Infection Control & Hospital Epidemiology (2019), **40**, 713–716
doi:10.1017/ice.2019.80

Concise Communication

Implementation of antimicrobial stewardship and infection prevention and control practices in long-term care facilities—Pennsylvania, 2017

Nkuchia M. M'ikanatha DrPH, MPH[1], Sameh W. Boktor MD, MPH[1], Arlene Seid MD, MPH[1], Allen R Kunselman MA[2] and Jennifer H. Han MD, MSCE[3,4]

[1]Pennsylvania Department of Health, Harrisburg, Pennsylvania, [2]Department of Public Health Sciences, Penn State College of Medicine, Hershey, Pennsylvania, [3]Division of Infectious Diseases, Department of Medicine, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania and [4]Department of Biostatistics, Epidemiology, and Informatics, Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania

Abstract

In 2017, we surveyed long-term care facilities in Pennsylvania regarding antimicrobial stewardship and infection prevention and control (IPC) practices. Among 244 responding facilities, 93% had IPC programs and 47% had antimicrobial stewardship programs. There was significant variation in practices across facilities, and a number of program implementation challenges were identified.

(Received 13 December 2018; accepted 12 March 2019)

Residents in long-term care facilities (LTCFs) are at risk of infections with multidrug-resistant organisms (MDROs) due to immunosuppression, underlying comorbidities, and functional or cognitive impairments.[1] Overuse of antibiotics contributes to the emergence of antimicrobial resistance and increases the risk for *Clostridiodes difficile* infection.[2] An estimated 6%–10% of LTCF residents are receiving antibiotics at any given time, and approximately half are prescribed antibiotics every year.[3]

The recent Centers for Medicare and Medicaid Services (CMS) final rule required LTCFs to have specific components of an infection prevention and control (IPC) program in place within designated timelines, including a trained infection preventionist by 2019. A related proposal calls for implementation of a formal antimicrobial stewardship program (ASP).[4] The Joint Commission's medication management standards became effective in January 2017,[5] and they encourage LTCFs to follow *The Core Elements of Antibiotic Stewardship for Nursing Homes* from the Centers for Disease Control and Prevention (CDC).[6] These elements include leadership commitment, pharmacy antibiotic expertise, education, and tracking and reporting of antibiotic use and outcomes. To better understand the current state of LTCF IPC and antimicrobial stewardship programs in the setting of these mandates, we evaluated IPC and ASP practices in Pennsylvania LTCFs.

Author for correspondence: Nkuchia M. M'ikanatha, Email: nmikanatha@pa.gov

PREVIOUS PRESENTATION: Preliminary results of this study were presented at the International Conference on Emerging Infectious Diseases (ICEID) on August 28, 2018, in Atlanta, Georgia

Cite this article: M'ikanatha NM, *et al.* (2019). Implementation of antimicrobial stewardship and infection prevention and control practices in long-term care facilities—Pennsylvania, 2017. *Infection Control & Hospital Epidemiology*, 40: 713–716, https://doi.org/10.1017/ice.2019.80

Methods

We utilized an existing CDC IPC assessment tool for LTCFs[7] and *The Core Elements of Antibiotic Stewardship for Nursing Homes*[6] to draft a comprehensive survey focused on IPC and ASP practices in LTCFs. The survey was revised based on stakeholder input from the Pennsylvania Department of Health and Patient Safety Authority. Data were collected on facility demographics (eg, number of beds), IPC program characteristics (eg, MDRO surveillance, contact precaution policies), and ASP practices, including the use of various strategies (eg, treatment guidelines for common conditions, formulary restriction, prospective audit, and feedback). The survey also assessed challenges to the successful implementation of IPC and antimicrobial stewardship programs. The Institutional Review Board of the University of Pennsylvania deemed this survey exempt from review.

We used Research Electronic Data Capture (REDCap) tools to administer the survey and collect data.[8] A unique link to the survey was e-mailed to each of the 702 LTCFs licensed by the Pennsylvania Department of Health in May 2017. The e-mail was addressed to the infection prevention designee of the LTCF, and reminders were sent in June and again in July 2017 to nonrespondents. A third reminder was sent before survey closure in mid-July 2017 from the Pennsylvania Association of Directors of Nursing Administration. Frequencies with percentages and medians with interquartile ranges (IQR) were calculated for categorical and continuous responses, respectively. When calculating percentages, only the facilities with a nonmissing response to the particular question were included in the denominator. Associations between characteristics were estimated using odds ratios (ORs) with associated 95% confidence intervals (CIs). For all calculations, a 2-tailed $P < 0.05$ was considered significant. Analyses were performed using SAS version 9.4 software (SAS Institute, Cary, NC).

