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Report on the Visit of the Infection Control Resource Team to the Niagara Health System (St. Catharine's General site) June 29, 2011

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Infection Control Resource Team Members:

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Staff Interviewed:

Executive Summary

The Ontario Agency for Health Protection and Promotion received a request from the Niagara Health System (NHS) for an Infection Control Resource Team (ICRT) to review the management of an outbreak of *Clostridium difficile* (CDI). The CDI outbreak in question was declared at the St. Catharine's site only on May 28, 2011. Subsequently, CDI outbreaks were declared at both the Niagara and Welland sites. The ICRT review focused specifically on the St Catharine's outbreak, although many of the recommendations made are applicable to the subsequent two outbreaks.

Requested information was received from the NHS infection prevention and control (IPAC) manager and the NHS administrative director responsible for IPAC on June 27, 2011. On June 29, 2011 the ICRT team was deployed to conduct interviews and perform an on-site assessment of the events involved in the outbreak. A number of preliminary recommendations were given verbally to NHS at the end of the site visit. These key recommendations and others generated from the review are outlined below.

Recommendations

Infection Prevention and Control Program

1. The position of manager of IPAC should be one full-time equivalent (FTE) with responsibilities dedicated solely to IPAC. This person should also have front line infection prevention and control experience and have obtained his/her Certification in Infection Control (CIC).

2. Physician support for IPAC should be increased to a minimum of 0.5FTE with 1FTE strongly preferred. This physician should have skills and training in surveillance and epidemiology; microbiology, infectious diseases and infection prevention and control including outbreak management.

3. IPAC should report to one person in senior administration who has corporate responsibility across all NHS sites and who has responsibility for clinical services. Ideally and if possible, this person should also be responsible for patient safety.

4. The NHS should review and redefine the indicators used in its Quality Improvement Plan and in its IPAC Strategic Plan. Indicators should reflect outcomes in addition to process, and should include tangible targets such as rates of CDI and hand hygiene.

5. When recording nosocomial cases of CDI, case counting and attribution should be done based upon symptom onset only.

6. The NHS should work together with Niagara Region Public Health to ensure clarity and mutual understanding of outbreak definitions for CDI.

7. The NHS infection prevention and control professionals should be empowered to utilize the Infection Control and Outbreak Administrator (ICOA) software system to analyze data and generate relevant reports. Currently this responsibility rests solely with the IPAC manager.

8. The NHS IPAC program should consider implementing the use of organism-specific surveillance forms or some other similar means for documenting nosocomial cases.

9. The process of creation, maintenance and use of outbreak line lists should be reviewed, to ensure that data are easy to group and analyze. Community cases or cases attributed to other health care facilities should be recorded on the same line list with nosocomial cases.

10. Ongoing maintenance of the line list should be assigned to one person on the IPAC team.

11. Epidemiologic review and analysis of trends in nosocomial activity should be carried out on a daily basis. A site-specific and facility-wide approach, in addition to a unit-specific approach, should be taken when looking for increases in nosocomial activity.

12. Outbreak measures such as enhanced cleaning can be implemented in advance of declaring a formal outbreak and when nosocomial activity is noted to be increasing. This should be considered as part of a proactive approach to outbreak avoidance.

13. The potential role of antibiotic-resistant organism burden and the resultant isolation burden in causing outbreaks, regardless of whether cases are nosocomial or not, should always be considered.

14. Weekend on-site IPAC presence is not required. The NHS should resume its previous weekend and after hours on-call system for IPAC services.

15. The Medical Advisory Committee should consider adding a regular update of rates of antibiotic-resistant organisms and hand hygiene to its agenda.

Outbreak Management/Clinical Practice

1. Suspect and confirmed CDI patients should never be cohorted together.

2. If cohorting of isolated patients becomes necessary, the first choice for cohorting should be patients with confirmed VRE, the second choice patients with confirmed MRSA of the same strain, and the last choice cohorting of patients with confirmed CDI. Cohorting of patients with confirmed CDI should be avoided.

3. The presence of beverages and water in clinical areas is acceptable. Food or meals should never be stored in or consumed by staff in patient care areas, except in designated location such as the staff lounge. Visitors should not consume food outside of the patient room and preferably avoid eating at all on clinical units.

4. The presence of plants and flowers in patient rooms is acceptable, as long as they are taken home or discarded when the patient leaves. Plants and flowers should never be stored or displayed in common areas such as the nursing station or patient lounge.

5. The SCG site of the NHS has successfully limited movement of both patients and equipment between units as part of outbreak management. This strategy should be maintained long term.

6. NHS senior administration initiated a process of daily walking rounds to affected clinical areas during the outbreak. This visual presence helps to maintain staff morale and to ensure that staff issues and concerns can be brought forward. This practice should be maintained at a frequency determined by the facility.

7. The NHS is encouraged to develop a sustainability plan for all measures to be implemented once the outbreak is declared over.

Hand Hygiene

1. It is important to engage all visitors to the hospital to clean their hands. The method for communicating this should be based on knowledge of the community and type of communication that has been successful in the past (i.e verbal, visual, interactive).
2. Results of hand hygiene and personal protective equipment use audits should be validated to ensure inter-rater reliability between the various groups carrying out the auditing.

