Impact of Implementation of Evidence-Based Best Practices on Nursing Home Infections

INTRODUCTION

The problem of healthcare-associated infections (HAIs) in nursing homes has been increasingly recognized over the last two decades. More robust literature and development of evidence-based recommendations devoted to nursing home infection control have resulted in the widespread initiation of infection control programs in this setting. Yet limited studies are available to evaluate the effectiveness or level of adoption of specific basic infection control measures to minimize HAIs in nursing homes.

Long-term care facilities must have individualized infection control programs, as mandated by the Centers for Medicare and Medicaid Services’ State Operations Manual and Pennsylvania Act 52 of 2007. In a seven-year study of infection control deficiency citations, Castle et al. found that an average of 15% of all nursing homes in the United States received a deficiency citation for infection control each year between 2000 and 2007. In a 2005 study, the results of a 43-item survey of 37 Michigan nursing homes found significant variability in implementation of infection control methods and guidelines. Strides have been made in infection control research in the nursing home setting; however, the number of deficiency citations for infection control problems and the inconsistencies in the implementation of infection control practices suggest the need for increased emphasis and research focusing on identifying barriers to implementing infection control best practices in nursing homes.

A major focus of the Pennsylvania Patient Safety Authority is to drive targeted research, education, and guidance efforts in infection control and prevention based on the Authority’s analysis of the HAI data reported by Pennsylvania nursing homes through the Authority’s reporting system as required by Pennsylvania Act 52. Authority analysts conducted an outreach project in order to study the impact of various levels of implementation of infection prevention best practices on HAI rates in Pennsylvania nursing homes and to assess patterns of care that could be targeted for improvement. This Authority study specifically sought to determine in which infection prevention domains nursing homes performed well or poorly, in which implementation categories there were differences in the performance of facilities with low or high HAI rates, respectively, and what elements of best practice were most lacking in areas of poor performance.

METHODS

Participants and Data Sources

Study participants were selected from Pennsylvania nursing homes with overall HAI rates at either the high or low end of the performance spectrum. Nursing homes were selected into performance quartiles based on HAI reports submitted to the Authority from March 2010 through May 2010. Selection criteria involved analysis of characteristics of the nursing homes falling into the highest HAI-rate quartiles and those falling into the lowest HAI-rate quartiles of all nursing homes reporting statewide, the distribution of HAIs across all reportable infection types, and the occurrence of HAIs in multiple care areas.

Twenty nursing homes were selected that consistently reported utilization data (resident-days and Foley catheter-days): 10 with rates in the highest HAI quartile (referred to as “H-HAI” nursing homes for the purposes of this article) and 10 with infection rates in the lowest quartile (“L-HAI” nursing homes). Facilities selected for the study ranged from 19- to 453-bed facilities (the median was 142 beds) and included a cross-section of corporate and single-owned facilities providing transitional care, nursing care, rehabilitation, and subacute care. A secondary data review was performed for the three months

ABSTRACT

Reports of inconsistencies in the implementation of evidence-based infection control best practices and the number of deficiency citations for infection control problems in nursing homes indicate the need to identify barriers to the integration of infection control practices in this setting. The Pennsylvania Patient Safety Authority conducted on-site assessment visits to 10 Pennsylvania nursing homes with high healthcare-associated infection (HAI) rates and 10 with low HAI rates. The assessment’s purpose was to study the impact of various levels of implementation of infection prevention best practices on HAI rates and to assess patterns of care that could be targeted for improvement. Authority analysts assessed the implementation of 50 evidence-based infection prevention best practices. Analysis of the aggregate assessment data from the visits demonstrated a relationship between high infection rates and low implementation of best practices. Compared with nursing homes with low infection rates, those with high rates were deficient in one or more of six levels of implementation for 45 of the 50 best practices. The assessments identified multidisciplinary implementation barriers in nursing homes with high HAI rates at the leadership, physician, clinical, and support staff levels and recognized patterns of care that nursing homes could target for improvement. (Pa Patient Saf Advis 2012 Sep;9[3]:89-98.)

