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Can Infection Prevention Programs in Hospitals and Nursing Facilities Be Integrated?:

From Silos to Partners

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Dissemination and implementation of evidence-based interventions have successfully reduced central line–associated bloodstream infections, surgical site infections, and *Clostridium difficile* in many acute care hospitals partly as a result of resourceful, diverse, and proficient hospital infection prevention teams. However, infection prevention programs in nursing facilities are less well developed.

Contemporary nursing facilities are composed of 2 distinct populations: patients who require skilled nursing and rehabilitation care after a hospital stay (postacute care) and long-term care residents who permanently reside at these facilities. Nursing facilities encounter many challenges in effectively implementing and maintaining infection prevention programs. First, both patients receiving postacute care and long-term residents frequently visit common areas including dining rooms, rehabilitation areas, and family visitation rooms, increasing the risk of pathogen transmission. Second, nursing facilities lack in-house diagnostic testing and rely on offsite physicians, leading to delays in the evaluation and management of individuals with acute infections. Third, the postacute care population has inherently more active

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medical problems, with more devices, wounds, recurrent hospital stays, and high antibiotic use compared with long-term care residents. Most important, nursing facilities lack adequate resources to support the increasingly complicated infection prevention mandates such as infection surveillance, staff education, and implementation of antimicrobial stewardship programs. However, we believe the transition toward integrated health care systems provides a unique opportunity to collaborate with a shared goal of reducing infections and enhancing quality of care.

Aging of the US Population

Adults aged 65 years or older comprise a large proportion of the population in the United States, and this cohort is projected to increase from 47.8 million in 2015 to 98 million by 2060.¹ This population is more likely to live with both multimorbidity and functional limitations increasing their likelihood of adverse outcomes. Infections are a common cause of hospitalization and a leading cause of death among adults older than 65 years.² Statistics from nursing facilities are equally concerning. The Office of the Inspector General found that in 2011 approximately 22% of Medicare beneficiaries experienced adverse events, such as septicemia, pneumonia, and urinary tract infection, during their postacute stay. One-quarter of these adverse events were attributed to preventable infections.³ More than half of these patients returned to the hospital, resulting in additional costs, functional decline, and delayed recovery, contributing to a vicious spiral of morbidity and mortality. To deliver quality health care across the continuum of care for this rapidly growing population, an effective, well-funded, and adaptive infection prevention program is critical.

Evolution of Infection Prevention Programs

Hospital infection prevention programs developed in the 1960s and were subsequently shaped by the 1974 Study on the Efficacy of Nosocomial Infection Control. The study found a site-specific reduction in nosocomial infection ranging from 7% to 48% in hospitals with effective infection prevention programs that included 1 infection control nurse, 1 trained hospital epidemiologist, and data audits with feedback to surgeons.⁴ In 1976, the Joint Commission on Accreditation of Healthcare Organizations began requiring infection control programs for hospitals. The emergence of drug-resistant organisms and evidence-based standards spurred maturation of these programs. Contemporary hospital infection prevention teams now include epidemiologists, infection control practitioners, and quality improvement specialists that shape policy, conduct surveillance, and ensure compliance.

Mandates to create similar programs in nursing facilities soon followed. Recognition of major deficiencies in care led to the Nursing Home Reform Act, part of the Omnibus Budget Reconciliation Act of 1987 (OBRA), and required individualized infection control programs. The US Centers for Medicare & Medicaid Services (CMS) pay facilities for their services only if those facilities are certified to be in compliance with the OBRA recommendations. In 2009, updates to the regulations by CMS called for more robust infection prevention programs. Nursing facilities, however, struggle to implement these programs.

With the burgeoning postacute care population, transmission of pathogens is frequent.⁵ Several studies have confirmed this trend. A study from 2011 showed extensive transfer of Carbapenem-resistant *Enterobacteriaceae* within a network composed of 14 hospitals, 2 long-term care hospitals, and 10 nursing facilities.⁶ Furthermore, outbreaks in nursing facilities have been shown to increase methicillin-resistant *Staphylococcus aureus* (MRSA) prevalence in the regional hospitals.

Leveraging Integrated Systems to Improve Infection Prevention Programs

The time is right to meaningfully update infection prevention programs. Changes in the US health care delivery system are creating opportunities to achieve this goal by strengthening collaborations across care settings. Kaiser Permanente-California serves as an exemplar of a nonprofit integrated health care system. Their approach aligns primary care and specialist physicians, hospitals, and pharmacies as well as postacute care with the explicit intent of making care delivery convenient and safe for their members.⁷

Community-based nursing facilities often partner with hospitals under Medicare accountable care organization (ACO) programs. Although ACOs care for less than 20% of the US population, this care model is anticipated to grow in the coming years. Accountable care organizations are expected to deliver more coordinated care with resultant higher quality, more patient-centric care at a lower cost. To achieve these goals, ACOs have started to develop preferred networks by inviting well-performing nursing facilities to be their partners. Using proactive bidirectional collaboration, these networks may be enriched to enhance quality and reduce hospitalizations. Key improvement targets could include common infection control problems such as urinary tract infection prevention, sepsis-related readmissions, preventing *C difficile* infections, improved immunization rates in short-stay populations, and antimicrobial stewardship.³ If successful, this model could be expanded to reduce other healthcare-associated infections (HAIs) and adverse events.

