HHS Public Access

Author manuscript

Am J Infect Control. Author manuscript; available in PMC 2019 April 30.

Published in final edited form as:

Am J Infect Control. 2014 January ; 42(1): 77–81. doi:10.1016/j.ajic.2013.06.016.

Hepatitis B outbreak associated with a home health care agency serving multiple assisted living facilities in Texas, 2008-2010

Yenlik A. Zheteyeva, MD, MPH[a,b], **Pritish Tosh, MD**[a,b], **Priti R. Patel, MD, MPH**[a], **Diana Martinez, MPH, PhD**[c], **Cindy Kilborn, MPH**[c], **Debo Awosika-Olumo, MD, MS, MPH**[d], **Salma Khuwaja, MD, MPH, DrPH**[d], **Syed Ibrahim, MD, MPH**[e], **Anthony Ryder, MD, MPH**[f], **Rania A. Tohme, MD, MPH**[b,g], **Yury Khudyakov, PhD**[g], **Hong Thai, PhD**[g], **Jan Drobeniuc, MD, PhD**[g], **Gary Heseltine, MD, MPH**[h], and **Alice Y. Guh, MD, MPH**[a,*]

[a]Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention, Atlanta, GA

[b]Epidemic Intelligence Service, Scientific Education and Professional Development Program Office, Centers for Disease Control and Prevention, Atlanta, GA

[c]Harris County Public Health and Environmental Services, Houston, TX

[d]City of Houston Department of Health and Human Services, Houston, TX

[e]Montgomery County Public Health Department, Conroe, TX

[f]Fort Bend County Health and Human Services, Rosenberg, TX

[g]Division of Viral Hepatitis, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention, Atlanta, GA

[h]Texas Department of State Health Services, Austin, TX

Abstract

We investigated a multifacility outbreak of acute hepatitis B virus infection involving 21 residents across 10 assisted living facilities in Texas during the period January 2008 through July 2010. Epidemiologic and laboratory data suggested that these infections belonged to a single outbreak. The only common exposure was receipt of assisted monitoring of blood glucose from the same home health care agency. Improved infection control oversight and training of assisted living facility and home health care agency personnel providing assisted monitoring of blood glucose is needed.

Keywords

Blood glucose monitoring; Infection control; Patient safety

*Address correspondence to Alice Y. Guh, MD, MPH, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention, 1600 Clifton Rd NE, MS A-31, Atlanta, GA 30333. ggt4@cdc.gov (A.Y. Guh).

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Conflicts of interest: None to report.

During March 2010, a local health department in Texas was notified of 2 cases of acute hepatitis B virus (HBV) infection among residents of a large long-term care facility that consisted of an assisted living facility, a specialized assisted living unit for memory-impaired residents, and an independent living unit. Reviewing hepatitis B surveillance records, local health departments in a preliminary investigation identified additional residents with acute HBV infection in 8 assisted living facilities located across 3 adjacent health department jurisdictions. All affected residents received diabetes care from the same home health care agency (Agency A). During June 2010 we initiated a joint epidemiologic investigation to determine the extent of the outbreak and risk factors for transmission.

METHODS

We reviewed surveillance reports at local health departments and facility medical charts for acute HBV infections and conducted HBV serologic testing in the 8 facilities where the preliminary investigation had identified an acute HBV infection, as well as in 5 other assisted living facilities where Agency A provided services. The testing strategy varied by jurisdiction; 1 health department tested all residents in facilities involved in the investigation, whereas others tested only residents with diabetes, their roommates, and their sexual partners in affected facilities. We classified long-term care facility residents with available HBV serologic results during January 2008 through July 2010 as acute HBV infection (positive immunoglobulin M [IgM] antibody to hepatitis B core antigen [anti-HBc], or positive hepatitis B surface antigen [HBs] with elevated serum transaminase levels [>100 IU/L] and/or jaundice); chronic HBV infection (positive HBsAg and total anti-HBc and negative IgM anti-HBc); immune to HBV infection (positive antibody to anti-HBs and total anti-HBc [resolved infection], or only positive anti-HBs [prior vaccination]); and susceptible to HBV infection (negative for all serologic markers). Available medical records of residents with acute HBV infection were reviewed. Blood samples positive for HBsAg, anti-HBc, or IgM anti-HBc were sent to the Centers for Disease Control and Prevention for verification and phylogenetic analysis.