3. All groups carrying out hand hygiene and personal protective equipment audits should use the same audit tool and be trained in a standardized manner to ensure they are all following the same processes.

4. The NHS should ensure that a sufficient number of observations are being made on each inpatient unit for hand hygiene and personal protective equipment audits to ensure that results are reliable and valid.

Environmental Cleaning

1. Starting immediately, all inpatient units in all NHS sites affected by CDI should undergo a full terminal clean with a sporicidal agent. This terminal clean should include all

common areas and the nursing units. Sufficient resources should be dedicated to this process to ensure the clean is completed quickly

2. A sporicidal cleaning agent should be used throughout the rooms of patients with suspected or confirmed CDI, and not used solely to clean the patient bathroom. Once the outbreak is over, consideration can be given to using a sporicidal agent only in rooms of confirmed CDI patients.

3. A sporicidal agent should always be used in the bathrooms in the emergency department, regardless of outbreak status.

4. Dilutions of accelerated hydrogen peroxide should be validated regularly, in accordance with accreditation standard 12.7.

5. Increases in housekeeping resources put into place during the outbreak should be maintained permanently so that high risk units can maintain twice daily cleaning and dedicated housekeeping staff.

6. Additional unit aides put into place on the medicine units during the outbreak should be retained permanently..

7. One additional FTE housekeeper should be recruited for the night shift at the SCG site, so that the emergency department can retain a dedicated nighttime housekeeper and to ensure that there are sufficient resources to address environmental cleaning issues overnight.

8. Wall washing is not indicated as part of routine or terminal cleaning. Walls should only be cleaned when visibly soiled or when included as a high touch surface.

9. The NHS should develop a guideline for proactive environmental cleaning of units or a site with a high isolation burden of MRSA, VRE and/or CDI, regardless of whether that burden is due to nosocomial activity or previously positive/community cases. The trigger for proactive cleaning should be clear. Proactive cleans in relation to CDI activity should always utilize a sporicidal agent.

10. The NHS has done an excellent job of decluttering inpatient areas at the SCG site. This decluttering should be maintained permanently and the level of clutter audited regularly.

11. Audits of housekeeping practice should continue, using a suitable environmental marker. Audits should be carried out using a standard checklist and all audit results should be documented and retained. Audit results should be fed back to housekeeping staff as part of ongoing professional development, as well as to senior administration.

Antibiotic Utilization

1. The NHS has taken important steps toward establishing an antibiotic stewardship program. The program shows immense promise and needs to be adequately resourced in order to accomplish its goals. The sole antibiotic stewardship

pharmacist should be dedicated to the program and not be asked to do general pharmacy tasks.

2. Information technology support for the antibiotic stewardship program is urgently needed to allow for necessary data and report generation.

3. Clinical pharmacist presence should be increased on all clinical units, if possible.

Communication

1. Each inpatient unit, and the emergency department if applicable, should receive monthly unit-specific reports of rates of MRSA, VRE, CDI and hand hygiene compliance. The report should be provided directly to the unit manager, and reflect both current and recent past rates.

2. The IPAC team should strive to meet face-to-face at least every 2 weeks in order to maximize sharing of information and increase team cohesiveness.

3. The NHS should strive to use one spokesperson when interacting with the media in an outbreak situation, in order to maintain consistent messaging and to increase public confidence.

4. The NHS is strongly encouraged to continue reaching out to regional partners on a regular basis, including the Central South Infection Control Network, Niagara Regional Public Health and peer hospitals.

Laboratory Support

1. PCR testing for CDI is highly sensitive and repeat testing is not required once a negative result has been obtained.

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Background

The NHS is a multisite health organization comprising 7 sites and approximately 725 beds. Three sites (St. Catharine's General (SCG), Greater Niagara General (GNG), Welland) are large community hospitals. Three sites (Douglas Memorial, Port Colborne, Niagara on the Lake) are small community hospitals. The Ontario Street site is fully ambulatory care. The NHS serves a regional population of 434,000. Between the 7 sites, the NHS provides a broad range of medical and surgical services. Specifically, the SCG site provides the following: general internal medicine, cardiology, respiratory, gastroenterology, a level 3 intensive care unit, general surgery, orthopaedics, urology, plastics, vascular, gynecology, paediatrics and obstetrics. SCG also supports the regional oncology program. Approximately 10% of the beds at SCG are occupied by ALC patients at any given time.

Patient transfers between sites are routine due to the varying services offered at each site. A new SCG site is due to open in 2013.

The NHS reports both the number of nosocomial infections due to *C. difficile* and the rate of CDI on its public website on a monthly basis. The NHS has not included any IPAC indicators in its Quality Improvement Plan (QIP). The NHS IPAC Committee has developed a strategic plan that includes a large number of process indicators; however, rates of CDI and other antibiotic resistant organisms are not included as indicators.

