Healthcare-Associated Hepatitis B and C Outbreaks (≥ 2 cases) Reported to the Centers for Disease Control and Prevention (CDC) 2008-2017

The tables below summarize healthcare-associated outbreaks of hepatitis B virus (HBV) and hepatitis C virus (HCV) infection reported in the United States during 2008-2017. Outbreaks previously reported in 1998-2008 can be found in Thompson, et al and Redd, et al. Because of the long incubation period (up to 6 months) and typically asymptomatic course of acute hepatitis B and C infection, it is likely that only a fraction of such outbreaks that occurred have been detected, and reporting of outbreaks detected and investigated by state and local health departments is not required. Therefore, the numbers reported here may greatly underestimate the number of outbreak-associated cases and the number of at-risk persons notified for screening.
Practical guidance on detecting and investigating such outbreaks may be found in the Healthcare Investigation Guide.

Resources for prevention include updated hepatitis B immunization guidelines, and infection control guidelines and resources .

Summary

61 outbreaks (two or more cases) of viral hepatitis related to healthcare reported to CDC during 2008-2017; of these, 58 (95%) occurred in non-hospital settings.

Hepatitis B (total 24 outbreaks including one of both HBV and HCV, 179 outbreak-associated cases, >10,935 persons notified for screening):

- 18 outbreaks occurred in long-term care facilities, with at least 133 outbreak-associated cases of HBV and approximately 1,680 at- risk persons notified for screening
  - 83% (15/18) of the outbreaks were associated with infection control breaks during assisted monitoring of blood glucose (AMBG)
- 5 outbreaks occurred in other settings, one each at: a free dental clinic in school gymnasium, an outpatient oncology clinic, a hospital surgery service, and two at pain remediation clinics (one outbreak of HBV and one with both HBV and HCV), with 46 outbreak-associated cases of HBV and > 8,500 persons at-risk persons notified for screening

Hepatitis C (38 total outbreaks including one of both HBV and HCV , >295 outbreak-associated cases, >105,632 at-risk persons notified for screening):

- 14 outbreaks occurred in outpatient facilities (including the above mentioned outbreak of both HBV and HCV), with 116 outbreak-associated cases of HCV and >74,457 persons notified for screening
- 21 outbreaks occurred in hemodialysis settings, with 102 outbreak-associated cases of HCV and 3,026 persons notified for screening
- Three outbreaks occurred because of drug diversion by HCV-infected health care providers, with at least 78 outbreak-associated cases of HCV and >26,217 persons notified for screening

Single identified cases are not included in the table and may be particularly difficult to confirm as healthcare-associated infection transmission events. However, although this list is not exhaustive, during 2008-2017 the following single cases were reported and confirmed as likely patient-to-patient healthcare-associated transmission:

- 2017: Two single cases of HCV were identified in two outpatient hemodialysis units in Philadelphia (unpublished data, Philadelphia Department of Health)
- 2017: Two single cases of HCV case in two outpatient hemodialysis units in unidentified single state (unpublished data)
- 2016: a single HCV case in an outpatient hemodialysis unit in California (unpublished data, California Department of Health)
- 2016: a single HCV case in an outpatient hemodialysis unit in California (unpublished data, California Department of Health)
- 2015: 3 single HCV cases in 3 outpatient hemodialysis units in New Jersey (unpublished data, New Jersey Department of Health)
- 2015: an HBV case in an outpatient urology clinic (unpublished data, New York State Department of Health)
- 2015: a single HCV case due to syringe reuse in a hospital in Texas (Arnold S, Melville S, Morehead B, et al. Notes from the field: Hepatitis C Transmission from Inappropriate Reuse of Saline Flush Syringes for Multiple Patients in an Acute Care General Hospital – Texas, 2015. MMWR 2017; 66:258-60.(https://www.cdc.gov/mmwr/volumes/66/wr/mm6609a4.htm)
- 2014: an HCV case in an outpatient dialysis clinic (unpublished data, State of New Jersey Department of Health) and an HCV case in an inpatient dialysis clinic (unpublished data, State of Massachusetts Department of Public Health)
- 2013: an HCV case in a dental clinic, an HBV case in an outpatient dialysis unit (manuscript in preparation, North Carolina Department of Health and Human Services), and two unrelated HCV transmissions in two New York endoscopy centers (Dentinger C et al. Acute HCV following outpatient endoscopy procedures, New York city, 2013. Presented at 2015 meeting of the American College of Gastroenterology.)
- 2012: an HCV case associated with healthcare delivery during autologous stem cell transplant (unpublished data, State of New York Department of Health)
- 2011: an HCV case in a hospital surgery unit (CDC. Transmission of Hepatitis C Virus Associated with Surgical Procedures — New Jersey 2010 and Wisconsin 2011. MMWR 2015, 64: 165-170.)
- 2010: an HCV case in an outpatient surgical center (CDC. Transmission of Hepatitis C Virus Associated with Surgical Procedures — New Jersey 2010 and Wisconsin 2011. MMWR 2015, 64: 165-170.), and an HBV case in a psychiatric long term care facility (unpublished data, State of New York Department of Health)
- 2009 : an HCV case in an outpatient hemodialysis clinic (unpublished data, South Dakota Department of Health)
- 2008: an HCV case in a hospital surgery unit. (Unpublished data, Pennsylvania Department of Health)

