monitored community-acquired and hospital-acquired infections.
- All *C. difficile* infection surveillance was done whole-house and almost all surveillance (98%) was done continuously.
- The majority of facilities (71%) that conducted *C. difficile* infection surveillance used the CDC NHSN Multidrug-Resistant Organism/*Clostridium difficile*-

associated Disease (MDRO/CDAD) module definition. The remainder used a modified CDC NHSN MDRO/CDAD definition (14%), a hospital-developed or corporate-developed definition (14%) or the Society for Healthcare Epidemiologists of America (SHEA) case definition (2%).

- Most facilities that conducted *C. difficile* infection surveillance used the NHSN-standard patient days as the denominator when calculating rates. Admissions (6%) and discharges (6%) were also used by a few facilities. Two facilities (4%) indicated that they did not calculate *C. difficile* infection rates.
- One in ten facilities that conducted *C. difficile* infection surveillance entered those data into NHSN; 2% used the CDAD Infection Surveillance module, while the remainder used the CDAD LabID Event Reporting module.

MRSA Surveillance

- One in five facilities that conducted surveillance for MRSA entered process and/or outcome data into NHSN; 15% used the MDRO Infection Surveillance module, 15% used the MDRO LabID Event Reporting module, 2% used the Monitoring Adherence to Hand Hygiene and Monitoring Adherence to Gown and Gloves Use as Part of Contact Precautions module, and 4% used the Monitoring Adherence to Active Surveillance Testing module.

Infection Preventionist Roles and Responsibilities

- On average, there were 1.41 infection preventionist (IP) full-time equivalents (FTEs) in responding facilities, ranging from 0.5 FTEs to 6.0 FTEs. Over half of responding facilities (53%) had exactly one infection preventionist. A variety of other types of employees contribute to the HAI surveillance and prevention efforts; the most common were infectious disease physician and administrative assistant or secretary. The mean number of total staff member FTEs who worked on HAI surveillance and prevention was 1.75 per facility (Table 2).

Table 2. Facility HAI surveillance, prevention, and control staff capacity

Type of staff member	Median FTEs	Mean FTEs	Minimum FTEs	Maximum FTEs	% of hospitals with this type of HAI staff member
Infection preventionist	1	1.41	0.5	6	100
Administrative assistant or secretary	0	0.10	0	1	17.0
Data analyst	0	0.05	0	1	5.7
Data manager	0	0.01	0	0.4	5.7
Hospital epidemiologist	0	0.02	0	1	5.7
Infectious disease physician	0	0.06	0	1	26.4
Other nurse	0	0.04	0	1	7.5
Other physician	0	0.01	0	0.25	9.4
Quality improvement official	0	0.02	0	0.5	9.4
Other staff member	0	0.01	0	0.3	1.9
Total staff members who do surveillance, prevention, and/or control of HAIs	1	1.75	0.5	9	--

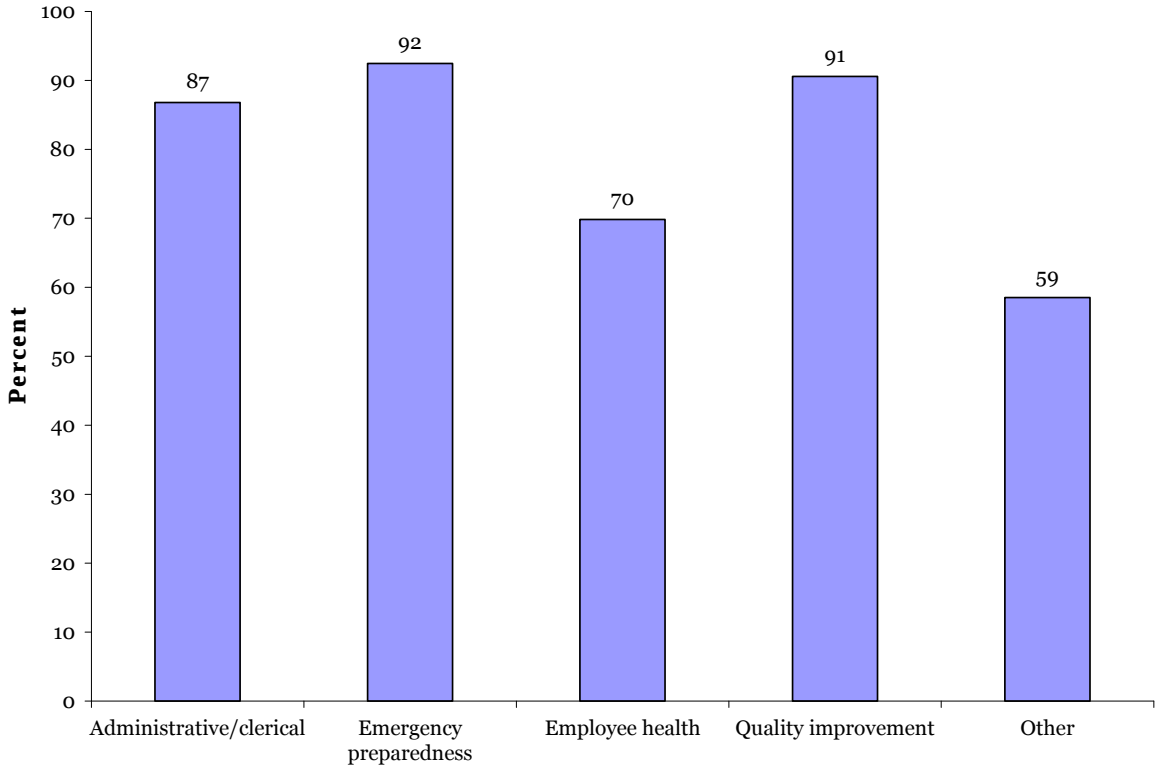
- Infection preventionist capacity varied by bedsize. One hospital did not answer the bedsize question, which resulted in the overall mean FTEs increasing from 1.41 FTEs to 1.42 FTEs.
    - Hospitals with 200 licensed beds or fewer had an average of 1.01 IP FTEs (range 0.5 – 2.5).
    - Hospitals with 201 – 500 licensed beds had an average of 1.51 IP FTEs (range 1.0 – 3.5).
    - Hospitals with more than 500 licensed beds had an average of 3.68 IP FTEs (range 1.5 – 6.0).
    - When the mean number of IP FTEs was divided by hospital bedsize of the Virginia needs assessment respondents, infection preventionists at hospitals with 100 beds or fewer or between 401 and 500 beds were responsible for the lowest number of beds per FTE (Table 3).