Results

Responses were received from 244 LTCFs, a 35% response rate. Responding LTCFs were located in 57 (85.1%) of the 67 counties in PA. Most facilities (40.1%) were free-standing, and the median bed size was 111 (interquartile range [IQR], 70–140). Of the 244 facilities, 211 (90.1%) provided skilled services such as care of patients with dementia (59.0%) and rehabilitation (79.1%). Most LTCFs (188 of 202 responding facilities) had an IPC program (Table 1); 96.9% of programs included registered nurses (RNs) and half (49.5%) included physicians.

Most LTCFs (n = 174, 89.7%) required contact precautions for at least 1 MDRO, most commonly for residents with active infection only. Of 193 responding LTCFs, 105 (54.4%) reported performing some form of surveillance for MDROs. Most of these facilities conducted surveillance for *C. difficile* (86.7%), and approximately half (53.3%) conducted surveillance for carbapenem-resistant Enterobacteriaceae. Of the 186 LTCFs responding to the question, 153 (82.3%) had MDRO policies pertaining to incoming patients; however, only 34 (18.2%) noted that they "always" received a patient's MDRO colonization/infection status from transferring facilities. The most frequently noted challenges to effective IPC programs included lack of time (30.7%), personnel/staffing constraints (29.1%), and limited educational opportunities (28.7%) (Table 1).

Of 179 responding LTCFs, 84 (46.9%) had a formal ASP: 78.6% included a non-infectious diseases physician, 85.0% had a pharmacist, 2.0% had a clinical microbiologist, and 94.1% had nurses. Most were led by RNs (n = 63, 75%). LTCFs affiliated with hospitals were more likely to have an ASP (odds ratio [OR], 2.20; 95% CI, 0.90–5.80; $P = .10$), although this association was not significant. Of the antimicrobial stewardship resources and practices reported (Fig. 1), 145 (79.7%) had pharmacist management of antibiotic orders, 43 (23.6%) utilized an infectious diseases consult service and 23 (12.7%) used formulary restriction with preauthorization. A total of 115 (62.8%) LTCFs used prospective audit and feedback, and 67 (37%) facilities used antibiotic de-escalation. Noted challenges facing ASPs included staffing constraints (27.1%), inadequate educational opportunities (26.2%), and lack of time (25.8%).

Table 1. Characteristics of Infection Prevention and Control (IPC) and Antimicrobial Stewardship Programs in 244 LTCFs, Pennsylvania, 2017

Survey Responses	Yes, No. (%)[a]	No, No. (%)[a]
IPC program in place	188 (93.1)	14 (6.9)
IPC employee type		
Physician	93 (49.5)	95 (50.5)
Physician assistant (PA)	17 (9.1)	171 (90.9)
Nurse practitioner (NP)	38 (20.2)	150 (79.8)
Registered nurse (RN)	182 (96.8)	6 (3.2)
Licensed practical nurse (LPN)	79 (42.0)	109 (58.0)
Antimicrobial stewardship program in place	84 (46.9)	95 (53.1)
Disciplines represented in the antimicrobial stewardship program[b]		
Infectious diseases physician	13 (15.5)	71 (84.5)
Other physician	66 (78.6)	18 (21.4)
Infectious diseases pharmacist	5 (5.9)	79 (94.1)
Other pharmacist	66 (78.6)	18 (21.4)
Clinical microbiologist	23 (27.4)	61 (72.6)
Data analyst	3 (3.6)	81 (96.4)
Nurse	79 (94.1)	5 (5.9)
Other	17 (20.2)	67 (79.8)
Challenges for IPC and antimicrobial stewardship programs		
What challenges does the facility face in regard to effective infection prevention and control?		
Lack of funding	19 (7.8)	225 (92.2)
Insufficient support by facility leadership	20 (8.2)	224 (91.8)
Lack of personnel/staffing constraints	71 (29.1)	173 (70.9)
Not enough ongoing educational opportunities	70 (28.7)	174 (71.3)
Insufficient clinical microbiology support	36 (14.8)	208 (85.2)
Insufficient information technology/data support	24 (9.8)	220 (90.2)
Lack of time	75 (30.7)	169 (69.3)
Other	26 (10.7)	218 (89.3)
What challenges does the facility face in regard to effective antimicrobial stewardship?		
Lack of funding	21 (8.6)	223 (91.4)
Insufficient support by facility leadership	22 (9.0)	222 (91.0)
Lack of personnel/staffing constraints	66 (27.1)	178 (72.9)
Not enough ongoing educational opportunities	64 (26.2)	180 (73.8)
Insufficient clinical microbiology support	40 (16.4)	204 (83.6)
Insufficient information technology/data support	37 (15.2)	207 (84.8)
Lack of time	63 (25.8)	181 (74.2)
Other	32 (13.1)	212 (86.9)