Epidemiologic Summary of the CDI Outbreak

At the time of the ICRT visit, 3 NHS sites had declared CDI outbreaks: SCG, GNG and Welland. At the SCG site, the number of nosocomial cases of CDI was 5, 3 and 7 for the months of February, March and April 2011 respectively. In May of 2011, the number of nosocomial cases of CDI jumped to 24 at the SCG site. To the date of the ICRT visit, the number of reported nosocomial CDI cases at the SCG site for the month of June 2011 was 18. Strain typing had been requested which to date has indicated NAP1/B27.

Process of the ICRT

Information regarding the events of the outbreak, including epidemiology, outbreak measures, hospital policies and the hospital organizational structure were provided to the ICRT on June 27th and prior to the visit. On June 29, 2011 a full-day ICRT visit to the SCG site of the NHS occurred. The site visit included interviews with senior management, frontline managers, the infection prevention and control team, and other key staff, in addition to a tour of the facility. During the interviews, informants shared pertinent information related to measures instituted to control the CDI outbreak. A number of preliminary recommendations, based on the provided information, were given verbally to the NHS at the end of the day.

PIDAC Best Practice Documents used to assess practice at the Niagara Health System:

- *Best Practices for Infection Prevention and Control Programs in Ontario in All Health Care Settings (September 2008)*
- *Best Practices for Hand Hygiene in All Health Care Settings (January 2009)*
- *Best Practice for the Management of Clostridium difficile in All Health Care Settings (January 2009)*
- *Best Practices for Surveillance of Health Care Associated Infections in Patient and Resident Populations (June 2008)*
- *Best Practices for Environmental Cleaning for Prevention and Control of Infections (December 2009)*

ICRT Findings

Infection Prevention and Control Program

The PIDAC *Best Practices for Infection Prevention and Control Programs in Ontario in All Health Care Settings* recommends "*Each facility's infection prevention and control program should have a physician with an interest and training in infection prevention and control to support and play a leadership role in the IPAC program.*"

This document identifies the value of IPAC programs and states that *"the responsibility for the infection prevention and control program in the health care setting lies primarily with senior administration of the organization".*

In addition the document states, *"The ICPs should have direct access to the Senior Management individual who is accountable for the organization's program and who can facilitate the actions required."*

NHS currently has 2.6 FTE infection control professionals (ICPs) at the SCG site covering 212 beds, including 23 intensive care beds; 1.5 FTE ICPs at the GNG site covering 212 beds, including 8 intensive care beds; and 1.5 FTE ICPs at the Welland site covering 188 beds, including 8 intensive care beds. This level of staffing should be adequate. All ICPs have obtained their Certification in Infection Control (CIC).

The IPAC program at NHS has a 0.4 FTE manager, who is also responsible for the laboratory program, and a 0.7 FTE administrative assistant. Given the size of the NHS and the number of sites, a 0.4 FTE manager would not have the time to provide the necessary support and leadership to the IPAC team in addition to fulfilling all of the required administrative managerial duties. While the current manager has done an admirable job in the face of an overwhelming workload, full time consistent leadership is essential to the

proper functioning of an IPAC program. The individual filling the IPAC manager role should have experience in infection prevention and control and have obtained his/her CIC.

The NHS is to be commended for striving to provide physician support for the IPAC program; however, 2 days per month of physician time, one day of which is dedicated to the Infection Prevention and Control Committee, is not sufficient to support a program as large as the NHS. The ICRT understands that recruitment is underway for an infectious diseases specialist and certainly this individual may also have training in infection control. The ICRT cautions NHS not to assume that an infectious disease specialist has knowledge of infection control, or to assume that a specialist will have sufficient time to properly support the program. Any physician with an interest and training in hospital epidemiology, microbiology, and infection prevention and control can fill this role. If possible, dedicated funding to support at least a 0.5 FTE infection control physician, with a strong preference to a full FTE, should be provided.

The IPAC manager currently reports to an administrative director who reports to the vice-president Patient Services (GNG site), who in turn meets regularly with the hospital CEO. The VP does not have any responsibility for clinical programs. This structure establishes a number of reporting levels that could hinder the ability to quickly and reliably transfer important information, as well as ensure that IPAC needs are being met in terms of planning and program/project support. A more direct reporting relationship with senior administration, preferably at the VP level and to an individual who has a clinical portfolio spanning all seven NHS sites, is recommended.

The NHS has recently implemented a Quality Improvement Plan (QIP), and had developed a specific IPAC strategic plan (2009). The QIP does not contain any infection control indicators. The IPAC strategic plan does not contain any indicators that are directly linked to and reflect rates of antibiotic resistant organisms (AROs) or hand hygiene. The strategic plan does include tracking of audit results for such things as compliance with routine practices and additional precautions. Quality improvement plans with clear targets help in setting organizational goals and ensuring these are met. Setting targets that are reflective of outcomes provides clarity as to whether goals are actually being met. As such, it is recommended that both the QIP and the IPAC strategic plan incorporate outcome indicators such as rates of AROs and hand hygiene compliance.