Table 3. Number of beds per one infection preventionist FTE by licensed bedsize category, Virginia acute care hospitals, 2010

Licensed beds	Hospitals (#)	Mean number of FTEs	Number of beds per 1 FTE (assuming min bedsize of range)	Number of beds per 1 FTE (assuming mid bedsize of range)	Number of beds per 1 FTE (assuming max bedsize of range)
≤100	6	0.92	--	54.3	108.7
101-200	25	1.03	98.1	145.6	194.2
201-300	10	1.28	157.0	195.3	234.4
301-400	5	1.58	190.5	221.5	253.2
401-500	1	3.50	114.6	128.6	142.9
501-600	3	2.97	168.7	185.2	202.0
601-700	0	--	--	--	--
701-800	0	--	--	--	--
801-900	2	4.75	168.6	178.9	188.7
>900	0	--	--	--	--

- The majority of respondents (82.7%) indicated that they spent 40-59 hours per week at the surveyed facility. Nearly one in ten (9.6%) said that they worked 60 hours or more at the facility.
- Almost two-thirds of respondents (64%) said that they spend >40% of their time on infection prevention activities. Figure 3 describes the percentage of respondents who indicated that they spent time on activities in addition to infection prevention. Nearly all respondents indicated that they spent time on emergency preparedness (92%) or quality improvement activities (91%). Some of the other duties mentioned by respondents included construction/maintenance issues, workers' compensation, and safety.

Figure 3. Percent of facilities where infection preventionists perform additional roles by type of activity, Virginia acute care hospitals, 2010



- Of their time spent on infection prevention-related tasks, infection preventionists indicated that, on average, they spent the greatest percentage attending meetings (17%), analyzing data and generating reports (15%), and reviewing charts (15%) (Table 4).

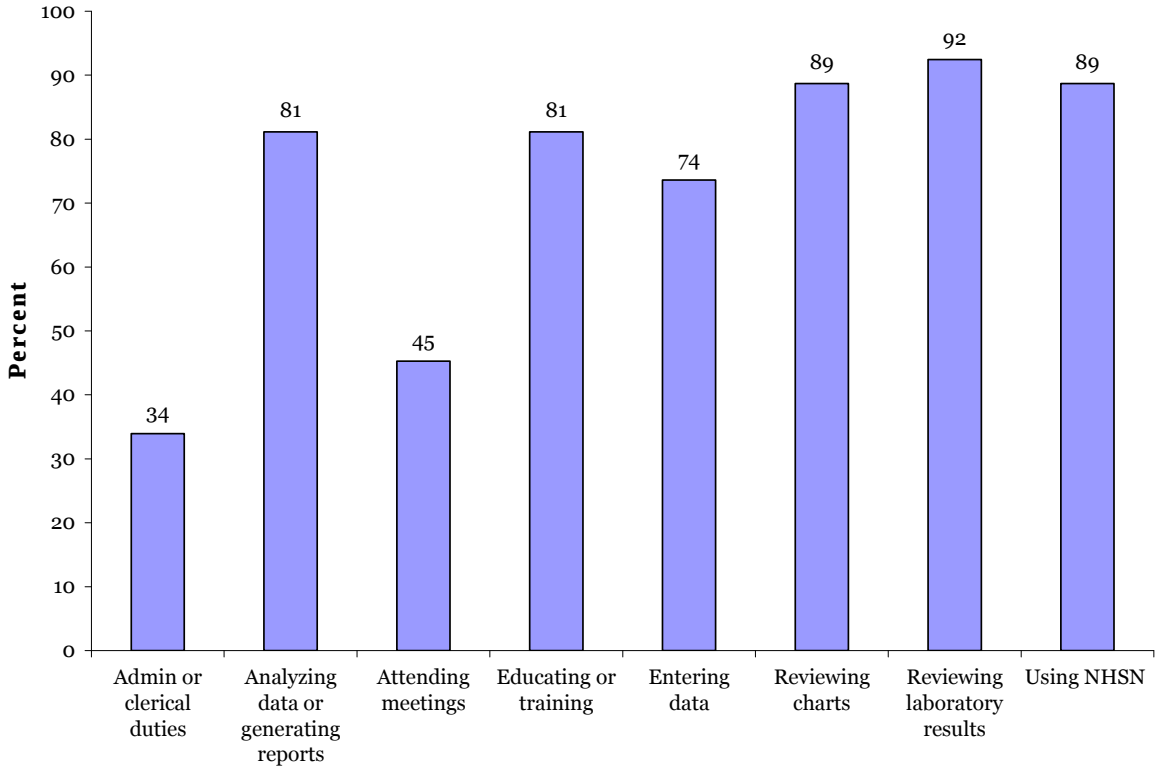
Table 4. Percentage of time spent on infection surveillance and prevention activities, Virginia acute care facilities, 2010

Activity	Median (%)	Mean (%)	Minimum (%)	Maximum (%)
Administrative/clerical duties related to infection prevention	10.0	13.4	2.0	40.0
Analyzing data/generating reports	15.0	15.1	5.0	30.0
Attending meetings	15.0	16.9	3.0	50.0
Education/training	10.0	9.9	2.0	25.0
Entering data	10.0	11.0	2.0	20.0
Reviewing charts	15.0	15.0	0.0	44.0
Reviewing laboratory reports	15.0	13.3	0.0	30.0
Using NHSN (once enrolled)	5.0	4.4	0.0	10.0
Other activities	2.5	5.5	0.0	43.0

- Respondents noted which of their regular activities related to infection surveillance and prevention require specific training in infection prevention (Figure 4). Most infection preventionists indicated that reviewing laboratory results (92%), reviewing