Scan this code with your mobile device’s QR reader to access the Authority’s toolkit on this topic.
immediately prior to each assessment visit to determine continued appropriateness for inclusion in the respective high- or low-HAI-rate categories. The study was conducted employing the Authority’s Long-Term Care Best-Practice Assessment Tool, which is based on best-practice strategies selected from current guidelines that have been shown in the research literature to deliver better quality and promote positive outcomes. Data from 8 of the 10 L-HAI facilities was available for analysis. Figure 1 shows that of the 10 nursing homes selected with high HAI rates, 9 had significantly higher rates than the state pooled mean rate (0.742 HAIs per 1,000 resident-days). Further, all eight nursing homes selected with low HAI rates had rates that were significantly lower than the state pooled mean rate.

**Study Design**
The Authority’s Long-Term Care Best-Practice Assessment Tool was designed to assess the structure and function of nursing homes’ infection control programs by measuring the level of implementation of current best practices in seven domains: hand hygiene, environmental, urinary tract infection (UTI), respiratory tract infection (RTI), gastrointestinal (GI) and multidrug-resistant organism (MDRO) infection, skin and soft-tissue infection (SSTI), and outbreaks.

Specific best practices listed in each of the seven domains were based on clearly defined interventions found in the literature and current guidelines for infection categories by which self-assessment could be easily completed and on HAIs that are reportable to the Authority. The tool incorporated a scoring system that identified the level of implementation for each of the 50 best practices. Six secondary implementation categories were used to measure how each of the best practices were integrated into a facility’s infection control program structure and clinical practice functions. The tool can be accessed at [http://patientsafetyauthority.org/EducationalTools/PatientSafetyTools/Pages/home.aspx](http://patientsafetyauthority.org/EducationalTools/PatientSafetyTools/Pages/home.aspx).

The tool’s implementation categories associated with infection control program structure assessed the following:

- Integration of best practices into the facility infection control plan, which is consistent with goals that are updated annually

**Figure 1. Healthcare-Associated Infection (HAI) Rates For Individual Nursing Homes, March 2010 to May 2010**

<table>
<thead>
<tr>
<th>Quartile mean</th>
<th>H-HAI NURSING HOMES</th>
<th>L-HAI NURSING HOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility rate</td>
<td>Lower confidence limit</td>
<td>Upper confidence limit</td>
</tr>
</tbody>
</table>

Note: H-HAI = nursing homes with high rates of HAIs; L-HAI = nursing homes with low rates of HAIs. The state pooled mean rate of 0.742 HAIs per 1,000 resident-days reflects data reported to the Pennsylvania Patient Safety Authority from March 2010 to May 2010.
— Policies and procedures that reflect the facility infection control plan
— Documentation of education provided on infection control goals and policies

The tool’s implementation categories associated with infection control program clinical practice assessed the following:
— Standard documentation methods in use
— Monitoring, documentation, and evaluation of process and outcome measures
— Assigned accountability and follow-up by managers and leaders

Assessment Interviews
Administrative and infection prevention staff from each of the 20 facilities agreed to an on-site consultation to participate in the best-practice assessment. The on-site consultations were conducted from October 2010 through November 2011, beginning with the H-HAI facilities. The authors looked for (and failed to find) evidence that would have suggested differences in rates simply reflected in vigilance around surveillance and reporting. Assessment methods during the on-site visit included a determination of adequate surveillance and reporting practices, a review of the availability of administrative support and resources, and a detailed analysis of the facility’s self-assessment. Assessment tools used included the best-practice survey, record reviews, observational rounds, and staff interviews. Each facility received a written follow-up report summarizing barriers to adherence to best practice for each facility, as well as positive findings and opportunities for improvement.