The ICPs at NHS currently carry out surveillance for methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE) and CDI. In terms of CDI, standard Ministry of Health and Long-Term Care (MoHLTC) case definitions are being used. The ICRT found no concerns regarding attribution of CDI cases as being nosocomial or community-acquired; however, there appeared to be some confusion regarding case counting in terms of date of attribution of a case. Case counting should always be done based upon symptom onset only, and this is reflected in the MoHLTC guidelines. There also appeared to be some confusion between public health and the hospital regarding application of MoHLTC outbreak definitions. Finally, in house line lists used for the CDI outbreak are maintained in the format that makes it difficult to organize and analyze the data. Community cases or cases attributed to other health care facilities are not entered on the same spreadsheet with nosocomial cases, making it difficult to assess over burden of disease.

Outside of an outbreak situation, ongoing daily surveillance for concerning trends in relation to nosocomial activity should be carried out. Trends should be monitored on a unit-specific basis as well as on a site specific and facility wide basis i.e. an increase in the number of nosocomial cases on a unit, at a specific site or across all of NHS should trigger an investigation and potential action regardless of whether an outbreak has been or is about to be declared. As discussed below, regular and clear communication between IPAC staff is imperative to accomplish this. A proactive approach to avoiding outbreaks is strongly suggested.

Outbreaks are frequently triggered by a high isolation burden on a given unit or within a facility, regardless of whether those isolations are a result of nosocomial activity or are community-based. In utilizing a proactive and risk based approach to outbreak avoidance, isolation burden should be assessed on a daily basis and preventive measures such as enhanced cleaning or increased practice audits put into place.

Surveillance data is collected and recorded manually by the ICPs on a daily basis. There are no specific surveillance forms to collect the data. Cases are then entered into the Infection Control and Outbreak Administrator (ICOA) surveillance software that has the ability to generate line lists and epi-curves. Currently, only the IPAC manager utilizes ICOA for data analysis and generation of reports on as-needed basis. Each ICP should be empowered to carry out data analysis and report generation for their clinical units.

Weekend on site presence of IPAC staff was recently implemented at NHS. All frontline staff should be empowered to initiate isolation precautions and it is not necessary that IPAC staff be available in person to evaluate these on weekends. Any IPAC issues arising on weekends or holidays can be effectively dealt with by an on-call system. Weekend shifts leave IPAC short staffed during busy weekdays.

The NHS largely operates on a hospitalist system, with very few community physicians having admitting privileges. Communication among physicians is good and there is currently a strong physician chief of staff who supports infection control. The Medical Advisory Committee (MAC) is engaged in outbreak management activities and does include IPAC issues on its standing agenda; however, the MAC does not receive regular reports of rates of antibiotic-resistant organisms or hand hygiene.

Recommendations

1. The position of manager of IPAC should be one full-time equivalent with responsibilities dedicated solely to IPAC. This person should also have front line infection prevention and control experience and have obtained his/her Certification in Infection Control (CIC).

2. Physician support for IPAC should be increased to a minimum of 0.5FTE with 1FTE strongly preferred. This physician should have skills and training in surveillance and epidemiology; microbiology, infectious diseases and infection prevention and control including outbreak management.

3. IPAC should report to one person in senior administration who has corporate responsibility across all NHS sites and who has responsibility for clinical services. Ideally and if possible, this person should also be responsible for patient safety.

4. The NHS should review and redefine the indicators used in its Quality Improvement Plan and in its IPAC Strategic Plan. Indicators should reflect outcomes in addition to process, and should include tangible targets such as rates of CDI and hand hygiene.

5. When recording nosocomial cases of CDI, case counting and attribution should be done based upon symptom onset only.

6. The NHS should work together with Niagara Region Public Health to ensure clarity and mutual understanding of outbreak definitions for CDI.

7. The NHS infection control professionals should be empowered to utilize the Infection Control and Outbreak Administrator (ICOA) software system to analyze data and generate relevant reports. Currently this responsibility rests solely with the IPAC manager.

8. The NHS IPAC program should consider implementing the use of organism-specific surveillance forms or some other similar means for documenting nosocomial cases.

9. The process of creation, maintenance and use of outbreak line lists should be reviewed, to ensure that data are easy to group and analyze. Community cases or cases attributed to other health care facilities should be recorded on the same line list with nosocomial cases.

10. Ongoing maintenance of the line list should be assigned to one person on the IPAC team.
11. Epidemiologic review and analysis of trends in nosocomial activity should be carried out on a daily basis. A site-specific and facility-wide approach, in addition to a unit-specific approach, should be taken when looking for increases in nosocomial activity.

12. Outbreak measures such as enhanced cleaning can be implemented in advance of declaring a formal outbreak and when nosocomial activity is noted to be increasing. This should be considered as part of a proactive approach to outbreak avoidance.

13. The potential role of antibiotic-resistant organism burden and the resultant isolation burden in causing outbreaks, regardless of whether cases are nosocomial or not, should always be considered.

14. Weekend on-site IPAC presence is not required. The NHS should resume its previous weekend and after hours on-call system for IPAC services.

15. The MAC should consider adding a regular update of rates of antibiotic-resistant organisms and hand hygiene to its agenda.