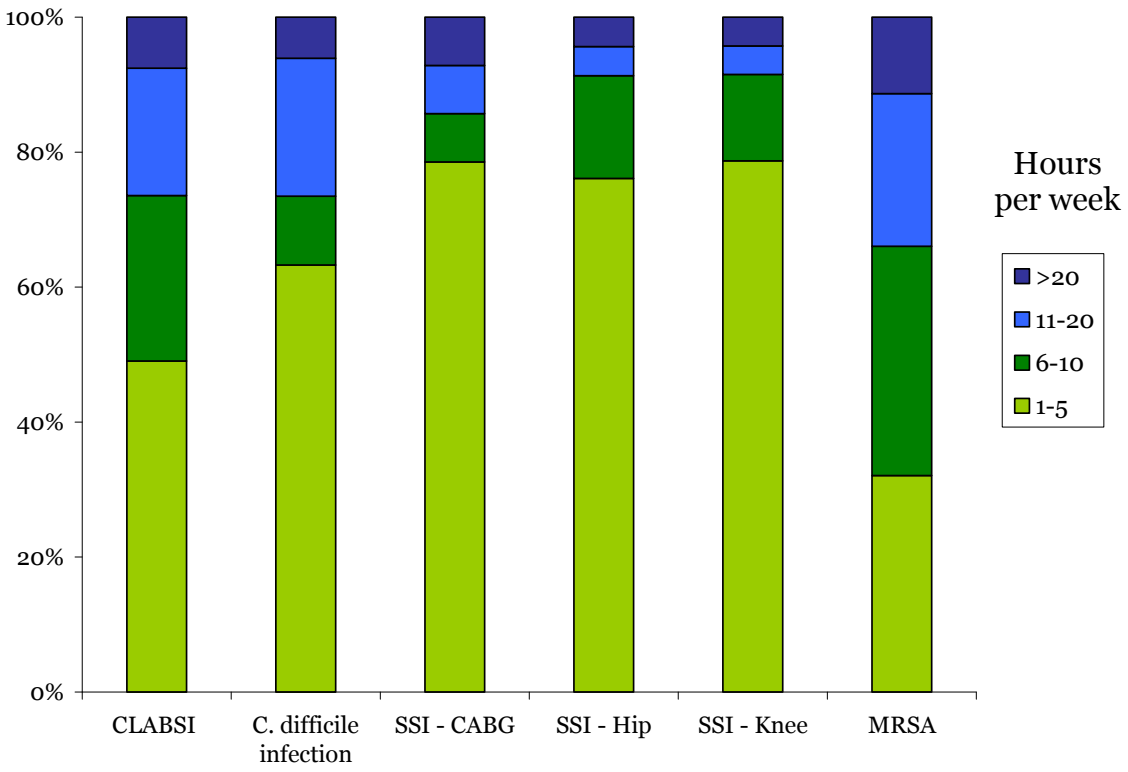
charts (88%), and using NHSN (88%) required their specialized training, but over a third (34%) said that even administrative/clerical duties required specialized infection prevention training.

Figure 4. Percent of facilities where infection preventionists indicated that specialized training in infection prevention is required for specific tasks by type of activity, Virginia acute care facilities, 2010



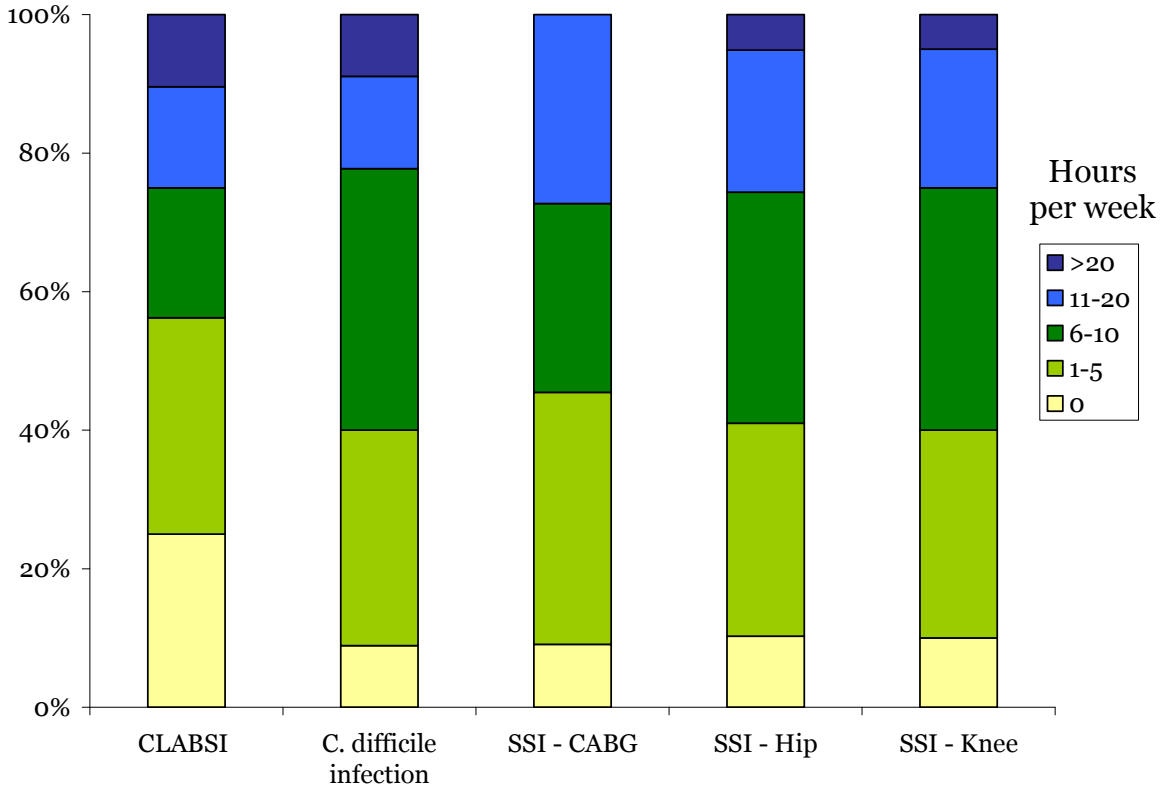
- Respondents were asked how many hours per week they spend doing surveillance for a variety of infection types and surgical procedures. Facilities that did not conduct surveillance for the noted infection were excluded from this analysis.
    - Excluding CLABSI, which already has a legislative mandate for NHSN use in adult ICUs, over 50% of facilities reported that HAI surveillance currently takes less than 6 hours per week on average for each infection type.
    - The greatest amount of time per week was spent on MRSA surveillance, with 11% indicating that they spent more than 20 hours each week. Similar amounts of time were spent on SSI surveillance of hip replacement and knee replacement surgeries (Figure 5).

Figure 5. Percent of facilities that spent time on HAI surveillance by number of hours per week and by infection / surgical procedure type, Virginia acute care hospitals, 2010



- Respondents were asked to quantify the additional burden that would be required if the use of NHSN were mandated for various types of infections / surgical procedures (Figure 6). For the surgical procedures, if a respondent noted that they did not do surveillance in the previous question or if they did not know how many additional hours would be needed, then they were excluded from this analysis.
    - With the exception of CLABSI, over 50% of facilities reported that over 5 hours of additional surveillance time per week would be necessary if NHSN use were mandated for that type of infection.
    - *C. difficile* was the infection with the highest percentage of respondents indicating that more than 5 hours of additional time per week would be required if surveillance were mandated (63%).
    - More than a quarter of respondents who do CABG surgeries (27%) indicated that it would take an additional 11-20 hours per week if surveillance were mandated.
    - CLABSI was the infection with the highest percentage of respondents who said that no additional hours would be required or more than 20 hours of additional surveillance time would be required.