[a]Percentages are calculated using the number of facilities that answered either Yes or No to the question as the denominator.
[b]These numbers represent facilities that responded that they have an antimicrobial stewardship program in place.

Discussion

The results of our study highlight the current state and ongoing challenges of IPC and ASPs in a large cohort of Pennsylvania LTCFs. Although the majority of responding facilities had an IPC program in place, only half had physician support, and there was significant variation in surveillance practices for specific MDROs. In addition, interfacility communication on MDRO status was identified as an opportunity for improvement as part of overall surveillance practices.

Formal ASPs were present in fewer than half of facilities, and implementation of CDC recommendations varied widely.[6] Although pharmacists managed orders in ~80% of LTCFs, availability of infectious diseases consultation services was limited. Notably, there was also significant variation in the use of antibiotic stewardship strategies. More "complex" strategies such as prospective audit and feedback were more commonly used compared to less resource-intensive ones such as formulary restriction and transitioning intravenous to oral therapy.

Facilities reported various challenges to the successful implementation of antimicrobial stewardship and IPC practices. Although most programs did not perceive a lack in leadership support, inadequate educational opportunities and lack of personnel were commonly noted barriers. Interdisciplinary educational interventions focused on practical steps for improving IPC and

https://doi.org/10.1017/ice.2019.80 Published online by Cambridge University Press

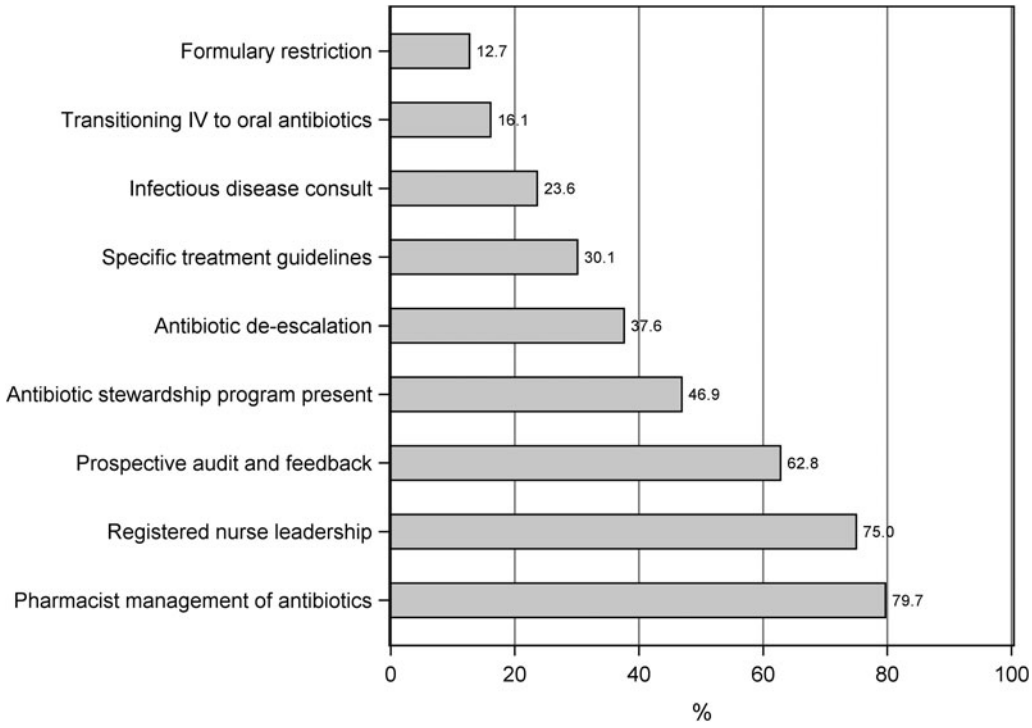

Fig. 1. Antimicrobial stewardship resources and practices in long-term care facilities in Pennsylvania, 2017. Note. Percentages were calculated using the number of facilities that answered either "Yes" or "No" to the question as the denominator.

antimicrobial stewardship programs in LTCFs are urgently needed. These educational opportunities could potentially be provided in collaboration with acute-care hospitals and regional and state health departments.