There are several potential advantages to an integrated infection prevention program. First, sharing resources from well-developed hospital-based infection prevention teams may improve policies and practices, assist with staff training, standardize prescribing practices, enhance knowledge transfer, and improve efficiency. Second, sharing knowledge about the unique characteristics of the population, care delivery, and care coordination could lead to an improved understanding of their challenges and opportunities for hospitals. Timely communication between hospitals and nursing facilities regarding emerging antibiotic resistant pathogens could lead to interventions that minimize regional transmissions and contain outbreaks. Third, appropriate use and interpretation of diagnostic testing including use of clinical algorithms and antibiograms could lead to more appropriate initial empirical antibiotic treatment. Ultimately, infection prevention programs with shared responsibility and oversight could be substantially more effective in enhancing patient safety and quality of life than the current framework in which these programs operate in silos. Lessons from existing integrated delivery systems show promise.

The Veterans Health Administration (VHA), the nation's largest integrated health care delivery system, provides care that exceeds that of other health care organizations for some

infection-related health outcomes. The centralized infrastructure of the VA including shared medical records, increased numbers and training of personnel, use of national VA benchmarks, and leadership engagement likely account for these findings. Similarly, a system-wide implementation of a MRSA prevention initiative within the VA hospitals, spinal cord units, and nursing facilities has successfully reduced MRSA rates in all 3 care settings.⁸

Integration with hospital-based infection prevention programs is an attractive model for nursing facilities; however, challenges remain. Most hospitals and nursing facilities do not share electronic medical systems. Thus, communication of vital patient information is often delayed, incomplete, and may not include critical information needed to direct infection prevention practices such as presence of devices, wounds, and antibiotics used in the hospitals. A related set of barriers involves the use of different clinical laboratories, lack of or different infection surveillance system, and differences in clinical documentation. In addition, the current lack of structured reimbursement to hospital-based infection preventionists who provide services to nursing facilities is a limitation.

Conclusions

With increasingly integrated health care systems, hospitals should explore incorporating nursing facilities into their infection prevention risk assessment and control strategy. Because nursing facilities often have limited personnel, leveraging tools and expertise from their regional hospital partners is a potential pragmatic solution. Since infections remain a major cause of readmission of patients from nursing facilities to hospitals, meaningful collaborations within an ACO structure have the potential to improve quality of care, patient satisfaction, and may result in fewer readmissions, reduced costs, and contained transmission of pathogens. The time is right to capitalize on the important changes in care delivery including integration to overcome these barriers and breakdown existing silos.

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References

1. Administration on Aging, Administration for Community Living. [Accessed December 21, 2017] Profile of older Americans. 2016. https://www.acl.gov/sites/default/files/Aging_and_Disability_in_America/2016-Profile.pdf
2. Murphy SL, Kochanek KD, Xu JQ, Curtin SC. [Accessed December 21, 2017] Deaths: final data for 2015. <https://www.cdc.gov/nchs/products/nvsr.htm>
3. Office of the Inspector General. [Accessed July 28, 2017] Adverse events in skilled nursing facilities. <https://oig.hhs.gov/oei/reports/oei-06-11-00370.pdf>
4. Haley RW, Culver DH, White JW, et al. The efficacy of infection surveillance and control programs in preventing nosocomial infections in US hospitals. *Am J Epidemiol.* 1985; 121(2):182–205. [PubMed: 4014115]
5. Wang J, Foxman B, Mody L, Snitkin ES. Network of microbial and antibiotic interactions drive colonization and infection with multidrug-resistant organisms. *Proc Natl Acad Sci U S A.* 2017; 114(39):10467–10472. [PubMed: 28900004]

6. Won SY, Munoz-Price LS, Lolans K, et al. Emergence and rapid regional spread of *Klebsiella pneumoniae* carbapenemase-producing *Enterobacteriaceae*. Clin Infect Dis. 2011; 53(6):532–540. [PubMed: 21865189]
7. McCarthy D. Kaiser Permanente: Bridging the Quality Divide With Integrate Practice, Group Accountability and Health Information Technology. New York, NY: Commonwealth Fund; 2009.
8. Jain R, Kralovic SM, Evans ME, et al. Veterans Affairs initiative to prevent methicillin-resistant *Staphylococcus aureus* infections. N Engl J Med. 2011; 364(15):1419–1430. [PubMed: 21488764]