Figure 6. Percent of facilities that may require additional hours for HAI surveillance if reporting through NHSN were mandatory by number of hours per week and by infection / surgical procedure type, Virginia acute care hospitals, 2010



Training Needs and Preferred Formats

Training of infection preventionists

- Data management and reporting using NHSN was identified as a training need by 83% of respondents. Quality improvement initiatives related to infection prevention (74%), outbreak investigation (74%), data management and reporting to other agencies (66%), and time management (60%) were the other top training needs.
- The most preferred formats for training were a one day in-person regional training and webinar (81% of respondents somewhat interested or very interested).
- Respondents indicated that administrators would be most likely to support webinar trainings for infection preventionists, followed by online self-study modules, and one day in-person regional trainings.

Training of non-infection preventionists

- Approximately one in four respondents (28%) indicated that it would be likely or somewhat likely that their hospital's administration would be able to designate time from a non-infection prevention staff member to devote to infection prevention.
    - There was no significant association between ability to designate non-infection preventionist staff support and bedsize category.

- The top identified training needs for non-infection preventionists were general infection prevention (70%), quality improvement initiatives related to infection prevention (70%), and healthcare-associated infection surveillance (57%).
- If trainings were available for non-infection preventionists, respondents said that administrators would be most likely to support webinar trainings or online self-study modules.
- Lack of financial resources was cited by IPs as the primary barrier preventing administrators from devoting additional resources to infection prevention, followed by lack of available personnel and lastly, lack of adequate training.

Organizational Culture

Infection prevention placement within the facility

- The majority of respondents indicated that they report to either a Chief Nursing Officer/Vice-President of Nursing (37%) or a Quality Improvement Director (35%).
- The majority of respondents were housed in either the Quality Improvement department (37%) or Infection Prevention department (35%).
    - The placement of infection prevention within the facility differed by bedsize category, although not significantly.
        - Approximately one-third of small hospitals (≤200 beds) had infection prevention in a stand-alone IP department (32%) or in the QI department (35%).
        - One-quarter of midsize hospitals (201-500 beds) had infection prevention housed in a stand-alone IP department and slightly less than half (44%) had infection prevention housed in the QI department.
        - Almost all large hospitals (>500 beds) (80%) had infection prevention housed in a stand-alone IP department.

Relationship between infection prevention and quality improvement teams

- Infection prevention (IP) and quality improvement (QI) teams were noted to interact between one and four hours per week by the majority of respondents (62%). Approximately one in ten respondents (9%) said that their IP and QI teams interacted more than 16 hours per week. No respondents reported that their IP and QI teams did not interact in an average week.
- IP and QI teams communicated most often over electronic mail, followed by in-person interactions, phone conversations, and formal meetings.
- Overall, the relationship between infection prevention and quality improvement was noted to be somewhat positive or very positive (88%). Eight percent of respondents classified the relationship as neither positive nor negative.
    - There was no significant association between IP-QI relationship and the number of hours of IP-QI interaction per week or hospital bedsize category.
    - The majority of respondents (60%) said that the IP team was somewhat knowledgeable or very knowledgeable about the QI team's activities. Six percent of respondents indicated that the IP team was neither knowledgeable nor unknowledgeable about the QI team's activities.
        - Compared to IP respondents housed in a stand-alone IP department, if IP respondents were housed within the QI department:

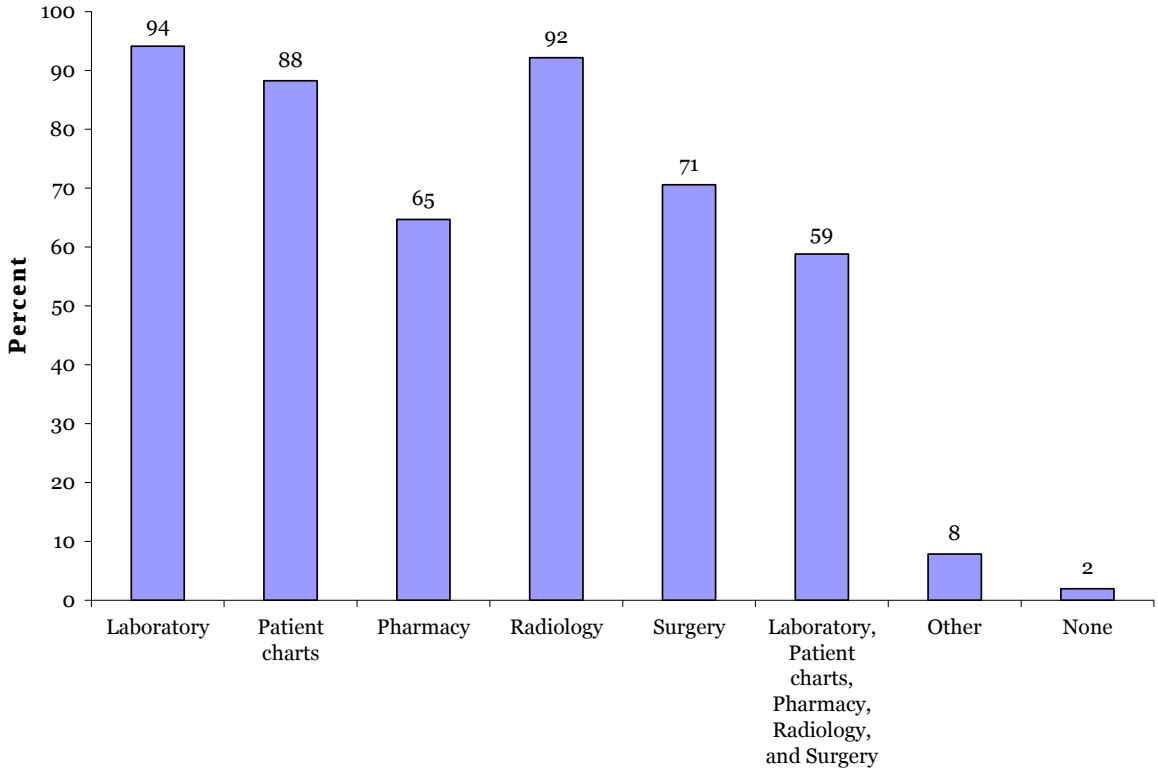
- IPs were more likely to be knowledgeable about QI activities, although not significantly so (Odds ratio = 4.22, 95% CI 0.98-18.12).
- IPs perceived that QIs were significantly more likely to be knowledgeable about IP activities (Odds ratio = 8.38, 95% CI 1.77-39.69).