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Long-term care [4]						
Personal care home (1)	2016	PA	82	2	Multiple infection control breaches primarily suboptimal universal precautions during provision of care including assistance with personal hygiene and blood glucose monitoring	2 staff members infected; all residents and staff screened. Source patient had very high viral load

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Personal care home (2)	2014	PA	49	8	Unsafe practices related to assisted blood glucose monitoring	
Sub-acute unit of a skilled nursing facility (3)	2014	CA	158	7	Infection control breaches related to instrument sterilization during the provision of podiatry care were identified; however, evidence was insufficient to implicate a specific source of transmission.	Of the 7 outbreak cases, viral molecular sequencing of DNA from 4 acute infections matched into a cluster with one chronic case. Sequencing could not be performed for three cases with serology indicative of resolving acute infection.
Assisted living facility (4)	2012	VA	84	2	Use of fingerstick devices for >1 resident	
Assisted living facility (5) *(most residents with neuropsychiatric disorders)*	2011	VA	103	7	Use of fingerstick devices for >1 resident	An additional 4 new chronic infections were detected; of these 3 had viral molecular sequencing and all matched into the cluster with the acute cases indicating likely outbreak-related cases.
Assisted living facility (6)	2011	CA	14	2	Use of blood glucose meter for >1 resident without cleaning and disinfection	Both infected residents received assisted monitoring of blood

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
					Failure to maintain separation of clean and contaminated podiatry equipment Improper reprocessing of contaminated podiatry equipment Failure to perform environmental cleaning and disinfection between podiatry patients	glucose as well as podiatry services.
Assisted living facility (7)	2010	CA	28	3	Unsafe practices related to assisted blood glucose monitoring *Although a clear infection prevention breach was not identified at the time of the investigation, all infections were in residents receiving assisted monitoring of blood glucose by the same home health agency. The home health agency lacked written policies on infection control relating to blood glucose monitoring.*	
Assisted living facility (8)	2010	NC	87	8	Use of fingerstick devices for >1 resident Use of blood glucose meter for >1 resident without cleaning and disinfection	6 of 8 case patients died from complications of hepatitis
Assisted living facilities (n=10) in the same metropolitan area served by the same home health agency for diabetic care (9)	2010	TX	>235	23	Unsafe practices related to assisted blood glucose monitoring *Although a clear infection prevention breach was not identified at the time of the investigation, all infections were in*	Cases include residents of the assisted living facilities plus one family member of an infected

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Patients living at home in private residences served by the same home health agency above for diabetic care (9)			≥19	1	*residents of assisted living facilities or at home who received assisted monitoring of blood glucose by the same home health agency.*	facility resident who experienced a needlestick injury while assisting with the resident's blood glucose monitoring.
Two affiliated assisted living facilities (7, 10) *(most residents with neuropsychiatric disorders)*	2010	VA	126	14	Use of fingerstick devices for >1 resident Use of blood glucose meter for >1 resident without cleaning and disinfection Failure to use gloves and perform hand hygiene between fingerstick procedures	An additional 4 new chronic infections were detected and had viral molecular sequencing; 3 matched into the clusters with the acute cases indicating likely outbreak-related cases.
Assisted living facility after transfer of a resident from assisted living facility above (5)	2010	VA	151	5	Use of fingerstick devices for >1 resident	
Skilled nursing facility (12)	2010	NC	116	6	Unclear mode of transmission; specific lapses in infection control not identified at the time of the investigation.	
Skilled nursing facility (11)	2010	NC	109	6	Specific lapses in infection control not identified at the time of the investigation. *However, assisted blood glucose monitoring and insulin injection (received*	