To identify factors associated with acute HBV infection, we conducted 2 retrospective cohort studies among residents of 2 facilities (Facility A and B) that had the largest numbers of acute HBV infections during January 2008 through July 2010. All residents residing in Facility A (the assisted living and comprehensive units) and Facility B during June 2010, when the study was conducted, were eligible to be screened for HBV. All HBV serologic testing was performed by local health departments. Residents with evidence of HBV immunity, HBV infection before the study period, or with unknown HBV status (residents could have refused testing) were excluded. Medical records of residents were abstracted using a standard form. We calculated attack rates; P values < .05 were considered statistically significant.

An infection control assessment was conducted in all affected facilities during June 2010, including observations of assisted monitoring of blood glucose (AMBG) and insulin administration by Agency A nurses. We also administered a survey to Agency A nurses regarding diabetes care practices and conducted an in-service training.

RESULTS

Of 236 residents with HBV serologic data available during January 2008 through July 2010, we identified 21 residents with acute HBV infection in assisted living facilities settings across 10 long-term care facilities (Table 1). Four residents had chronic HBV infections and 9 had resolved infections. The earliest acute HBV infection occurred during July 2008, and 48% occurred during January through July 2010 (Figure 1). All 21 residents with acute HBV infection had positive IgM anti-HBc. Nine of these residents had symptoms of viral hepatitis and 4 were asymptomatic. Information on symptoms for the remaining 8 residents was not available. Six residents with acute HBV infection died; however, the cause of death was not available. The median age of the 21 residents with acute HBV infection was 85 years (range, 60-99 years); 15 (71%) were women. All 21 residents had diabetes and received AMBG and insulin injections from Agency A within 6 months preceding their HBV diagnosis. Eleven (52%) residents also received diabetes care from 9 other home health care agencies (Table 1). Only 2 (10%) of 21 residents received diabetes care services from in-house facility staff. Additional health care exposures during the preceding 6 months included hospitalization (14 residents), podiatry services (5 residents), wound care (7 residents), and dental care (2 residents), but no health care providers were common to >3 acutely infected residents.

HBV DNA isolated from 9 acutely infected residents (residing in 7 different assisted living facilities) and 1 chronically infected resident all belonged to genotype A2 and shared 99.8-100% homology in their complete genomes (Figure 2). In addition, 1 family member of an acutely infected resident was diagnosed with acute HBV infection after experiencing a needle stick injury while providing AMBG to this resident. HBV DNA from this family member also belonged to genotype A2 and shared the same degree of homology in its genome as that of the cluster.

Fifty-four residents in Facility A (excluding 3 residents with HBV immunity and 44 with unknown HBV status) and 45 residents in Facility B (excluding 4 residents with HBV immunity and 21 with unknown HBV status) were included in the retrospective cohort studies. In both facilities, having diabetes ($P < .01$) and receiving diabetes services from Agency A ($P < .01$) were risk factors for acute HBV infection (Table 2). Although podiatry care was also associated with acute HBV infection among Facility B residents, not all residents had exposure to the same podiatrist; exposure data were missing for 1 acutely infected resident.

Our observations of diabetes care at all 10 affected long-term care facilities during June 2010, including 7 instances of AMBG (provided by 2 Agency A nurses, 1 nurse from another home health care agency, and 4 facility personnel), did not reveal major infection control breaches. We found that fingerstick devices were assigned to individual residents, were not shared between residents, and were cleaned after each use. However, Facility A nurses reported that before March 2010, a single reusable fingerstick device designed and approved only for individual use was shared among multiple residents, although the lancets were changed between each resident. Concerning practices identified or reported in some of the other facilities included storage of blood glucose meters together in medication carts with potential for cross-contamination and occasional AMBG and insulin injections

performed by individuals lacking formal training, such as family members and “sitters” (persons without formal clinical training who were privately hired to provide general care as needed). Survey responses of Agency A nurses during June 2010 indicated adequate knowledge of appropriate diabetes-care practices, but only 2 nurses were directly observed while providing AMBG.