RESULTS

While both H-HAI and L-HAI nursing homes routinely implemented infection surveillance activities and documented outcome measures, standardized process measurement and evaluation of implementation of specific infection control practices were often not a priority. The results of the study were measured by comparing the differences in the percentage of H-HAI and L-HAI nursing homes showing full implementation of each of the 50 best practices in three levels of analysis: domain assessment, implementation category assessment, and best-practice performance.

Domain Assessment
Overall, the scores for both H-HAI and L-HAI nursing homes were lowest in full implementation of hand hygiene best practices. The highest overall scores for the L-HAI homes were in implementation of SSTI prevention practices; the highest scores for the H-HAI homes were in implementation of GI and MDRO infection prevention practices. Compared with H-HAI nursing homes, L-HAI nursing homes scored better in full implementation of best practices in five of the seven assessment domains (see Figure 2). H-HAI nursing homes scored lower than L-HAI nursing homes in full implementation of best practices for UTI (L-HAI: 83%, H-HAI: 70%), followed by SSTI (L-HAI: 95%, H-HAI: 84%), hand hygiene (L-HAI: 75%, H-HAI: 65%), environmental control (L-HAI: 84%, H-HAI: 76%), and RTI (L-HAI: 85%, H-HAI: 79%). H-HAI nursing homes scored better than L-HAI facilities in implementation of outbreak control practices (L-HAI: 77%, H-HAI: 84%), as well as in the GI and MDRO infection domain (L-HAI: 86%, H-HAI: 88%).

Implementation Category Assessment
Assessment of the six implementation categories found notable differences between H-HAI and L-HAI nursing homes in implementation of best practices (see Tables 1 and 2). Overall, L-HAI nursing homes scored higher in full implementation of best practices in five of the six implementation categories:

1. Integration of best practices into the facility infection control plan, which is consistent with goals that are updated annually (L-HAI: 78%, H-HAI: 57%)
2. Policies and procedures that reflect the facility infection control plan (L-HAI: 90%, H-HAI: 86%)
3. Education provided on infection control goals and policies (L-HAI: 89%, H-HAI: 88%)
4. Standard documentation methods in use (L-HAI: 81%, H-HAI: 70%)
5. Monitoring, documentation, and evaluation of process and outcome measures (L-HAI: 75%, H-HAI: 71%)

H-HAI and L-HAI nursing homes both scored 91% in overall implementation of assigned accountability and follow-up by managers and leaders.

The H-HAI nursing homes scored higher in individual categories for implementation of a plan, goals, education, documentation, monitoring and assigned accountability for outbreak control. H-HAI homes also scored higher in integration of hand hygiene best practices into the facility infection control plan, education for environmental control, monitoring for RTI, and assigned accountability and monitoring for GI and MDRO infection.

There was no difference between the H-HAI and the L-HAI nursing homes in the individual categories of integration of GI and MDRO infection prevention best practices into the facility infection control plan or in implementation of policies and procedures that reflect the facility infection control plan for SSTI and outbreak control. (For an interactive graphic of the scores, see http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/Pages/Home.aspx.)

Best-Practice Performance
This level of analysis identified which specific elements of best practices were most lacking and indicated practices that could be targeted for improvement. Study findings are described here by individual
Figure 2. Difference in Percentages of Full Implementation of Nursing Home Best Practices

Note: L-HAI = Nursing homes with low rates of healthcare-associated Infections; H-HAI = nursing homes with high rates of healthcare-associated infections

domain. Figures associated with each domain demonstrate the percentage of H-HAI nursing homes that scored higher or lower than the L-HAI nursing homes in full implementation of each best practice across all six implementation categories.