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
					by 4 of 6 infected patients) associated with illness in case-control study.	
Assisted living facilities (n=2) (12) Blood glucose monitoring at both assisted-living facilities provided by same home health agency	2009	FL	65	9	Cross-contamination of clean supplies with contaminated blood glucose monitoring equipment used by home health agency *Investigators noted visible traces of blood on some of the blood glucose meters and one reusable fingerstick device.*	
Assisted living facility (5)	2009	VA	64	5	Unsafe practices related to assisted blood glucose monitoring *A clear infection prevention breach was not identified. The facility did use reusable fingerstick devices but denied using them for >1 resident. In an analytic study, having diabetes and undergoing blood glucose monitoring (all 5 acute cases and 4 of 5 newly identified chronic cases) was significantly associated with infection*	An additional 5 new chronic infections were detected; of these 4 had viral molecular sequencing and all matched into the cluster with the acute cases indicating likely outbreak-related cases. 2 of 17 facility staff tested also had acute HBV. Investigators identified that after performing AMBG, personnel manually removed used, exposed lancets from the fingerstick device, placing themselves at

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
						risk for exposure via a sharps injury. Neither staff member received HBV vaccination.
Assisted living facility (13)	2008	IL	21	7	Use of blood glucose meter for >1 resident without cleaning and disinfection Failure to consistently wear gloves and perform hand hygiene between fingerstick procedures	Note: this outbreak is also included in Thompson, et al.
Assisted living facility (14)	2008	PA	25	9	Use of fingerstick devices for >1 resident Use of blood glucose meter for >1 resident without cleaning and disinfection	Note: this outbreak is also included in Thompson, et al.
Skilled nursing facility (15) *(most residents with neuropsychiatric disorders)*	2008	CA	143	9	Failure to maintain separation of clean and contaminated podiatry equipment	
Totals			***>1,679***	***133***		
Oral Health						
Free dental clinic conducted in school gymnasium (16)	2009	WV	>1,500	5	Multiple procedural and infection control breaches were identified during retrospective investigation; however, sparse documentation did not provide	Of the 5 cases, 3 were patients and 2 were non-healthcare worker volunteers

Hepatitis B (HBV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
					evidence to link specific breaches with infection.	
Totals			***>1,500***	***5***		
Other outpatient Settings						
Pain management clinic (17)	2013	SC	534	9	Procedure and infection control breaches related to injection safety were identified during the investigation, however, there was insufficient evidence to implicate a specific breach as the source of transmission	One additional prevalent case was identified which may represent a source.
Outpatient oncology clinic (18)	2009	NJ	4,600	29	Preparation of medications in same area where blood specimens were processed Use of saline-bags for >1 patient Use of single-dose vials for >1 patient	
Totals			***5,134***	***38***		
Hospital						
Hospital-based surgery service (19)	2009	VA	**329**	**2***	HBV-infected orthopedic surgeon with high viral load performing exposure-prone procedures on patients	*An additional 4 resolved HBV infections may also have been associated with this outbreak

Outbreak of both Hepatitis B and Hepatitis C						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Outpatient						
Pain management clinic (20)	2010	CA	2,293	HBV:1 HCV:1	Syringe reuse contaminating medication vials used for >1 patient Use of single-dose vials for >1 patient	

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Outpatient						
Alternative medicine practice (55)	2017	NY	584	5 (see comment)	IV (intravenous) infusions were prepared using non-sterile glassware and tubing, which was not properly reprocessed between patients. Scope of practice issues were also identified with a phlebotomist preparing and administering injections and IV infusions.	In addition to the 5 cases determined to be transmission-linked with HCV genetic sequencing, 3 clinic patients with resolved HCV may have had outbreak-associated infection