        - If IP was somewhat unknowledgeable or very unknowledgeable about QI activities, then it was significantly more likely for the IP-QI relationship to be categorized as neutral, somewhat negative, or very negative (Odds ratio = 9.67, 95% CI 1.03-90.41).
        - There was no significant association between IP knowledge about QI activities and the number of hours of IP-QI interaction per week, or hospital bedsize category.
    - Over half of respondents (59%) said that they thought the QI team was knowledgeable about the IP team's activities. Ten percent of respondents indicated that the QI team was neither knowledgeable nor unknowledgeable about the IP team's activities.
        - If QI was perceived to be somewhat unknowledgeable or very unknowledgeable about IP activities, then it was more likely for the IP-QI relationship to be categorized as neutral, somewhat negative, or very negative, although this failed to reach statistical significance (Odds ratio = 9.06, 95% CI 0.97-84.46)
        - There was no significant association between perceived QI knowledge about IP activities and the number of hours of IP-QI interaction per week, or hospital bedsize category.

Information Technology (IT)

- A hospital-specific customized database (22%), AICE (20%), and Premier Safety Surveillor (16%) were the most commonly mentioned infection prevention databases or software vendors. Nearly one in five respondents (18%) indicated that their facility did not use an infection prevention database or software vendor.
- AICE (20%), a hospital-specific customized database (16%), and Premier Safety Surveillor (4%) were the most commonly mentioned surgical databases or vendors. Approximately one-third of respondents (35%) said that their facility did not use a vendor for surveillance of surgical procedures and an additional 22% were not sure which vendor was used.
- Two-thirds of respondents (66%) indicated that it was likely or somewhat likely that their IT department and/or vendor would be able to support the creation and maintenance of a file transmission if the option to upload information into NHSN became available.
- Comet (20%), Premier Safety Surveillor (8%) and Midas (4%) were the most commonly mentioned Surgical Care Improvement Project (SCIP) vendors. Half of respondents were not sure which vendor their facility used for abstraction and reporting of SCIP measures.
- Electronic access to medical records can be beneficial for efficient and timely tracking of HAIs. Almost all responding infection preventionists noted that they had electronic access to laboratory or radiology records and 59% had electronic access to laboratory records, patient charts, as well as pharmacy, radiology, and surgery records (Figure 7).

Figure 7. Percent of facilities where infection preventionists had electronic access to selected types of records, Virginia acute care facilities, 2010



Comments

- Respondents thought VDH may be able to support acute care infection prevention activities by providing education and training (73%), connecting facilities with resources (71%), and assisting with outbreak investigation (58%).
- Infection preventionists had the opportunity to provide comments or feedback at the end of the assessment. A few themes emerged from these comments:
    - It is important that the public be educated about infection prevention.
    - VDH can help to advocate to hospital administrators for a strong infection program and for increased resource allocation.
    - Infection preventionists are engaged in many HAI initiatives. If additional work will be expected from the infection preventionists, the work should add value to what is already conducted and the initiatives should relate directly to what is publicly reportable.
    - Adequate staffing is a key element to success of an infection prevention program.

Results from the Quality Improvement Needs Assessment

The quality improvement needs assessment response rate was 53% (n=39). Approximately three-fourths of respondents (72%) worked in a facility that is part of a hospital corporation. Two-thirds of respondents worked in a facility with 200 licensed beds or fewer. Ten percent worked in a facility with over 500 licensed beds.

Infection Prevention Staff Capacity

- On average, there were 1.44 infection preventionist (IP) full-time equivalents (FTEs) in responding facilities, ranging from 0.4 FTEs to 6.0 FTEs and a total of 2.17 staff FTEs (range 0.5 – 7) who work on HAI surveillance and prevention. Over half (63%) of responding facilities had exactly one infection preventionist.

Training Needs and Preferred Formats

Training of quality improvement professionals

- Quality improvement initiatives related to infection prevention was identified as a training need by 54% of respondents. Time management (39%), team building (39%), and data management and reporting to NHSN (36%) were other top training needs.
- The most preferred format for training was webinar (72% somewhat interested or very interested), followed by online self-study module (62% somewhat interested or very interested).

Training of infection preventionists

- Respondents indicated that administrators would be most likely to support webinar trainings for infection preventionists, followed by online self-study modules, and one day in-person regional trainings.

Training of non-infection preventionists

- Two-thirds of respondents indicated that it would be likely or somewhat likely that their hospital's administration would be able to designate time from a non-infection prevention staff member to devote to infection prevention.
    - There was no significant association between ability to designate non-infection preventionist staff support and bedsize category.
- The top identified training needs for non-infection preventionists were quality improvement initiatives related to infection prevention (79%), general infection prevention (61%), and healthcare-associated infection surveillance (58%).
- If trainings were available for non-infection preventionists, respondents said that administrators would be most likely to support webinar trainings or online self-study modules.

Organization and Culture

Quality improvement placement within the facility

- The largest percentage of respondents report to the Chief Executive Officer/President/Vice-President (38%), Chief Nursing Officer/Vice-President of Nursing (18%) or the Quality Improvement Director (18%).

- Approximately three-quarters of respondents (74%) were housed within the quality improvement department and 15% were housed in the administration department.

Relationship between infection prevention and quality improvement teams

- Infection prevention (IP) and quality improvement (QI) teams were noted to interact between one and four hours per week by the majority of respondents (54%). Approximately one in six respondents (16%) said that their IP and QI teams interacted more than 16 hours per week. No respondents reported that their IP and QI teams did not interact in an average week.
- Respondents indicated that IP and QI teams communicated most often via in-person interactions, followed by electronic mail, phone conversations, and formal meetings.
- Respondents were asked about the relationship between the infection prevention (IP) and quality improvement (QI) teams and how knowledgeable each team is about the other team's activities.
    - Almost all respondents (90%) indicated that the relationship between the IP and QI teams was somewhat positive or very positive. The remaining 10% all categorized the relationship as neither positive nor negative.
        - There was no significant association between the quality of the IP-QI relationship and the number of hours of IP-QI interaction per week or hospital bedsize category.
    - Two-thirds of respondents perceived that the IP team was somewhat knowledgeable or very knowledgeable about the QI team's activities. Three percent of respondents perceived that the IP team was neither knowledgeable nor unknowledgeable about the QI team's activities.
        - There was no significant association between perceived IP knowledge about QI activities and the quality of the IP-QI relationship, the number of hours of IP-QI interaction per week, or hospital bedsize category.
    - Just over two-thirds of respondents (69%) indicated that the QI team was somewhat knowledgeable or very knowledgeable about the IP team's activities. Three percent of respondents indicated that the QI team was neither knowledgeable nor unknowledgeable about the IP team's activities.
        - There was no significant association between QI knowledge about IP activities and the quality of the IP-QI relationship, the number of hours of IP-QI interaction per week, or hospital bedsize category.