UTIs. Compared with L-HAI nursing homes, H-HAI nursing homes scored lower across all six implementation categories in full implementation of each best practice in all six implementation categories. H-HAI nursing homes also scored lower in implementation of standing orders to remove catheters if criteria are not met. H-HAI nursing homes also lacked full implementation of the following categories:

— Education, monitoring, and assigned accountability for the institution of a toileting and hydration program
— Development of policies, procedures, and documentation for a daily review of Foley catheter necessity
— Documentation of use of a Foley securement device and proper positioning of Foley drainage bags
— Policies, education, documentation, and assigned accountability for daily and postincontinence perineal care
— Policies, education, monitoring, and assigned accountability for assuring that a closed, sterile system is in place
— Documentation and monitoring for aseptic Foley insertion and maintenance

Strategic approaches to sustain low UTI rates in the L-HAI nursing homes included oversight by the director of nursing of resident admission assessments of residents with Foley catheters, assigned accountability for catheter removal decisions, monitoring of catheter maintenance, and a written training program for nursing assistants. Additional strategies included use of a bladder scanner to measure bladder volume and use of silver-coated catheters.
A two-tailed statistical test for comparing the proportions of the two groups' compliance rates was run on the percentage of responses of full implementation for the H-HAI group against the L-HAI group. The resultant z-score was -4.86, indicating that the difference between the H-HAI group and L-HAI group was significant at the p value < 0.001.

**STTIs.** The most notable difference between the H-HAI and the L-HAI nursing homes in the SSTI prevention domain was found in the H-HAI nursing homes’ lack of incorporation of all eight SSTI best practices into the facility infection control plan and goals, as well as a lack of nutrition and hydration protocols in all six implementation categories. H-HAI nursing homes also scored lower in implementation of policies, documentation, and monitoring of daily skin inspection procedures, as well as in education, documentation, monitoring, and accountability for reassessing pressure ulcer risk. H-HAI nursing homes also lacked full implementation of policies for promoting wound healing and in education and monitoring for pressure-minimizing protocols. (See Figure 4.) (Figures 4 through 9 are available exclusively with this article online at http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2012/Sep;9(3)/Pages/home.aspx.)

Strategies to sustain low SSTI rates in the L-HAI nursing homes included highly structured skin rounds—including a specific day and time for rounds completed by a wound specialist and a nurse—a dedicated skin care nurse or consultant, monthly physician specialist rounds, and oversight by nursing administration. Other factors contributing to low SSTI rates included high levels of nurse training and education in SSTI prevention, as well as the use of infection control protocols that were specifically designed for SSTIs.

### Table 1. Average % of Full Implementation of Combined Best Practices for Nursing Homes with Low Rates of Healthcare-Associated Infections, by Domain and Implementation Category

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>STRUCTURE CATEGORIES</th>
<th>CLINICAL PRACTICE CATEGORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plan</td>
<td>Policy</td>
</tr>
<tr>
<td>Hand hygiene</td>
<td>73%</td>
<td>84%</td>
</tr>
<tr>
<td>Environmental control</td>
<td>88%</td>
<td>98%</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>75%</td>
<td>86%</td>
</tr>
<tr>
<td>Respiratory tract infection</td>
<td>79%</td>
<td>91%</td>
</tr>
<tr>
<td>Gastrointestinal and multidrug-resistant organism infection</td>
<td>78%</td>
<td>91%</td>
</tr>
<tr>
<td>Skin and soft-tissue infection</td>
<td>84%</td>
<td>95%</td>
</tr>
<tr>
<td>Outbreak control</td>
<td>71%</td>
<td>84%</td>
</tr>
</tbody>
</table>

Note: Shaded cells reflect a higher level of implementation when compared with nursing homes with high rates of healthcare-associated infections (H-HAI). Bolded percentages indicate no difference when compared with H-HAI nursing homes.

### Table 2. Average % of Full Implementation of Combined Best Practices for Nursing Homes with High Rates of Healthcare-Associated Infections, by Domain and Implementation Category