DISCUSSION

We investigated a large, multifacility outbreak of HBV infection among residents of 10 separate assisted living facilities that extended over a 25-month period. All 21 acute HBV infections occurred in residents with diabetes who had received AMBG from a common home health care agency. Receipt of diabetes care from this home health care agency was strongly associated with acute HBV infection. Residents with acute infection had >99% homology in the genomic sequences of HBV, suggesting that transmission could have occurred across facilities. Given the congregate setting of assisted living facilities and the mobile nature of home health care agency services, sharing of fingerstick devices or contaminated glucometers could have occurred between residents, both within and between facilities. All diabetes-care providers should be aware of the potential for bloodborne pathogen transmission through unsafe diabetes-care practices and implement recommended infection prevention measures. These include using only single-use, auto-disabling fingerstick devices in settings where AMBG is performed and restricting insulin pens and glucometers to individual residents. If glucometers need to be used on multiple residents, these devices should be of the type that is designed to withstand the routine cleaning and disinfection that must be performed after each use and be appropriately stored to prevent cross-contamination.[1–3]

The fact that the earliest acute HBV infection occurred almost 2 years before the detection of the outbreak highlights missed opportunities for earlier recognition and control. The extended nature of this outbreak serves as a reminder that single cases of acute hepatitis B in long-term care facility residents require prompt reporting by health care providers to public health authorities and a thorough investigation by the facility in consultation with the health department, with special attention to diabetes care and other infection control practices.[4] Although we did not observe deficiencies in infection control practices of Agency A nurses, our observations were conducted over a limited period at least 6 months after Agency A experienced significant staff turnover; thus, our findings may not reflect previous diabetes-care practices. In addition, the staff survey was based on self-report and responses could not be verified. Another limitation was that serologic testing was not performed on all residents in affected facilities, which might have underestimated the extent of the outbreak. In addition, because of the sparse documentation in facility records, we may not have captured all of the relevant resident exposures.

A number of recent HBV outbreaks in long-term care facilities have resulted from inappropriate AMBG practices.[3–5] Despite established national guidance on preventing bloodborne pathogen transmission during AMBG,[1] recent surveys showed that long-term care facilities, particularly assisted living facilities, lack appropriate policies and oversight and often fail to comply with infection control standards.[6,7] Because diabetes care for

assisted living facility residents is commonly provided by home health care agencies, regular trainings in appropriate AMBG need to target home health care agency nurses as well as assisted living facility personnel. Moreover, many home health care agencies are certified by the Centers for Medicare and Medicaid Services[8]; specific safe AMBG and basic infection control guidance—along the lines of that specified for Centers for Medicare and Medicaid Services-certified nursing homes—would likely benefit home health care agencies and their patients.[3] Ultimately, oversight and regulation of the health care delivery in assisted living facilities, including services provided by home health care agency, will be needed to ensure that appropriate infection control recommendations are consistently followed. In addition to improving infection control practices, considerations for hepatitis B vaccination of unvaccinated long-term care facility residents with diabetes may provide further protection against HBV infection.[9,10]

Acknowledgments

The authors thank Joseph Perz, Division of Healthcare Quality Promotion, Centers for Disease Control and Prevention; Philip Spradling, Umid Sharapov, Dale Hu, Carrie Nielsen, Guoliang Xia, Natalya Khudyakov, and Tracy Greene-Montfort, Division of Viral Hepatitis, Centers for Disease Control and Prevention; Michelle LaCour, Harris County Public Health and Environmental Services; Howard Turner, Okey Akwari, and Raouf Arafat, City of Houston Department of Health and Human Services; and John Jordan, Texas Department of State Health Services, Health Service Region 6 and 5 South, for their assistance in the investigation.