Information Technology

- Thomson Reuters (21%), Premier Safety Surveillor (21%), and Medai (10%) were the most commonly mentioned Surgical Care Improvement Project (SCIP) vendors. Nearly one-fifth of respondents (18%) were not sure which vendor their facility used for abstraction and reporting of SCIP measures.

Comments

- Respondents indicated that they envisioned VDH being able to support acute care infection prevention activities by providing education and training (82%), connecting facilities with resources (79%), and assisting with data interpretation (49%).
- Quality improvement professionals had the opportunity to provide comments or feedback at the end of the assessment. A few themes emerged from these comments:

- Hospitals have limited resources and the overlap of HAI initiatives seems to be growing. VDH can support hospitals by not duplicating current efforts and or creating excessive reporting burdens.
- Hospitals can benefit from additional support, resources, and education from VDH. Training on HAI definitions for physicians is also needed.
- Validation is important to ensure that all facilities are identifying infections in the same way.

Results from the Administration Needs Assessment

The administration response rate was 20% (n=15). Approximately four-fifths of respondents (82%) worked in a facility that is part of a hospital corporation.
Over half of respondents (62%) worked in a facility with 200 licensed beds or fewer. Fifteen percent worked in a facility with over 500 licensed beds.

Infection Prevention Staff Capacity

- On average, there were 1.57 infection preventionist (IP) full-time equivalents in responding facilities, ranging from 1.0 FTEs to 6.5 FTEs with a total of 2.58 staff FTEs (range 1 – 10) who worked on HAI surveillance and prevention. All responding facilities had at least one infection preventionist.

Training Needs and Preferred Formats

Training of infection preventionists

- Respondents indicated that administrators would be most likely to support webinar trainings for infection preventionists, followed by online self-study modules, and one day in-person regional trainings. All respondents said that administration would be somewhat likely or very likely to support any of the three aforementioned types of trainings.

Training of non-infection preventionists

- A high percentage of respondents (87%) indicated that it would be likely or somewhat likely that their hospital's administration would be able to designate time from a non-infection prevention staff member to devote to infection prevention.
- The top identified training needs for non-infection preventionists were quality improvement initiatives related to infection prevention (80%), healthcare-associated infection surveillance (80%), general infection prevention (47%), and data management and reporting (47%).
- If trainings were available for non-infection preventionists, respondents said that administrators would be most likely to support webinar trainings, online self-study modules, or one day in-person regional trainings.
- Lack of available personnel was cited as the primary barrier preventing administrators from devoting additional resources to infection prevention, followed by lack of financial resources and lastly, lack of adequate training.

Organization and Culture

Infection prevention placement within the facility

- In half of the responding facilities, the infection preventionist reported to the Chief Nursing Officer/Vice-President of Nursing. In less than a quarter of facilities (21%), the infection preventionist reported to the Quality Improvement Director.

Relationship between infection prevention and quality improvement teams

- Almost all respondents (92%) indicated that the relationship between the IP and QI teams was somewhat positive or very positive. The remaining 8% all categorized the relationship as neither positive nor negative.

- Over three-quarters of respondents (79%) said that the IP team was somewhat knowledgeable or very knowledgeable about the QI team's activities. No respondents indicated that the IP team was neither knowledgeable nor unknowledgeable about the QI team's activities.
- Similarly, over three-quarters of respondents (79%) indicated that the QI team was knowledgeable about the IP team's activities. No respondents indicated that the QI team was neither knowledgeable nor unknowledgeable about the IP team's activities.

Comments

- Respondents indicated that they envisioned VDH being able to support acute care infection prevention activities by connecting facilities with resources (62%), providing education and training (62%), and helping feed data back to clinicians (46%).
- Hospital administrators had the opportunity to provide comments or feedback at the end of the assessment. A few themes emerged from these comments:
    - It is essential that surveillance practices are standardized to assure that publicly reported infection numbers are accurate.
    - Resources are limited and must be used wisely.
    - Communication of new information is important.

Organizational Culture

Table 5 compares all responses of infection prevention, quality improvement, and administration respondents regarding support and culture at their respective facilities relative to infection prevention. Perceptions of organizational culture varied significantly among the three groups for some of the statements.

Senior leadership is supportive

- A high percentage of all respondents agreed or strongly agreed with this statement but agreement was unanimous for administrators and slightly lower (85%) for IPs.

Staff work together to develop best practices

- A high percentage of all respondents agreed or strongly agreed with this statement but agreement was unanimous for administrators and slightly lower (83%) for IPs.

Infection prevention resources are adequate

- Just over one in three IP respondents (35%) agreed or strongly agreed with this statement, compared with more than half of QI (56%) and administration (57%) respondents.

Change only happens when there are external mandates

- Administrators (7%) agreed with this statement least often, while a larger percentage of QI (23%) and IP (33%) respondents agreed or strongly agreed.

Facility supports continuing staff education

- A high percentage of administrators (86%) agreed or strongly agreed, compared with lower percentages of IPs (58%) and QIs (67%).

Senior management has a good understanding of the infection prevention's activities

- The three audiences differed significantly (p=0.03) in their perceptions of senior management's understanding of infection prevention activities.
- Close to half of IP respondents (48%) agreed or strongly agreed with this statement whereas the great majority (86%) of administrators agreed or strongly agreed.

Physician staff are highly involved in infection prevention projects

- The three groups differed significantly (p<0.001) in their perceptions of physician staff involvement in infection prevention projects.
- A low percentage of IP respondents (21%) agreed that physician staff members were highly involved in infection prevention projects, compared with more than half of QIs (56%) and nearly two-thirds of administrators (64%).