<table>
<thead>
<tr>
<th>DOMAIN</th>
<th>STRUCTURE CATEGORIES</th>
<th>CLINICAL PRACTICE CATEGORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Plan</td>
<td>Policy</td>
</tr>
<tr>
<td>Hand hygiene</td>
<td>76%</td>
<td>77%</td>
</tr>
<tr>
<td>Environmental control</td>
<td>74%</td>
<td>96%</td>
</tr>
<tr>
<td>Urinary tract infection</td>
<td>32%</td>
<td>79%</td>
</tr>
<tr>
<td>Respiratory tract infection</td>
<td>52%</td>
<td>85%</td>
</tr>
<tr>
<td>Gastrointestinal and multidrug-resistant organism infection</td>
<td>78%</td>
<td>90%</td>
</tr>
<tr>
<td>Skin and soft-tissue infection</td>
<td>30%</td>
<td>95%</td>
</tr>
<tr>
<td>Outbreak control</td>
<td>86%</td>
<td>84%</td>
</tr>
</tbody>
</table>

Note: Shaded cells reflect a higher level of implementation when compared with nursing homes with low rates of healthcare-associated infections (L-HAI). Bolded percentages indicate no difference when compared with L-HAI nursing homes.
rates were implementation of a novel feedback communication loop with written receipts for delivery of messages, a rotating mattress replacement program, a low incidence of bedbound residents, and a high nurse-to-resident ratio.

A two-tailed statistical test for comparing the proportions of the two groups’ compliance rates was run on the percentage of responses of full implementation for the H-HAI group against the L-HAI group. The resultant z-score was -5.23, indicating that the difference between the H-HAI group and L-HAI group was significant at the p value < 0.001.

Hand hygiene. Across all six implementation categories, H-HAI nursing homes were most lacking in implementation of an individualized program to monitor hand hygiene compliance. H-HAI nursing homes also scored lower in documentation and process monitoring for all of the hand hygiene best practices, including the following:

- Clinician’s demonstration of understanding hand hygiene rationale, indications, and methods
— Availability of alcohol-based handrubs and gloves at the point of care
— Glove changes in between residents and in between clean and dirty activities on the same resident
— Handwashing with soap and water when hands are visibly soiled and before and after resident care
— Residents’ and families’ knowledge about hand hygiene

H-HAI nursing homes also lacked full implementation of staff education on the glove changing process and developing facility infection control goals and policies to help residents and family members become knowledgeable about hand hygiene. H-HAI nursing homes also failed to assign accountability for clinical staff understanding about hand hygiene. (See Figure 5 online.)

Analysis of interviews with infection prevention representatives from the L-HAI nursing homes found that successful implementation of hand hygiene best practices was associated with the use of hand hygiene competency checklists, involvement of administrative staff with hands-on monitoring and interventions in hand hygiene practices across all disciplines on a daily basis, and the availability of hand sanitizers at each point of care and in critical access areas. Also helpful were hand hygiene reminder paycheck inserts, annual hand-hygiene-specific inservices, and the use of individual, personal-size hand sanitizers.

A two-tailed statistical test for comparing the proportions of the two groups’ compliance rates was run on the percentage of responses of full implementation for the H-HAI group against the L-HAI group. The resultant z-score was -2.34, indicating that the difference between the H-HAI group and L-HAI group was significant at the p value < 0.01.

**Environmental control.** The most notable difference between L-HAI and H-HAI nursing homes’ performance was the H-HAI nursing homes’ lack of standard documentation for best practices for glove use and for handling, cleaning, and disinfecting reusable equipment, surfaces, and linens, as well as lower scores on incorporation of all of these environmental control best practices (except for glove use) into the facility’s infection control plan and goals. Additionally, H-HAI nursing homes showed opportunities for improvement in policy development for linen handling and environmental surface disinfection, as well as in monitoring of glove use, equipment disinfection, and linen disposal. H-HAI nursing homes also failed to assign accountability to assure proper cleaning of environmental surfaces. (See Figure 6 online.)

L-HAI nursing homes described several strategies for sustained environmental infection control, including use of a pre-determined daily cleaning schedule and cleaning checklists, cleaning frequency increases based on clinical input, a structured clean/dirty workflow process in laundry areas, and staff access to sufficient resources.

A two-tailed statistical test for comparing the proportions of the two groups’ compliance rates was run on the percentage of responses of full implementation for the H-HAI group against the L-HAI group. The resultant z-score was -2.34, indicating that the difference between the H-HAI group and L-HAI group was significant at the p value < 0.01.