References

1. Centers for Disease Control and Prevention. Infection prevention during blood glucose monitoring and insulin administration. Available from: http://www.cdc.gov/injectionsafety/blood-glucose-monitoring.html. Accessed July 13, 2012.
2. Centers for Medicare & Medicaid Services. Point of care devices and infection control in nursing homes. Available from: http://www.cms.gov/Medicare/Provider-Enrollment-and-Certification/SurveyCertificationGenInfo/downloads/SCLetter10_28.pdf. Accessed December 22, 2012.
3. Thompson ND, Perz JF. Eliminating the blood: ongoing outbreaks of hepatitis B virus infection and the need for innovative glucose monitoring technologies. J Diabetes Sci Technol 2009;3:283–8. [PubMed: 20144359]
4. Centers for Disease Control and Prevention. Transmission of hepatitis B virus among persons undergoing blood glucose monitoring in long-term–care facilities—Mississippi, North Carolina, and Los Angeles County, California, 2003-2004. MMWR Morb Mortal Wkly Rep 2005;54:220–3. [PubMed: 15758894]
5. Schaffzin JK, Southwick KL, Clement EJ, Konings F, Ganova-Raeva L, Xia G, et al. Transmission of hepatitis B virus associated with assisted monitoring of blood glucose at an assisted living facility in New York State. Am J Infect Control 2012;40:726–31. [PubMed: 22284938]
6. Thompson ND, Barry V, Alelis K, Cui D, Perz JF. Evaluation of the potential for bloodborne pathogen transmission associated with diabetes care practices in nursing homes and assisted living facilities, Pinellas County. J Am Geriatr Soc 2010;58:914–8. [PubMed: 20374398]
7. Patel AS, White-Comstock MB, Woolard CD, Perz JF. Infection control practices in assisted living facilities: a response to hepatitis B virus infection outbreaks. Infect Control Hosp Epidemiol 2009;30:209–14. [PubMed: 19193126]
8. Park-Lee EY, Decker FH. Comparison of home health and hospice care agencies by organizational characteristics and services provided: United States, 2007 National Health Statistics Report No. 30: November 9, 2010. Available from: http://www.cdc.gov/nchs/data/nhsr/nhsr030.pdf. Accessed December 22, 2012.
9. Centers for Disease Control and Prevention. Use of hepatitis B vaccination for adults with diabetes mellitus: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Morb Mortal Wkly Rep 2011;60:1709–11. [PubMed: 22189894]

10. Tohme RA, Awosika-Olumo D, Nielsen C, Khuwaja S, Scott J, Xing J, et al. Evaluation of hepatitis B vaccine immunogenicity among older adults during an outbreak response in assisted living facilities. Vaccine 2011;29: 9316–20. [PubMed: 22015390]