Table 5. Percent agreement (agree or strongly agree) with statements related to support of infection prevention by respondent type, Virginia acute care hospitals, 2010

Statement	Infection prevention	Quality improvement	Administration	*p*-value
Senior leadership is supportive	85%	92%	100%	0.19
Staff work together to adopt HAI best practices	83%	92%	100%	0.13
Resources are adequate	35%	56%	57%	0.08
Change only happens when there are external mandates	33%	23%	7%	0.14
Facility supports continuing education for staff	58%	67%	86%	0.14
Senior management at hospital has a good understanding of key tasks and activities performed by the infection prevention program	48%	64%	86%	0.03
Physician staff are highly involved in infection prevention projects	21%	56%	64%	<0.001

All three audiences were also asked for their perception of the likelihood that their facility would able to designate time from non-infection prevention staff members to devote to infection prevention. The responses of the three groups were significantly different ($p<0.001$); just over a quarter (28%) of infection preventionists said that it would be somewhat likely or very likely that their facility would be able to designate time, compared to 67% of quality improvement staff and 87% of administrators.

Intrahospital Analyses

In twenty-four hospitals (46% of responding facilities with completed needs assessments), responses were received by both an infection preventionist and a quality improvement professional.

Relationship Between Infection Prevention and Quality Improvement Teams

- Overall, IPs and QIs were very concordant (86%) on the classification of the IP-QI relationship.
    - In 86% of facilities in this analysis, the IP and QI respondents both said that the IP-QI relationship was somewhat positive or very positive.
- More than two-thirds of facilities (68%) were concordant when respondents were asked how knowledgeable the infection prevention team was about the quality improvement team's activities.
    - In 58% of facilities in this analysis, the IP and QI respondents both said that the IP team was somewhat knowledgeable or very knowledgeable about the QI team's activities.
- Concordance was slightly lower (62%) when respondents were asked how knowledgeable the quality improvement was about the infection prevention team's activities.
    - In 52% of facilities in this analysis, the IP and QI respondents both said that QIs were somewhat knowledgeable or very knowledgeable about IP activities.

Organizational Culture

Concordant responses on questions related to organizational culture indicate that infection prevention and quality improvement staff members view their organization in the same way – both agreed/strongly agreed or both were neutral/disagreed/strongly disagreed with statements regarding facility support of infection prevention or staff education, adequacy of resources, and involvement of physician staff in infection prevention, among other topics.

- Concordance was high (82%) when respondents were asked if senior leadership was supportive of infection prevention.
    - In 77% of facilities in this analysis, the IP and QI respondents both agreed or strongly agreed that senior leadership was supportive of infection prevention.
- Approximately three-quarters of facilities (77%) were concordant when asked if staff worked together to adopt HAI best practices.
    - In 77% of facilities in this analysis, the IP and QI respondents both said that staff worked together to adopt HAI best practices.
- Concordance was lowest (36%) when respondents were asked if infection prevention resources are adequate in the facility.
    - In only 23% of facilities in this analysis, the IP and QI respondents both agreed or strongly agreed that infection prevention resources were adequate.
- Concordance was highest (86%) when respondents were asked if change only happens when there are external mandates.
    - In 18% of facilities in this analysis, the IP and QI respondents both agreed or strongly agreed that change only happens when there are external mandates.
- About three-quarters of facilities (73%) were concordant when respondents were asked if their facility supported continuing education.

    - In 55% of facilities in this analysis, the IP and QI respondents both agreed or strongly agreed that their facility supported continuing education for staff.
- Less than half of facilities (41%) were concordant when respondents were asked if senior management had a good understanding of key tasks and activities performed by the infection prevention team.
    - In 27% of facilities in this analysis, the IP and QI respondents both agreed or strongly agreed that senior management had a good understanding of infection prevention key tasks.
- Half of facilities were concordant when respondents were asked if physician staff were highly involved in infection prevention projects.
    - In 14% of facilities in this analysis, the IP and QI respondents both agreed or strongly agreed that physicians were highly involved in infection prevention projects.

Limitations

A few limitations should be considered when interpreting these results and conclusions:

- Responses from one infection preventionist, one quality improvement professional, and one administrator may give insight into infection prevention activities and culture in a facility; however, they may not be representative of other opinions in their departments or of other staff involved in infection prevention-related activities.

- While the response rate for the infection prevention (76%) and quality improvement (53%) needs assessments were relatively high, only 20% of administrators responded, limiting the ability to conduct intrahospital analyses and make strong generalizations about the perceptions of hospital administrators. Furthermore, there is potential for response bias because it is not possible to know if non-respondents would have answered the questions in the same ways as respondents.

- These analyses were restricted to acute care facilities, which represent a subset of healthcare facilities and generally have the most resources and knowledge pertaining to infection prevention and HAIs specifically. A few children's hospitals and critical access hospitals responded to our assessments but their responses were excluded from these analyses and evaluated independently.

- Infection surveillance questions focused on selected infections and surgical procedures that VDH was considering for future public reporting metrics. There are many other types of infections, such as ventilator-associated pneumonia and catheter-associated urinary tract infections, that are routinely under surveillance in the healthcare setting and are of public health concern because of their prevalence, cost, morbidity, and/or mortality.

- Although the response rates were similar (79% in 2004 and 76% in 2010) and both assessments surveyed acute care facilities, direct comparisons between the 2004 and 2010 needs assessments were limited due to variations in questions asked as well as differences in responding facilities.

Discussion

The 2010 needs assessments not only helped to create a baseline of surveillance activities around selected procedures and infections, but also helped demonstrate similarities and differences in infection prevention since the 2004 needs assessment and identify areas for improvement in the future.

Because the 2004 needs assessment also focused on infection prevention capacity and personnel resources that would be required to implement hospital-wide HAI surveillance, some comparisons can be made between the 2004 and 2010 assessments. Similar to 2004, in 2010, infection preventionists still have many responsibilities other than infection prevention (employee health, emergency preparedness, etc.). Increases in overall infection preventionist staff capacity were observed between 2004 and 2010; the mean number of IPs in the responding facilities increased from 1.0 to 1.4. Additionally, the percent of facilities with more than one IP increased from 14% in 2004 to 32% in 2010. Despite the increased IP capacity, there are still few facilities with staff members who lend support to the infection prevention program; in 2010, excluding the IP(s), the average facility had less than 0.5 FTEs who assisted with infection prevention duties. Although there was increased automation of data abstraction and analysis in 2010, one-fifth of facilities that responded to the infection prevention needs assessment still did not use an infection prevention database or software vendor. In 2004, the National Healthcare Safety Network (NHSN) was still in development, but a lack of consistency in surveillance methodology was noted; 81% of facilities used CDC's nosocomial infection definitions and 62% used patient days or device days as denominators when calculating infection rates. In the 2010 assessment, when measuring CLABSI outside the adult ICU, *C. difficile* infection, and SSIs related to three surgical procedures (CABG, hip replacement, and knee replacement), 91% of facilities used CDC's NHSN standards to define infections and 82% of facilities used NHSN-standard denominators when calculating rates..