**RTI (lower respiratory tract infection [LRTI] and influenza-like illness [ILI]).** The most notable difference between the H-HAI nursing homes’ and L-HAI nursing homes’ performances in the LRTI and ILI domains was the H-HAI nursing homes’ lack of institution of a standardized oral care and aspiration prevention program across all six implementation categories. H-HAI nursing homes also lacked implementation of the following practices:
— Integration of a respiratory etiquette program into the facility infection control plan, goals, and policies
— Development of policies and an education program for a standing order immunization process
— Provision of an education and infection control plan and policies for use of single-dose aerosolized medications
— Documentation and education with regard to separation of ill employees from residents
— Development of policies and a written plan to monitor, assign accountability for, and document cleaning and disinfection of respiratory equipment
— Establishment of a plan and policies to assure education, documentation, and assigned accountability for use of sterile catheters and techniques for suctioning.

However, H-HAI nursing homes did score higher than L-HAI facilities in all implementation categories with respect to employee influenza immunization programs and separation of residents with communicable diseases from other residents. (See Figure 7 online.)

Nursing homes with low RTI rates associated successful prevention with routine dental care, an intense mobilization program, communication alerts for clusters of infections, and triggers for new tracheostomy consults. Some nursing homes found success with the services of a respiratory therapist who also performed regular educational and competency activities for the nursing staff. Additional interventions that may have impacted rates of influenza and pneumococcal pneumonia and invasive disease included preprinted vaccination orders, increased staff vaccination, and vaccination consents obtained at the time of admission by the facility admissions director.

A two-tailed statistical test for comparing the proportions of two groups’ compliance rates was run on the percentage of responses of full implementation for the H-HAI group against the L-HAI group.
The resultant z-score was 2.69, indicating that the difference between the H-HAI group and L-HAI group was significant at the p value < 0.01.

**Outbreak control.** Multiple opportunities for improvement for H-HAI nursing homes were found in this level of analysis of individual best-practice assessment (see Figure 8 online), including in the following practices:

- Incorporating methods to investigate cases that rise above the facility’s normal baseline into the facility infection control plan, policies, and procedures
- Assigning accountability and developing documentation methods for identifying increased numbers of outbreak cases
- Developing a policy and documentation, monitoring, and accountability methods for monitoring of infection control measures and isolation
- Instituting policies, education, documentation, and accountability for specific outbreak case definition and timely institution of infection control

H-HAI nursing homes did score higher than L-HAI homes in all six categories of full implementation for conducting case finding and in having procedures to identify transmission of disease.

The visited facilities described successful outbreak control strategies, including using a case-tracking form and the 24-hour report for identification of increasing infection trend action plans, placing residents in private rooms, and a using cohort/quarantine system to respond to a potential outbreak.

A two-tailed statistical test for comparing the proportions of the two groups' compliance rates was run on the percentage of responses of full implementation for the H-HAI group against the L-HAI group. The resultant z-score was 2.52, indicating that the difference between the H-HAI group and L-HAI group was significant at the p value < 0.01.

**GI and MDRO infection.** Compared with L-HAI nursing homes, those with high HAI rates scored lower in documentation of ensuring compliance with precautions, as well as in documentation, monitoring, and incorporation of communication of GI and MDRO prevention practices into the facility infection control plan. The overall lowest scores in this domain for both L-HAI and H-HAI nursing homes were in implementation of antimicrobial monitoring best practices. In individual categories, H-HAI homes scored lower in integration of antimicrobial monitoring into the facility plan, goals, policies, and educational programs. Overall, H-HAI homes scored slightly better than L-HAI homes in all implementation categories for posting transmission-based precaution signage. (See Figure 9 online.)