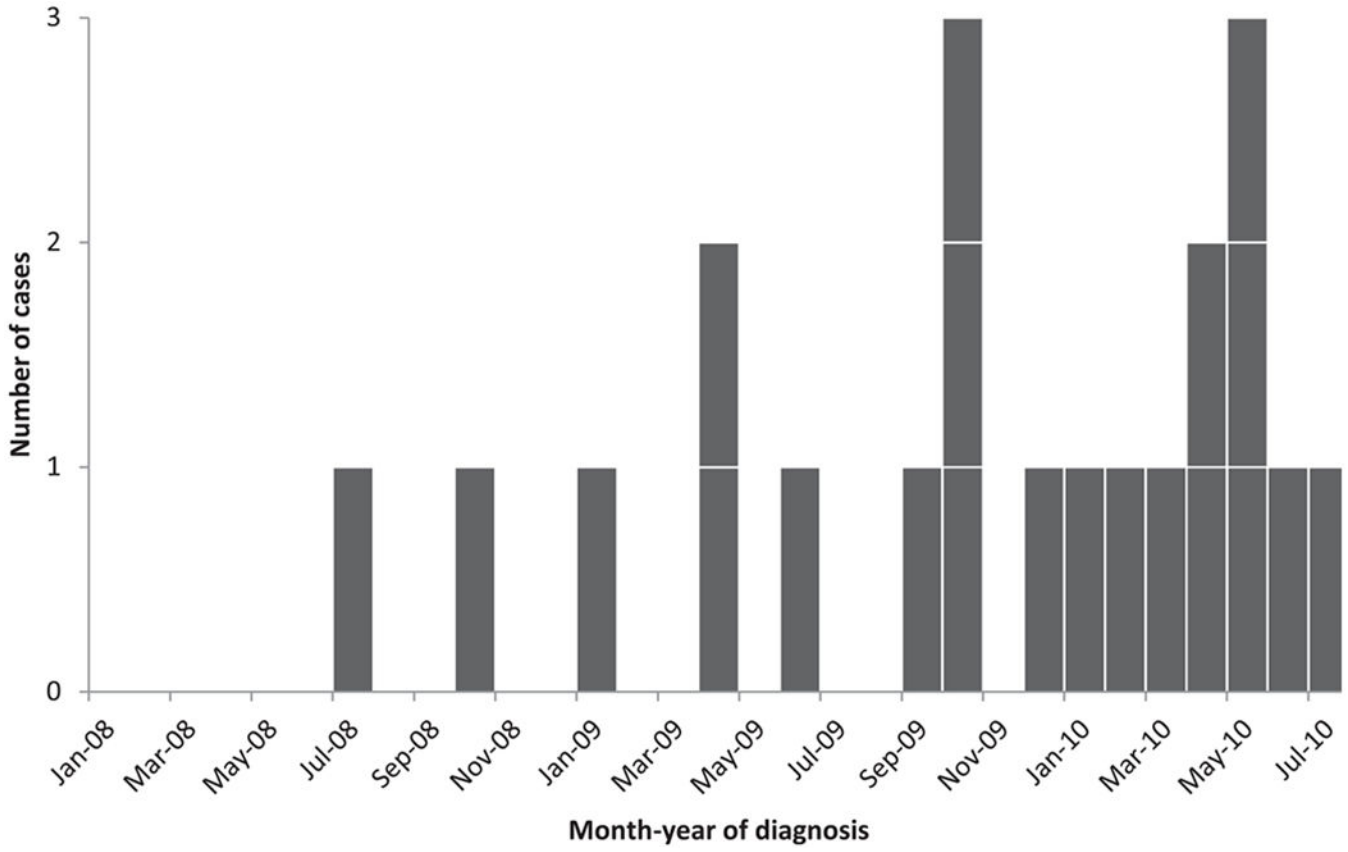

Fig 1.

Acute hepatitis B cases in long-term care facilities in Texas during January 2008 through July 2010.