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Prolotherapy clinic (46)	2015	CA	>1,500	5	Syringe reuse contaminating medication vials used for >1 patient Use of single-dose vials for >1 patient	
Insulin infusion clinic (47)	2015	CA	92	9	Unsafe practices related to assisted blood glucose monitoring including use of fingerstick devices for >1 person and inadequate cleaning and disinfection of glucometer before reuse.	
Pain management clinic (48)	2015	MI	122	2	Syringe reuse contaminating medication vials used for >1 patient	
Cardiology clinic (49)	2015	WV	>2,000	5	Use of single-dose vials for >1 patient	
Hematology Oncology Clinic(21)	2012	MI	>300	10	Specific lapses in infection control not identified at the time of the investigation	
Pain management clinic (22)	2011	NY	466	2	Suspected syringe reuse contaminating medication vials	
Outpatient clinic (23)	2010	FL	3,929	5	Drug diversion (fentanyl) by an HCV-infected radiology technician	
Outpatient alternative medicine clinic (24)	2009	FL	163	9	Syringe reuse contaminating medication vials used for >1 patient	

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
					Use of single-dose vials for >1 patient	
Endoscopy clinics (25)	2009	NY	3,287	2	Suspected syringe reuse contaminating medication vials	2009 investigation of cases occurring in 2006- 2007
Ambulatory surgical centers (single-purpose endoscopy clinics) (n=2) (26, 27, 28)	2008	NV	>60,000	9	Syringe reuse contaminating single-use medications vials (propofol) that were used for >1 patient	8 cases were from the first center and one from the second. The health department identified an additional 106 infections that could have been linked to the clinics. Note: this outbreak is also included in Thompson, et al, but at the time of publication only 6 cases had been identified.
Outpatient cardiology clinic (29)	2008	NC	1,200	5	Syringe reuse contaminating multi-dose vials of saline solution used for >1 patient	An additional 2 new infections were identified in probable source patients
Totals			***>71,664***	***68***		

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Long-term care						
Skilled nursing (30)	2013	ND	>**500**	**46**	Epidemiologic analysis suggested podiatry care, phlebotomy, and nail care performed at the skilled nursing facility were associated with HCV infection	
Hospital						
Hospital (50)	2015	UT	7,217	>7	Drug diversion by nurse	
Hospital (31)	2012	NH AZ GA KS MD MI NY PA	>**11,000**	**45**	Drug diversion by radiology technologist.	Patients from 16 facilities in 8 states were notified about potential exposure and recommended to undergo testing for HCV infection.
Hospital-based surgery service (32)	2009	CO	>**8,000**	**26**	Drug diversion (fentanyl) by an HCV-infected surgical technician	18 cases were linked by viral sequencing to the surgical technician; an additional 8 infections were determined to be epidemiologically linked but viral

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
						sequencing was not able to be performed. The number screened includes patients from three facilities where the surgical technician had worked.
Totals			***>26,217***	***>78***		
Hemodialysis						
Outpatient hemodialysis facility (53)	2017	GA	47	2	Patients were dialyzed in close proximity and cared for by the same staff	

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
					Lapses identified included environmental cleaning, hand hygiene	
Outpatient hemodialysis facility (33)	2016	unspecified	203	2	Specific lapses in infection control not identified at the time of the investigation	
Outpatient hemodialysis facility (54)	2016	PA	154	2	Breaches in environmental cleaning and disinfection practices identified included: lapses in hand hygiene, mixing of clean and dirty areas, inadequate cleaning of stations between patients	
Outpatient hemodialysis facility (51)	2015	NJ	237	2	Multiple lapses in infection control identified, including hand hygiene and glove use, vascular access care, medication preparation, cleaning and disinfection	
Outpatient hemodialysis facility (51)	2015	NJ	84	2	Multiple lapses in infection control identified, vascular access care, medication preparation, cleaning and disinfection	
Outpatient hemodialysis facility (51)	2015	NJ	98	2	Multiple lapses in infection control identified, including hand hygiene and glove use, vascular access care, medication preparation, cleaning and disinfection	