Outbreak Management/Clinical Practice

PIDAC's Best Practices Document for the Management of Clostridium difficile in All Health Care Settings recommends several control measures for *C.difficile*, including: initiation of contact precautions for any patient who is considered to be at risk for *C. difficile* at the onset of symptoms; meticulous hand hygiene; environmental cleaning; appropriate treatment; and education.

At the time of the ICRT visit, the NHS had taken a number of important steps in managing the outbreak. Public Health was actively involved with the hospital, the Central South Infection Control Network had been engaged, enhanced housekeeping had been put into place, and unit aides had been engaged on the high risk units, among other things.

As is the case for many Ontario hospitals, the NHS is frequently over census and therefore has issues of overcrowding and overstretched staff. In addition, most sites at the NHS have a chronically high isolation burden, due to high regional rates of antibiotic-resistant organisms. There are no hand hygiene sinks present in many clinical areas and certain facilities do not have patient bathrooms in every room. The ICRT acknowledges that these factors create a challenging patient care environment. Good IPAC practice remains imperative to prevent the spread of hospital-acquired infections such as CDI.

The ICRT understands that at times the NHS would cohort suspect and confirmed CDI patients together. This practice should be discontinued immediately as CDI cannot be diagnosed symptomatically and *C. difficile* may be easily transmitted between undiagnosed diarrheal cohorted patients. The ICRT appreciates that due to a high isolation burden and a shortage of single room accommodation, isolated patients may occasionally need to be cohorted together. In carrying out any such cohorting, a risk based approach should be used as follows

- First choice: patients with confirmed VRE
- Second choice: patients with confirmed MRSA of the same strain
- Last choice: patients with confirmed CDI; this should be avoided as re-infection can occur.

Prior to declaration of the outbreak, it appears that transfer of both patients and patient care equipment between units was common. Increased movement of patients with actual or possible CDI increases the risk of spreading *C. difficile* and its spores, through environmental contamination and unwashed hands. During the outbreak, these transfers were minimized and this practice should be continued as part of outbreak management and prevention.

Although there were few opportunities for observation of adherence to additional precautions during the ICRT visit, during the opportunities that were witnessed there were no significant breaches of practice. One small point that was noted is that gowns need to fully tied at the back rather than left open. In addition, during the visit used meal trays were observed to be stored in dirty utility rooms pending pickup. This is good practice as meal trays should never be left in common areas or on isolation carts.

At the time of the ICRT visit, the NHS had instituted a number of outbreak measures that the ICRT feels can be discontinued. The presence of beverages and water in outbreak areas do not pose an outbreak risk. However, food or meals should never be consumed in patient care areas, regardless of outbreak status. Similarly, plants and flowers in patient rooms do not pose an outbreak risk, as long as they do not enter common areas like the nursing station and are removed/discarded when the patient is discharged.

During the outbreak, a practice of daily senior administration walkabouts on the affected units was implemented. This helps to boost staff morale and provides a venue for frontline staff to discuss issues and concerns they may have. It also solidifies senior administration engagement in management of the outbreak.

Sustainability of both outbreak measures and other future outbreak prevention and early outbreak detection measures should be ensured. To that end, the NHS is encouraged to develop and implement a sustainability plan once the outbreak is over. This can be done as part of an outbreak/incident management debrief.

Recommendations

1. Suspect and confirmed CDI patients should never be cohorted together.

2. If cohorting of isolated patients becomes necessary, the first choice for cohorting should be patients with confirmed VRE, the second choice patients with confirmed MRSA of the same strain, and the last choice cohorting of patients with confirmed CDI. Cohorting of patients with confirmed CDI should be avoided.

3. The presence of beverages and water in clinical areas is acceptable. Food or meals should never be stored in or consumed by staff in patient care areas, except in designated location such as the staff lounge. Visitors should not consume food outside of the patient room and preferably avoid eating at all on clinical units.

4. The presence of plants and flowers in patient rooms is acceptable, a long as they are taken home or discarded when the patient leaves. Plants and flowers should never be stored or displayed in common areas such as the nursing station or patient lounge.

5. The SCG site of the NHS has successfully limited movement of both patients and equipment between units as part of outbreak management. This strategy should be maintained long term.

6. NHS senior administration initiated a process of daily walking rounds to affected clinical areas during the outbreak. This visual presence helps to maintain staff morale and to ensure that staff issues and concerns can be brought forward. This practice should be maintained at a frequency determined by the facility..

7. The NHS is encouraged to develop a sustainability plan for all measures to be implemented once the outbreak is declared over.

Hand Hygiene

Best Practices for Hand Hygiene in all Healthcare Settings (PIDAC January 2009) makes the following recommendation:
"Routinely monitor hand hygiene compliance with the provision of timely feedback by using a reliable, validated observer audit tool and training process."

The NHS has alcohol-based hand rub (ABHR) installed throughout the facility. It is also readily available at the point of care. On occasion, access to ABHR dispensers was obstructed by furniture or patient care equipment and this should be remedied. All ABHR dispensers appeared to be full and functioning. It was noted that some hand hygiene signage was not visible; signage should be visible and strategically located especially in areas where there is a lack of dedicated hand hygiene sinks.
Security staff were being utilized to remind visitors to wash their hands upon entry and exit of key areas like the emergency department. Use of ABHR is critical in a facility that has few to no dedicated hand hygiene sinks, and remains a useful mode of performing hand hygiene for outbreaks of CDI.