The majority of infection preventionists noted that senior leadership at their facility was supportive of the infection prevention program. However, less than half felt that senior management understood the key tasks and activities performed by the IP team and only one-third agreed that infection prevention resources were adequate. While infection preventionists noted financial resources to be the primary barrier that limits the facility's ability to assign additional resources to the infection prevention program, administrators ranked lack of available personnel as the primary barrier. Nevertheless, administrators may be able to take action on their highest perceived barrier since most responding administrators (87%) indicated that it was likely that they could designate time from non-infection prevention staff members to devote to infection prevention. IPs may not have known involving other staff members was a viable option in their facilities and may want to explore this possibility with their administration further.

In comparing the results from the infection prevention and quality improvement assessments, the characteristics of responding facilities were similar with respect to hospital corporation affiliation, bedsize, and infection prevention staff capacity. Additionally, the majority of both types of staff members described the IP-QI relationship as a somewhat positive or very positive one. Differences were also identified between IP and QI respondents with respect to questions that were asked of both audiences. Fewer IP respondents (9%) than QI respondents (26%) noted that there was a quality improvement staff member who was part of the infection prevention team. Quality improvement respondents noted that there was

more interaction between the IP and QI teams and that interaction occurred most often in-person whereas IPs reported less frequent interactions which occurred most often by e-mail. As expected, different training needs were identified by the infection preventionists and quality improvement professionals, although both groups identified quality improvement related to infection prevention as a need. There were also slight variations in preferred training formats; although the majority of respondents in both groups were interested in webinar trainings, IPs preferred one-day regional trainings while QIs were interested in online self-study modules. These differences in training topics and preferences will allow VDH to craft trainings specific to the respective audiences.

Low concordance of some of the organizational culture questions in the intrahospital analyses demonstrated that there were differences between infection preventionists' and quality improvement professionals' views on the adequacy of infection prevention resources and senior managements' understanding of the key tasks and activities performed by the infection prevention program; for both questions, the responding IP tended to agree or strongly agree less often than the responding QI from the same facility. Concordance was high when asked if senior leadership supported infection prevention and if staff worked together to adopt HAI best practices; in each facility, both the IP and QI agreed or strongly agreed with these statements for 77% of the hospitals in this analysis. These results reinforce the importance for staff members to continue to work together to capitalize upon leadership support that may help bring about change in their facility regarding enhancement of infection prevention resources and the implementation of HAI best practices.

Administrators consistently characterized infection prevention resource capacity and culture in a more favorable light than quality improvement staff or infection preventionists. The most significant differences involved physician involvement in infection prevention, management's understanding of infection prevention activities, and the facility's ability to designate additional resources to infection prevention. These discrepancies can be due to many factors, but identifying and closing these gaps are important to align facility support for HAI prevention. Despite some differences on these questions, the three groups did all agree that administrators would be most likely to support webinar trainings or online self-study modules to educate infection preventionists or other staff members about infection prevention-related topics.

Although facilities may be concerned about the future burden associated with added state HAI reporting mandates as evidenced by high numbers of expected additional surveillance hours, there is ongoing work from the facility to the national level to improve IT capacity and electronic data transfer. Nearly two-thirds of IP respondents indicated that their IT department/vendor would be able to support the creation and maintenance of an automatic file transmission from the infection prevention database to NHSN. While NHSN continues to work with APIC and the vendor community (including several vendors of needs assessment respondents) to automate this process, VDH will work to keep Virginia facilities updated with the most recent developments. With the perceived acceptability of this upload being so high, facilities are encouraged to communicate directly with their vendor to see if automated file transmission is possible currently or in the near future.

Conclusions

Nationally, HAI public reporting is growing and additional measures may be proposed to the Virginia legislature in the future. Although an increase in the number of reportable HAIs will add to the workload of IPs, the results of these needs assessments have demonstrated that in 2010, facilities are better equipped to monitor and report HAIs than they were during the last needs assessment in 2004. In addition to already using NHSN for reporting of CLABSIs in adult ICUs, many facilities use NHSN definitions for surveillance of non-mandated HAIs and are interested in receiving more training on data management and the use of NHSN.

To address some of the issues identified by these needs assessments further, VDH will bolster its online resources to connect healthcare providers and the general public with HAI prevention messages and share best practices as well as the latest research on HAI topics of interest. Communication with infection prevention personnel will also be enhanced through the development and dissemination of a VDH HAI newsletter. Standardization of HAI surveillance was mentioned as an issue of concern by several respondents; in 2010, VDH will be designing and implementing a project to validate CLABSI data that have been publicly reported and results will be shared and disseminated. To inform future HAI reporting mandates through NHSN, infection preventionists will help quantify burden and evaluate usefulness through surveillance pilots for *C. difficile* infections and surgical site infections associated with coronary artery bypass graft surgery, hip replacement surgery, and knee replacement surgery. VDH also plans to develop education and training for infection preventionists and quality improvement professionals on identified areas of need in the suggested formats when possible. Administrators noted that VDH may be able to help with data feedback to clinicians; VDH will be working with a subset of hospitals to discuss methods of data feedback and experiences regarding how sharing data with facility clinicians and administrators can affect HAI process and/or outcome measures. Lastly, VDH is working to strengthen partnerships with organizations that are working to prevent HAIs to avoid duplication of efforts and assure that programmatic activities add value to current infection prevention initiatives in the state.

The purpose of conducting these needs assessments was to help improve the quality of VDH's HAI program and aid the program in achieving its objectives. Although the results of these assessments do not present a full picture of HAI surveillance or prevention activities in facilities around the state, the results give the Virginia Department of Health a starting point to build its HAI program, take an active role in addressing some areas for improvement, and build relationships with other agencies, healthcare facilities, and healthcare personnel in reducing healthcare-associated infections.

References

Edmond MB, White-Russell MB, Ober J, Woolard CD, Bearman GML. A Statewide Survey of Nosocomial Infection Surveillance in Acute Care Hospitals. *American Journal of Infection Control* 2005; 33:480-482.

Klevens RM, Edwards J, Richards C, Horan T, Gaynes R, Pollock D, Cardo D. Estimating Health Care-Associated Infections and Deaths in U.S. Hospitals, 2002. *Public Health Reports* 2007; 122:160-166.

Scott RD. The Direct Medical Costs of Healthcare-Associated Infections in U.S. hospitals and the Benefits of Prevention, 2009. 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.