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Outpatient hemodialysis facility (52)	2015	PA	115	3	Multiple lapses in infection control identified, medication preparation close to treatment area	
Outpatient hemodialysis facility (52)	2015	PA	130	3	Multiple lapses in infection control identified, medication preparation close to treatment area	
Outpatient hemodialysis facility (52)	2015	PA	97	2	Multiple lapses in infection control identified, medication preparation close to treatment area, Use of single-dose vials for >1 patient, no separation of dirty and clean areas	(Philadelphia)
Outpatient hemodialysis facility (53)	2015	CA	28	3	Breaches in environmental cleaning and disinfection practices	
Outpatient hemodialysis facility (34)	2014	WA	186	3	Breaches in environmental cleaning and disinfection practices identified included: failure to consistently change gloves and perform hand hygiene between patients, and breaches in environmental cleaning and disinfection practices to prevent cross-contamination between clean and dirty areas	
Outpatient hemodialysis facility (35)	2014	TN	62	2	Breaches in environmental cleaning and disinfection practices	
Outpatient hemodialysis facility (36)	2014	NJ	69	4	Breaches in environmental cleaning and disinfection practices	

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
					identified included failure to: wash hands before and after glove use; adequately clean surrounding area of the station, the dialysis chair and priming bucket after use	
Outpatient hemodialysis facility (37)	2014	NJ	97	2	Breaches in environmental cleaning and disinfection practices identified included failure to: appropriately separate clean and contaminated supply areas, properly disinfect clamps in the open position, adequately clean the dialysis chair and priming bucket after use; ensure patients applying pressure to their own hemodialysis access site wash their hands after doffing gloves and prior to using the scale.	
Outpatient hemodialysis facility (38)	2012	PA	66	18	Multiple lapses in infection control identified, including hand hygiene and glove use, vascular access care, medication preparation, cleaning and disinfection	18 new HCV infections between 2008–2013; (Philadelphia)
Outpatient hemodialysis facility (39)	2012	CA	42	4	Specific lapses in infection control not identified at the time of the investigation	

Hepatitis C (HCV) Outbreaks by Setting						
Setting	**Year**	**State**	**Persons Notified for Screening[1]**	**Outbreak-Associated Infections[2]**	**Known or suspected mode of transmission[3]**	**Comments**
Outpatient hemodialysis facility (40)	2011	GA	89	6	Failure to maintain separation between clean and contaminated workspaces	
Outpatient hemodialysis facility (41)	2010	TX	171	2	Specific lapses in infection control not identified at the time of the investigation	
Outpatient hemodialysis facility (42)	2009	MD	250	8	Breaches in medication preparation and administration practices Breaches in environmental cleaning and disinfection practices	
Hospital-based outpatient hemodialysis facility (43)	2009	NJ	144	21	Breaches in medication preparation and administration practices Breaches in environmental cleaning and disinfection practices	All patients who received dialysis in this facility since 2005 were notified for screening
Outpatient hemodialysis facility (44)	2008	NY	657	9	Failure to consistently change gloves and perform hand hygiene between patients. Breaches in environmental cleaning and disinfection practices	All patients who received dialysis in this facility since 2004 were notified for screening
Totals			***3,026***	***102***		

1 The number of persons notified for screening is dependent upon information and resources available at the time of investigation and may underestimate the total number of individuals at risk.

2 Outbreak-associated HBV and HCV infections are defined as those with epidemiologic evidence supporting healthcare related transmission and include patients/residents identified with acute infection, or previously undiagnosed chronic infections with epidemiologic evidence indicating that

these were likely outbreak-related incident cases that progressed from acute to chronic. Patients/residents identified as likely (previously infected) sources for transmission are not included. In the outbreak investigation setting case definitions are based on laboratory profile and clinical evidence rather than CDC surveillance case definitions which may omit asymptomatic cases.
Acute HBV is typically defined as having a positive hepatitis B surface antigen and positive IgM core antibody, or positive surface antigen and negative total core antibody (early infection). Chronic HBV is typically defined as having a positive hepatitis B surface antigen, positive total core antibody and negative IgM core antibody. There are no serologic markers to differentiate between acute and chronic HCV infection; defining an infection as possible healthcare transmission is dependent upon epidemiologic evidence along with a new finding of hepatitis C antibody and/or RNA positivity in a person not previously known positive (whether or not symptoms or alanine aminotransferase [ALT] elevation are present).