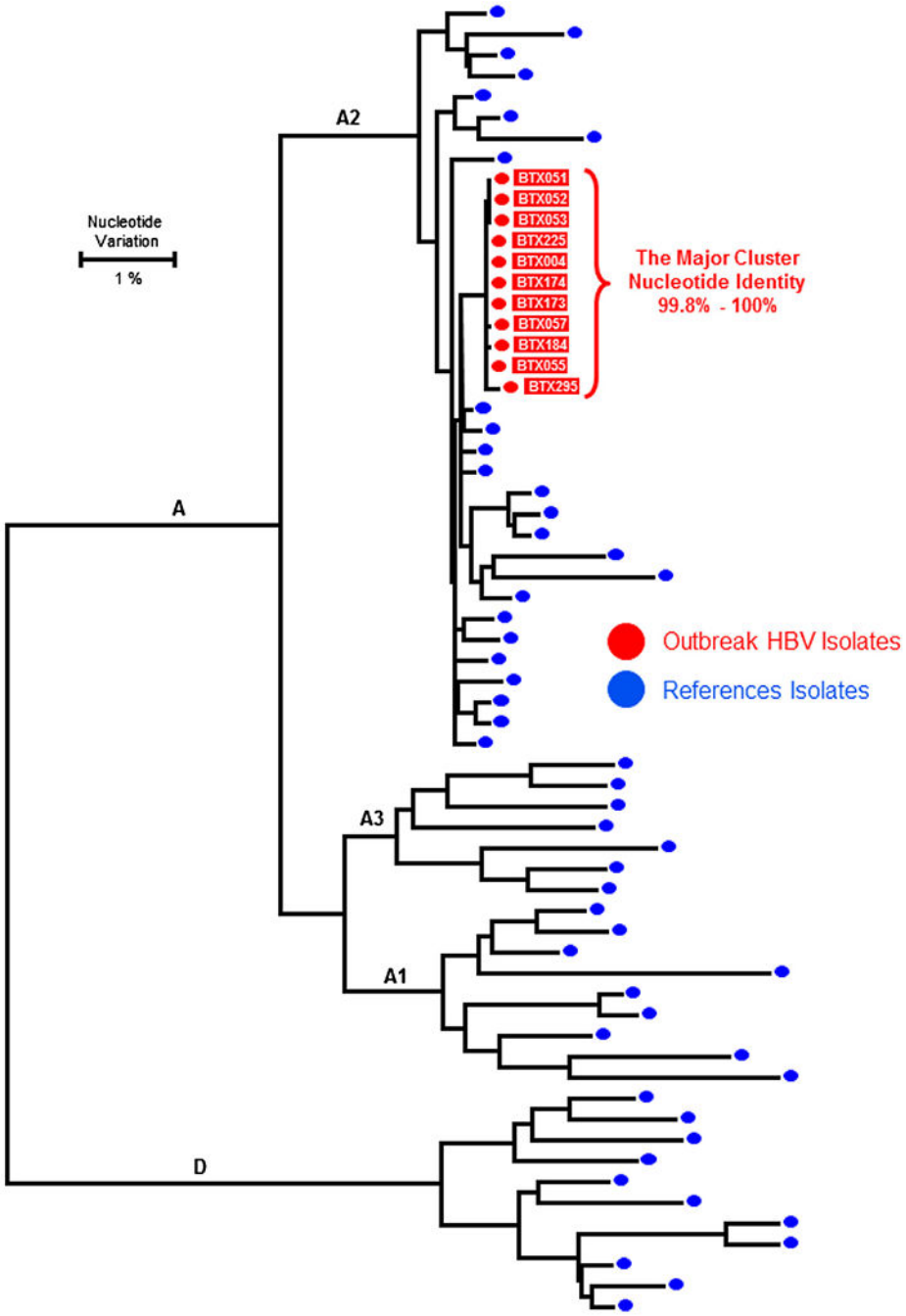

Fig 2.

Hepatitis B virus (HBV) DNA sequence analysis. HBV DNA isolated from 10 residents (9 with acute and 1 with chronic HBV infection) and 1 family member (of an acutely infected resident) all belonged to genotype A2 and shared 99.8%-100% homology in their complete genomes.

Table 1

Acute hepatitis B virus (HBV) infections identified in long-term care facilities served by various home health care agencies in Texas, 2008-2010

Facility	No. of residents with acute HBV	Type of facility	Home health care agencies known to have served the facility
Facility A	5	Assisted living, specialized assisted living for dementia care, independent living	Agency A, Agency B
Facility B	4	Assisted living	Agency A, Agency B, Agency C
Facility C	3	Assisted living	Agency A
Facility D	2	Assisted living	Agency A, Agency D, Agency E, Agency F, Agency G, Agency H
Facility E	2	Assisted living	Agency A, Agency I
Facility F	1	Assisted living, independent living	Agency A, Agency B, Agency F
Facility G	1	Assisted living	Agency A, Agency B
Facility H	1	Assisted living	Agency A, Agency J
Facility I	1	Assisted living	Agency A
Facility J	1	Assisted living	Agency A

Table 2

Cohort analysis of risk factors for acute hepatitis B virus (HBV) infection among residents of Facility A and Facility B in Texas, 2008-2010

	Attack rates		
Risk factor	**Infected/exposed**	**Infected/unexposed**	***P*-value***
Facility A (n = 54)†			
Diabetes	5/13 (38.5)	0/41 (0)	<.01
Diabetes services by Agency A	5/6 (83.3)	0/48 (0)	<.01
Diabetes services provided by Facility A	2/9 (22.2)	3/45 (6.7)	.19
Diabetes services provided by other home health care agencies	1/16 (6.3)	4/37 (10.8)	1.00
Administration of PPD test	1/18 (5.6)	4/36 (11.1)	.65
Administration of flu vaccine	1/14 (7.1)	4/40 (10.0)	1.00
Wound care services	2/6 (33.3)	3/48 (6.3)	.09
Dental services	1/2 (50.0)	2/50 (4.0)	.11
Podiatry services	1/1 (100.0)	4/53 (7.6)	.09
Hospitalizations	5/35 (14.3)	0/19 (0)	.15
Any outpatient visit for health care procedure(s)	0/3 (0)	5/50 (10.0)	1.00
Facility B (n = 45)‡			
Diabetes	4/6 (66.7)	0/39 (0)	<.01
Diabetes services by Agency A	4/8 (50.0)	0/37 (0)	<.01
Diabetes services provided by Facility B	0/0 (0)	3/30 (10)	N/A
Diabetes services provided by other home health care agencies	2/8 (25.0)	1/36 (2.9)	.08
Administration of PPD test	0/0 (0)	3/44 (6.8)	N/A
Administration of flu vaccine	1/12 (8.3)	2/32 (6.3)	1.00
Wound care services	1/1 (100)	2/43 (4.7)	.07
Dental services	0/0 (0)	3/44 (6.8)	N/A
Podiatry services	3/6 (50.0)	0/38 (0)	<.01
Hospitalizations	2/8 (25.0)	1/36 (2.8)	.08
Any outpatient visit for health care procedure(s)	0/2 (0)	3/42 (7.1)	1.00

NOTE. Values are presented as n (%).

N/A, Not available; *PPD*, purified protein derivative.

*Fisher exact test.

†Consisted of residents from the assisted living facility and the comprehensive care unit; 3 residents with immunity to HBV and 44 residents with unknown HBV status were excluded from analysis.

‡Excluded 4 residents with immunity to HBV and 21 residents with unknown HBV status from analysis.