Auditing of hand hygiene compliance, as well as compliance with use of personal protective equipment, is carried out by unit-based charge nurses, by modified workers and by IPAC staff. Auditing is done in real time and this practice is encouraged. The ICRT supports the goal of attaining greater than 80% staff compliance for hand hygiene. It is unclear whether the auditing processes used by each of these groups have been validated and that inter-rater reliability has been determined. Further, in order to be meaningful, a sufficient number of observations of hand hygiene must be made; at minimum, 50 observations per unit per month should be made.

Hand hygiene compliance data are compiled on a quarterly basis by the IPAC manager, and reported back through quality councils. Hand hygiene data are most meaningful to frontline staff when reported in as close to real time as possible; therefore, it is recommended that hand hygiene compliance reports be generated on a monthly basis and be provided directly to clinical managers as well as senior administration.

Recommendations

1. Visitors to the hospital should be encouraged to clean their hands. The method for communicating this should be based on knowledge of the community and type of communication that has been successful in the past (i.e verbal, visual, interactive). .

2. Results of hand hygiene and personal protective equipment use audits should be validated to ensure inter-rater reliability between the various groups carrying out the auditing.

3. All groups carrying out hand hygiene and personal protective equipment audits should use the same audit tool and be trained in a standardized manner to ensure they are all following the same processes.

4. The NHS should ensure that a sufficient number of observations are being made on each inpatient unit for hand hygiene and personal protective equipment audits to ensure that results are reliable and valid.

Environmental Services

> The PIDAC *Best Practices Document for the Management of Clostridium difficile in All Health Care Settings* recommends *"all horizontal surfaces in the room and all items within reach of patient with suspected or confirmed CDAD should be cleaned twice daily with a hospital-grade disinfectant…. Particular attention should be paid to high risk or high touch surfaces…and consideration of the use of new disinfectant products with in vitro evidence of sporicidal activity."*

At the time of the ICRT visit, the NHS was using Virox™ liquid to clean all patient rooms twice daily, and Virox Rescue™ gel was being used to clean bathroom fixtures. In addition, additional housekeeping resources had been brought in to accommodate the increased cleaningfrequency. Housekeepers had been dedicated to the outbreak units as well as to the emergency department; normally, the ICRT understood that housekeepers would float between units and not be dedicated to a given unit. Housekeeping services are contracted out and are not a corporate in-house service. In addition, unit aides were brought in to assist with environmental cleaning, among other things, on high risk units. These aides, in addition to increased and dedicated housekeeping staff, play a fundamental role in maintaining environmental cleanliness and both of these enhanced resources should be maintained over the long term. Unit aides need to be appropriately trained regarding cleaning of patient equipment.

Cleaning of multi-use patient equipment should not be solely a nursing responsibility. Nursing and housekeeping should develop a process to ensure shared equipment is cleaned consistently between uses.

Nighttime housekeeping coverage at the SCG site consists of 2 housekeepers for the entire facility; one of these is meant to be dedicated to the emergency department but that person is often pulled away to deal with cleaning issues on the inpatient units. Given the high volume of patient visits to the SCG emergency department and the subsequent high risk of environmental contamination due to high patient turnover, it is important to ensure that there is dedicated housekeeping staff for the emergency department 24 hours per day. Staffing should be increased by 1 FTE for the night shift at SCG.

C. difficile is a particularly difficult hospital-acquired infection to deal with as *C. difficile* spores readily contaminate the patient environment and are very difficult to remove and destroy. In managing a CDI outbreak, particularly one of the magnitude experienced by the NHS, it is imperative to use a sporicidal agent broadly as it can be assumed in a facility-wide outbreak that gross spore contamination has occurred. Two currently available

agents have sporicidal properties: accelerated hydrogen peroxide at higher concentrations and in specific formulations and hypochlorite based solutions, the most common being bleach. The NHS is already using accelerated hydrogen peroxide so the ICRT recommends that the hospital use the sporicidal product Virox Rescue™ liquid to carry out a terminal clean of all inpatient areas (not just outbreak areas) at the SCG. GNG and Welland sites effective immediately, in order to reduce the spore burden. Virox Rescue™ liquid use should continue on an ongoing basis in rooms of suspected or confirmed CDI patients. Virox Rescue™ gel use should continue for bathroom fixtures in rooms of suspected or confirmed CDI patients; however, Virox Rescue™ liquid should be used on all other high touch surfaces of the patient bathroom. Twice daily cleaning should be maintained on units with suspected or confirmed CDI cases, as well as long term on high risk units such as medicine. Once the outbreak is over, consideration can be given to pulling back use of Rescue (liquid and gel) only to rooms housing confirmed CDI patients. Regular Virox™ should not be used in rooms of confirmed CDI patients.

Regular Virox™ liquid is generally supplied as a concentrate and requires dilution. Accreditation standards (12.7) stipulate that dilutions should be verified on a daily basis.