3 All modes of transmission are patient-to-patient unless otherwise indicated.

4 One additional healthcare facility outbreak was reported during 2009, in an Illinois psychiatric long term care facility with 8 outbreak-related hepatitis B cases among 180 residents screened, and an additional three cases of chronic HBV infection detected at the time of screening. The likely mode of transmission was sexual contact, though other behavioral risk factors such as illicit drug use could not be ruled out.
Source: Jasuja S, Thompson N, Peters P et al. Investigation of hepatitis B virus and human immunodeficiency virus transmission among severely mentally ill residents at a long term care facility. PLoS ONE 2012; 7: e43252.
http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0043252

References:

1. Unpublished data, Pennsylvania Department of Health, 2016

2. Unpublished data, Pennsylvania Department of Health, 2014

3. Unpublished data, Los Angeles County Department of Public Health, 2014

4. Centers for Disease Control and Prevention. Notes from the Field – Ongoing transmission of HBV among ALF residents despite ongoing public health efforts, Virginia 2012. Morbid Mortal Weekly Rpt 2013, 62(19);389-389.

5. Centers for Disease Control and Prevention. Multiple Outbreaks of Hepatitis B Virus Infection Related to Assisted Monitoring of Blood Glucose Among Residents of Assisted Living Facilities — Virginia, 2009-2011 MMWR 2012; 61: 339-343.

6. Unpublished data, Los Angeles County Department of Public Health, 2011.

7. Bancroft E, Hathaway S. Hepatitis B Outbreak in an Assisted Living Facility. Acute Communicable Diseases Program, Special Studies Report 2010, Los Angeles County Department of Public Health, pages 41-44.

8. Centers for Disease Control and Prevention. Deaths from acute hepatitis B virus infection associated with assisted blood glucose monitoring in an assisted-living facility — North Carolina, August–October 2010. MMWR 2011; 60: 182.

9. Zheteyeva Y, Tosh P, Patel P, Martinez D, Kilborn C, Awosika-Olumo D, Khuwaja S, Ibrahim S, Ryder A, Tohme R, Khudyakov Y, Thai H, Drobeniuc J, Heseltine G, Guh A. Hepatitis B outbreak associated with a home health care agency serving multiple assisted living facilities in Texas, 2008-2010. American Journal of Infection Control 2014; 42: 77-81.

10. Bender TJ, Wise ME, Utah O, Xing J, Moorman AC, Sharapov UM, Drobeniuc J, Khudyakov Y, Fricchione M, White-Comstock MB, Thompson N, Patel PR. Outbreak of Hepatitis B Virus Infections Associated with Assisted Monitoring of Blood Glucose in an Assisted Living Facility — Virginia, 2010. PLoS One. 2012;7(12):e50012.

11. Seña A, Moorman A, Njord L, Williams R, Colborn J, Khudyakov Y, Drobenuic J, Xia G-L, Wood H, Moore Z. Acute hepatitis B outbreaks in two skilled nursing facilities and possible sources of transmission—North Carolina, 2009-2010. Infect Control Hosp Epidemiol 2013;34(7):709-716

12. Forero S, Alvarez J, Doyle T. Hepatitis B outbreak associated with home health care in South Florida. October 2010 Epi Update.

13. Counard C, Perz J, Linchangco P, et al. Acute hepatitis B outbreaks related to fingerstick blood glucose monitoring in two assisted living facilities. J Am Geriatr Soc 2010; 58:306-311.

14. Thompson ND, Perz JF, Moorman AC, Holmberg SD. Nonhospital health care-associated hepatitis B and C virus transmission: United States, 1998-2008. Ann Intern Med 2009;150:33-9.

15. Wise ME, Marquez P, Sharapov U, Hathaway S, et al. Outbreak of acute hepatitis B infections at a psychiatric long term care facility. Am J Infect Control 2012: 40: 16-21.

16. Radcliffe R, Bixler D, Moorman A, Hogan V, Greenfield V, Gaviria D, Patel PR, Schaefer M, Collins A, Khudyakov Y, Drobeniuc J, Cleveland J. Hepatitis B Virus Transmissions Associated with a Portable Dental Clinic, West Virginia, 2009. J Am Dent Assoc 2013 144: 1110-1118.

17. Unpublished data, South Carolina Department of Health and Environmental Control

18. Greeley RD, Semple S, Thompson ND, et al. Hepatitis B outbreak associated with a hematology-oncology office practice in New Jersey, 2009 Am J Infect Contr 2011; 39:663-70.