L-HAI nursing homes described several strategies to sustain low GI and MDRO infection rates, including a novel feedback loop among nursing assistants, nurses, and administration, which requires documentation of communication of infectious cases; preemptive isolation and intervention with suspect contagious cases; and a removal-from-isolation protocol. Approaches that may have contributed to low GI and MDRO rates were special Clostridium difficile cleaning protocols, an active antimicrobial stewardship program with oversight by the director of nursing, and the use of private rooms for each resident. Additional resources can be accessed in the Authority’s online norovirus prevention toolkit at http://patientsafetyauthority.org/ADVISORIES/AdvisoryLibrary/2010/dec7(4)/Pages/I41.aspx.

A two-tailed statistical test for comparing the proportions of the two groups’ compliance rates was run on the percentage of responses of full implementation for the H-HAI group against the L-HAI group. The resultant z-score was 0.32, indicating that the difference between the H-HAI group and L-HAI group was not significant at the p value < 0.636.

**BARRIERS**

Assessment visits to H-HAI facilities identified multiple barriers to staff and administrative performance of best practices for prevention of HAI. Specific barriers reported included unavailability of alcohol-based handrub stations at the point of care, monitoring of antimicrobial use performed only at the pharmacy level, a lack of knowledge of aspiration prevention strategies, use of the outdated practice of routine changing and irrigation of Foley catheters, and refusal of physicians or residents to remove Foley catheters that do not meet evidence-based insertion criteria.

Facility-wide barriers affecting all assessment domains included high acuity, low staffing, and limited consultant services. Infection prevention designees described lack of training, responsibility for multiple roles and multiple campuses, and lack of administrative support for infection control programs. Notable throughout the H-HAI survey results was an absence of structured and/or documented monitoring programs and communication strategies to involve and educate staff on infection issues and an absence of ownership of improvement projects, as well as a lack of infection control education for family members and residents. Limited space to separate clean and dirty items and unavailability of resources were also cited by H-HAI nursing homes as barriers to best-practice performance. While every facility had a process improvement or safety committee in place, H-HAI nursing homes described reactive versus proactive infection prevention programs, a lack of root-cause analysis for infection issues, and the frequent institution of infection control strategies without a planned approach.

**LIMITATIONS**

The study results are limited by several factors. Analysis of the nursing homes’ HAI rates was based on compliance with HAI reporting to the Authority. The
sample size of 20 nursing homes was limited and, in order to achieve diversity in size and patient population, participants were specifically selected (i.e., not selected randomly). The analysts conducted all 10 L-HAI nursing home assessment visits; however, data from two facilities was not available for analysis. Therefore, data analysis on the assessment results was based on 10 H-HAI nursing homes and 8 L-HAI nursing homes. Practices from the new norovirus guidelines published by the Centers for Disease Control and Prevention (CDC) after development of the Long-Term Care Best-Practice Assessment Tool were not available for the GI and outbreak control domain assessments.

**DISCUSSION**

Monitoring compliance with best practices aimed at preventing HAIs is fundamental to improvement. The Authority’s Long-Term Care Best-Practice Assessment Tool and consultation program were designed to assist nursing homes to increase success with integrating infection control best-practice concepts into clinical practice by exploring nursing homes’ areas of greatest challenge. The practices listed under each of the seven assessment categories mirror current evidence-based guidelines and could be considered a “bundle” for success in that category. The implementation categories identify the particular area in which resources may need to be directed.

The tool was designed to apply a multidisciplinary approach to information gathering for the assessment and facilitates several different methods of review to simplify the process for monitoring compliance with best practices. The tool is compact, customizable, and contains elements that can be measured by clinical observation at the bedside, by interviews, and by record review. Once populated with data, the tool displays a snapshot of the existence and extent of process defects and barriers to HAI prevention in nursing home residents and provides both a pre- and postintervention assessment. It can be used to demonstrate the evidence needed to justify or prioritize implementation of appropriate prevention strategies and resources and to gain a fresh perspective on the effectiveness of improvement strategies needed to enhance the infection control program. The tool has been updated to include best-practice elements from the new CDC norovirus guidelines.