Wall washing is not required as part of effective environmental cleaning. Walls should only be washed when visibly soiled or at high touch points such as handrails and light switches. Washing walls takes up a large amount of time that should be otherwise dedicated to effective cleaning of high touch surfaces and bathrooms.

Given that environmental contamination is an important underlying cause of nosocomial transmission of antibiotic resistant organisms, and that environmental contamination can occur whenever there is an isolation burden on a given unit or in a facility, an important concept to keep in mind is that housekeeping and environmental cleaning should be proactive rather than reactive to maximize its benefit in preventing outbreaks. One way to utilize housekeeping proactively is to determine a threshold of isolation burden, on a given unit or across a facility, that triggers a proactive pre-outbreak intensive cleaning effort. As an example, a threshold could be the percentage of isolated patients on a given unit or in a facility, or a certain level of nosocomial activity that does not yet meet a threshold definition. The NHS is strongly encouraged to develop a guideline for proactive environmental cleaning.

As part of outbreak management, the NHS has done an excellent job of decluttering inpatient areas: removing patient care equipment from hallways, removing extra patient care supplies from patient rooms. Clutter in inpatient areas makes housekeeping difficult and serves as a vector for the spread of spores. The decluttering should be maintained and audited regularly.

The NHS has implemented a system of auditing of housekeeping practice, using a marker system to indicate whether an area has been properly cleaned. This is a positive step and should continue. All audits should be carried out using a standard checklist and all audit results should be documented on an ongoing basis. All audit results should be reported back to housekeeping staff as part of quality improvement as well as to senior administration.

During the ICRT visit, housekeeping staff exhibited good cleaning techniques and applied excellent infection control practices. Staff were also able to clearly articulate cleaning principles going from least contaminated to most contaminated using different cloths. It was noted that several hospital disinfectant wipes containers were left open. This will allow the wipes to dry, rendering them ineffective in killing microorganisms.

At the SCG site, there is clear separation of clean and dirty utility rooms, and these rooms were being used appropriately.

Recommendations

1. Starting immediately, all inpatient units in all NHS sites affected by CDI should undergo a full terminal clean with a sporicidal agent. This terminal clean should include all common areas and the nursing units. Sufficient resources should be dedicated to this process to ensure the clean is completed quickly
2. A sporicidal cleaning agent should be used throughout the rooms of patients with suspected or confirmed CDI, and not used solely to clean the patient bathroom. Once the outbreak is over, consideration can be given to using a sporicidal agent only in rooms of confirmed CDI patients.

3. A sporicidal agent should always be used in the bathrooms in the emergency department, regardless of outbreak status.

4. Dilutions of accelerated hydrogen peroxide should be validated regularly, in accordance with accreditation standard 12.7.

5. Increases in housekeeping resources put into place during the outbreak should be maintained permanently so that high risk units can maintain twice daily cleaning anddedicated housekeeping staff.

6. Additional unit aides put into place on the medicine units during the outbreak should be retained permanently.

7. One additional FTE housekeeper should be recruited for the night shift at the SCG site, so that the emergency department can retain a dedicated nighttime housekeeper and to ensure that there are sufficient resources to address environmental cleaning issues overnight.

8. Wall washing is not indicated as part of routine or terminal cleaning. Walls should only be cleaned when visibly soiled or when included as a high touch surface.

9. The NHS should develop a guideline for proactive environmental cleaning of units or a site with a high isolation burden of MRSA, VRE and/or CDI, regardless of whether that burden is due to nosocomial activity or previously positive/community cases. The trigger for proactive cleaning should be clear. Proactive cleans in relation to CDI activity should always utilize a sporicidal agent.

10. The NHS has done an excellent job of decluttering inpatient areas at the SCG site. This decluttering should be maintained permanently and the level of clutter audited regularly.

11. Audits of housekeeping practice should continue, using a suitable environmental marker. Audits should be carried out using a standard checklist and all audit results should be documented and retained. Audit results should be fed back to housekeeping staff as part of ongoing professional development, as well as to senior administration.

Antibiotic Utilization

The PIDAC *Best Practices for Infection Prevention and Control of Resistant Staphylococci and Enterococci* identifies antibiotic use as a risk for the development and transmission of antibiotic resistant organisms. The document recommends *"Policies and procedures should be implemented to promote judicious antibiotic use, in order to limit the spread of antibiotic resistant microorganisms."* The document also recommends *"Health care setting should institute formulary control of antibiotics and should conduct regular reviews of antibiotic utilization."*

Control of Clostridium difficile infection (CDI) Outbreaks in Hospitals: A Guide for Hospital and Health Unit Staff (MoHLTC December 2009) states: "Antibiotic management is an important component of outbreak management for *C. difficile*. Antimicrobial stewardship involves limiting inappropriate use, optimizing antimicrobial selection, dosing, route, and duration of therapy in an effort to maximize clinical cure or prevention of infection while limiting the unintended consequences, such as the emergence of resistance, adverse drug events, and costs."