Our study has several limitations. Although we made multiple attempts to reach participants, the final response rate was 35%. Second, LTCFs with a robust IPC and/or ASP may have been more likely to respond, potentially leading to selection bias. Despite these limitations, the significant variation in antimicrobial stewardship and IPC programs across facilities underscores the need for statewide interventions in the long-term care setting. Focused IPC and antimicrobial stewardship forums that engage key stakeholders, including nurses, prescribers, and pharmacists should be considered. Although current guidelines highlight the importance of involving frontline providers in ASPs,[9] they acknowledge specific limitations in LTCFs, including the availability of on-site expertise (eg, infectious diseases). Telemedicine consultations or enhanced collaboration with acute-care hospitals could help sustain LTCF ASPs.[10]

In summary, most LTCFs in Pennsylvania that responded to our survey have implemented IPC programs, but half lack formal ASPs. Interdisciplinary IPC and antimicrobial stewardship educational interventions in association with regional and state health department collaborations may be effective strategies for standardizing and improving IPC and antimicrobial stewardship practices in the long-term care setting.

Author ORCIDs. Nkuchia M. M'ikanatha, 0000-0002-5631-184X; Sameh W. Boktor, 0000-0001-9651-7706

Acknowledgments. We thank Susan Williamson, Bureau of Facility Licensure, for her feedback regarding the survey instrument. We also thank Rosanne Pogash, Department of Public Health Sciences, Penn State College of Medicine, and Sharon Bradley, ECRI Institute, for assistance with the administration of the survey.

Financial support. This work was supported in part by the Commonwealth of Pennsylvania and the Centers for Disease Control and Prevention Cooperative Agreement Program (grant no. ELC CK14-1401PPHF) for Healthcare Associated Infection and Antimicrobial Stewardship Activities.

Conflicts of interest. All authors report no conflicts of interest relevant to this article.

References

1. Harris-Kojetin L, Sengupta M, Park-Lee E, Valverde R, Caffrey C, Rome V, Lendon J. Long-term care providers and services users in the United States: data from the National Study of Long-Term Care Providers, 2013–2014. *Vital Health Stat 3* 2016;38:x–xii;1–105.
2. Dumyati G, Stone ND, Nace DA, Crnich CJ, Jump RL. Challenges and strategies for prevention of multidrug-resistant organism transmission in nursing homes. *Curr Infect Dis Rep* 2017;19:18.
3. Daneman N, Gruneir A, Newman A, Fischer HD, Bronskill SE, Rochon PA, Anderson GM, Bell CM. Antibiotic use in long-term care facilities. *J Antimicrob Chemother* 2011;66:2856–2863.
4. CMS finalizes improvements in care, safety, and consumer protections for long-term care facility residents. Centers for Medicare and Medicaid Services website. https://www.cms.gov/newsroom/press-releases/cms-finalizes-improvements-care-safety-and-consumer-protections-long-term-care-facility-residents. Published 2016. Accessed November 12, 2018.
5. New antimicrobial stewardship standard. The Joint Commission website. https://www.jointcommission.org/assets/1/6/New_Antimicrobial_Stewardship_Standard.pdf. Published 2016. Accessed August 7, 2018.
6. The core elements of antibiotic stewardship for nursing homes. Centers for Disease Control and Prevention website. https://www.cdc.gov/longtermcare/pdfs/core-elements-antibiotic-stewardship.pdf. Published 2015. Accessed September 25, 2018.
7. Infection prevention and control assessment tool for long-term care facilities. Centers for Disease Control and Prevention website. https://www.cdc.gov/infectioncontrol/pdf/ICAR/LTCF.pdf. Published 2016. Accessed September 25, 2018.

https://doi.org/10.1017/ice.2019.80 Published online by Cambridge University Press

8. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research Electronic Data Capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform* 2009;42:377–381.
9. Barlam TF, Cosgrove SE, Abbo LM, *et al.* Implementing an antibiotic stewardship program: guidelines by the Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America. *Clin Infect Dis* 2016;62:e51–e77.
10. Kullar R, Yang H, Grein J, Murthy R. A roadmap to implementing antimicrobial stewardship principles in long-term care facilities (LTCFs): collaboration between an acute-care hospital and LTCFs. *Clin Infect Dis* 2018;66:1304–1312.

https://doi.org/10.1017/ice.2019.80 Published online by Cambridge University Press