**CONCLUSION**

The results of this study suggest an association between high infection rates and limited implementation of best practices in Pennsylvania nursing homes. Examination of the differences between L-HAI and H-HAI nursing homes’ applications of specific best practices within multiple levels of implementation revealed that nursing homes reporting high HAI rates also had limited adoption of best practices in one or more levels of implementation for 45 of the 50 best practices in the survey. Opportunities for improvement for H-HAI nursing homes were identified in all seven infection control domains and across all six categories of best-practice implementation. The interviews and observations conducted by the authors uncovered multidisciplinary implementation barriers in the H-HAI nursing homes at the leadership, physician, clinical, and support staff levels.

This study reveals the variability in implementation and maintenance of infection control practices in nursing homes and demonstrates the need to better identify and overcome barriers to implementing infection control best practices in this setting. This survey identified problems that are likely present in almost all nursing homes to some extent and demonstrated multiple methods to focus on problems that nursing homes could reasonably address to improve infection control. The L-HAI nursing homes’ strategies for success in each of the domains are previously mentioned. In addition, this study suggests that moving best practices from evidence to the bedside by fully implementing those practices at a higher level in each of the six implementation categories may be associated with lower infection rates.

Nursing homes with consistently low infection rates described facility-wide strategies for success that require high visibility of managers on resident care units in order to enhance communication, resolve problems, investigate changes in conditions, ensure accountability, reward staff performance, and foster an “it’s okay to speak up” culture. Frequent competency evaluations at all staff levels ingrain best practices in a structured framework for application at the bedside. Corporate and administrative support was evident for trained infection prevention designees who implemented nationally recognized, standardized surveillance methods to actively search for HAI cases. Multiple communication methods and feedback loops—such as a multidisciplinary daily triage at each nursing station, standardized structured reports, and frequent, interactive educational programs—keep staff informed. A highly structured process-monitoring system supports a strong infection control program and a proactive performance improvement process.

**MOVING FORWARD**

The Authority survey results identified suboptimal patterns of care, thus providing a targeted focus for follow-up education programs that can be widely applied in the long-term care setting for collaboration with nursing homes to overcome obstacles to full implementation of the current best practices for HAI prevention and for development of a consistent framework to integrate successful infection control strategies into clinical practice. To support the Authority’s goal to minimize HAIs in Pennsylvania nursing homes, the next step of following...
FOCUS ON INFECTION PREVENTION

up with nursing homes involved in this project is currently underway to compare pre- and postintervention HAI rates and methods of overcoming barriers. Multiple infection control educational strategies and toolkits can be found at http://www.patientsafetyauthority.org.

NOTES


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THE PENNSYLVANIA PATIENT SAFETY AUTHORITY AND ITS CONTRACTORS

The Pennsylvania Patient Safety Authority is an independent state agency created by Act 13 of 2002, the Medical Care Availability and Reduction of Error (“Mcare”) Act. Consistent with Act 13, ECRI Institute, as contractor for the Authority, is issuing this publication to advise medical facilities of immediate changes that can be instituted to reduce Serious Events and Incidents. For more information about the Pennsylvania Patient Safety Authority, see the Authority’s website at http://www.patientsafetyauthority.org.

ECRI Institute, a nonprofit organization, dedicates itself to bringing the discipline of applied scientific research in healthcare to uncover the best approaches to improving patient care. As pioneers in this science for more than 40 years, ECRI Institute marries experience and independence with the objectivity of evidence-based research. More than 5,000 healthcare organizations worldwide rely on ECRI Institute’s expertise in patient safety improvement, risk and quality management, and healthcare processes, devices, procedures and drug technology.

The Institute for Safe Medication Practices (ISMP) is an independent, nonprofit organization dedicated solely to medication error prevention and safe medication use. ISMP provides recommendations for the safe use of medications to the healthcare community including healthcare professionals, government agencies, accrediting organizations, and consumers. ISMP’s efforts are built on a nonpunitive approach and systems-based solutions.