The NHS does have a drug formulary system; however, non-formulary medications can be brought in on request. There are few limits or controls on antibiotic use. Antibiotics with the highest usage profiles include quinolones and third generation cephalosporins. Physician order sets do exist but up to date care pathways for common infections either do not exist or are outdated. There are no standard surgical site infection prophylaxis guidelines at the NHS and post-operative antibiotic use is high.

A solid vision and plan for an antibiotic stewardship program (ASP) is in place at the NHS. The first goal of the ASP is to develop up-to-date antimicrobial guidelines.An antibiotic stewardship pharmacist has been hired very recently; however, due to staffing shortages she is frequently pulled back to do regular pharmacy duties. In addition, she does not have the necessary information technology supports to generate essential reports on antibiotic utilization and spends an inordinate amount of her time manually generating data.

In order to have an effective and functional ASP, the appropriate IT supports are required for data and report generation. In addition, the current ASP pharmacist must remain dedicated to the program and not be sidelined by other pharmacy duties. Further, clinical pharmacist presence is key to an ASP and the NHS should explore the possibility of increasing this presence on all clinical units, in tandem with increasing pharmacy technician

responsibility for the technical aspects of pharmacy duties such as order entry and drug dispensing.

Recommendations

1. The NHS has taken important steps toward establishing an antibiotic stewardship program. The program shows immense promise and needs to be adequately resourced in order to accomplish its goals. The sole antibiotic stewardship pharmacist should be dedicated to the program and not be asked to do general pharmacy tasks.

2. Information technology support for the antibiotic stewardship program is urgently needed to allow for necessary data and report generation.

3. Clinical pharmacist presence should be increased on all clinical units, if possible.

Communication

> *Best Practices for Surveillance of Healthcare-Associated Infections in Patient and Resident Populations (PIDAC June 2008)* recommends: "Communication of surveillance data should take place on an ongoing, systematic basis and be targeted to those with the ability to change infection control practice. All surveillance reports should be clear and easy to follow."

Data regarding antibiotic resistant organisms are provided to the clinical managers but it appears that this happens only quarterly and as a presentation at a larger group quality meeting. Regular feedback of data at the unit level empowers frontline staff to engage in quality improvement initiatives. The NHS is encouraged to develop a system of unit-specific reporting of rates of methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE), CDI and hand hygiene compliance, through which data are reported on a monthly basis and in a manner that is simple to understand.

The entire IPAC team meets together face-to-face only once per month. Additional weekly meetings occur by either teleconference or videoconference. Most communication between the ICPs and between the ICPS and the IPAC manager/physician occurs by telephone or email. It was not clear from the ICRT visit how frequently the IPAC manager updates and communicates with the administrative director. The vice presidents of Patient Services meet with senior administration on a weekly basis. Regular and effective communication is essential to the effective functioning of an IPAC program. The ICPs need to be provided with a venue through which they can collectively update one another of issues and concerns across all 7 sites of NHS, and any such issues and concerns need to be communicated to senior administration in a timely manner.

NHS has unfortunately been subject to negative media as a result of the outbreak. In future, NHS is encouraged to maintain the greatest degree of transparency possible and to ensure that one spokesperson is utilized so that messaging remains consistent. NHS has consulted with peer hospitals that have been subject to large CDI outbreaks and this is a very positive step. In addition, ongoing relationships with other regional partners are

extremely useful in obtaining support and advice during outbreaks or in relation to other IPAC issues.

Recommendations

1. Each inpatient unit, and the emergency department if applicable, should receive monthly unit-specific reports of rates of MRSA, VRE, CDI and hand hygiene compliance. The report should be provided directly to the unit manager, and reflect both current and recent past rates.

2. The IPAC team should strive to meet face-to-face at least every 2 weeks in order to maximize sharing of information and increase team cohesiveness.

3. The NHS should strive to use one spokesperson when interacting with the media in an outbreak situation, in order to maintain consistent messaging and to increase public confidence.

4. The NHS is strongly encouraged to continue reaching out to regional partners on a regular basis, including the Central South Infection Control Network, Niagara Regional Public Health and peer hospitals.

Laboratory Support

The NHS changed from an enzyme immunoassay platform to a polymerase chain reaction (PCR) platform for *C. difficile* testing in mid June 2011. PCR has a greater sensitivity (accuracy) for detection of *C. difficile* and the test generally has a faster turnaround time. Because of the greater accuracy of PCR, only one test is needed to rule out CDI, as compared to at least 2 for EIA. In addition, test for cure after treatment of CDI is not required and symptom resolution should be used to guide patient response.

Recommendations

1. PCR testing for CDI is highly sensitive and repeat testing is not required once a negative result has been obtained.

Concluding Remarks

In advance of the ICRT visit, the NHS had taken a number of positive steps to control the current CDI outbreak. Many of these measures need to be sustained over the long term. A number of key recommendations made verbally to the hospital by the ICRT have already been implemented in advance of completion of this report and the NHS is to be commended for this. There is a great deal of commitment from senior administration, physicians and frontline staff to controlling the outbreak and to implementing measures to prevent future similar outbreaks; this is very encouraging.

The ICRT team thanks all participating staff at the NHS for their time, honesty and effort during the site visit. We welcome any questions you may have as you work towards implementing the recommendations found in this report.

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