19. Enfield KB, Sharapov U, Hall K, et al. Transmission of hepatitis B virus to patients from an orthopedic surgeon. Presented at: 20th Annual Scientific Meeting of the Society for Healthcare Epidemiology of America (SHEA), Atlanta, Georgia, March 20, 2010.

20. Bancroft E, Hathaway S, Itano A. Pain Clinic Hepatitis Investigation Report. Acute Communicable Diseases Program, Special Studies Report 2010, Los Angeles County Department of Public Health, pages 33-36. http://publichealth.lacounty.gov/acd/HepInfo.htm
21. Unpublished data, Michigan Department of Community Health

22. New York City Department of Health and Mental Hygiene, unpublished data, 2011.

23. Hellinger WC, Bacalis LP, Kay RS, Thompson ND, Xia GL, Lin Y, Khudyakov YE, Perz JF. Health care–associated hepatitis C virus infections attributed to narcotic diversion. Ann Intern Med 2012; 156: 477-82.

24. Sanderson R, Atrubin D, Santiago A, et al. 2010. Hepatitis C outbreak at an outpatient infusion clinic- Hillsborough County, Florida 2009. APIC 2010 Annual Conference and Meeting. New Orleans, July 11-15, 2010.

25. Centers for Disease Control and Prevention. Investigation of Case Reports of Viral Hepatitis Infection Possibly Related to Healthcare Delivery: One Local Health Department's Approach. MMWR 2012; 61: 333-338.

26. Fischer G, Schaefer M, Labus B, et al. Hepatitis C virus infections from unsafe injection practices at an endoscopy clinic in Las Vegas, Nevada, 2007-2008. Clin Infect Dis 2010; 51:267-273.

27. Centers for Disease Control and Prevention. Acute hepatitis C virus infections attributed to unsafe injection practices at an endoscopy clinic — Nevada, 2007. MMWR 2008; 57: 513-517.

28. Southern Nevada Health District. Outbreak of hepatitis C at outpatient surgical centers, public health investigation report. December 2009.

29. Moore ZS, Schaefer MK, Hoffmann KK, Thompson SC, Guo-Liang X, Lin Y, et al. Transmission of hepatitis C virus during myocardial perfusion imaging in an outpatient clinic. Am J Cardiol. 2011;108:126-132.

30. Calles D, Collier M, Khudyakov Y, et al. Hepatitis C virus transmission in a skilled nursing facility, North Dakota, 2013. Am J Infect Control 2017; 45: 126-32.

31. State of New Hampshire. Hepatitis C Outbreak Investigation, Exeter Hospital, Public Report, June 2013. New Hampshire Department of Health and Human Services. Available on the New Hampshire Department of Health and Human Services website.

32. Unpublished data, Colorado Department of Health. Manuscript in preparation.

33. Unpublished data, CDC, 2014

34. Unpublished data, Washington State Department of Health, 2014

35. Muleta D et al. Notes from the Field: Hepatitis C Outbreak in a Dialysis Clinic — Tennessee, 2014. Morbid Mortal Wkly Rpts 2016 64 (50):1386-7. https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6450a5.htm

36. Nguyen D, Collier M, Moorman A, Khudyakov Y, Patel. Outbreaks of Hepatitis C Virus Infection in U.S. Hemodialysis Facilities, 2008–2014. KidneyWeek, San Diego, November 3-8, 2015

37. Jason Lake, Prathit Kulkarni, Jason Mehr, Duc Nguyen, Ellen Rudowski, Nicole Gualandi, Lindsay Hamilton, Joseph Forbi, Gilberto Vaughan, Guoliang Xia, Anne Moorman, Tina Tan, Priti Patel. Improving Infection Control in Hemodialysis Centers After Acute Hepatitis C Infections. National Kidney Foundation Spring Clinical Meeting 2016, Boston, MA, April 27 – May 1, 2016. Poster# 416

38. Manuscript in preparation, Philadelphia Department of Public Health.

39. Unpublished data, California Department of Public Health

40. Mbaeyi C. Outbreak of hepatitis C virus infections in an outpatient dialysis facility—Georgia, 2011. 61st Annual Epidemic Intelligence Service (EIS) Conference, Atlanta, April 16–20, 2012.

41. Janneh MD, Tran J, Cantu G, et al. Assessment of Hepatitis Screening and Infection Control in County Outpatient Hemodialysis Facilities. Presented at: 21st Annual Scientific Meeting of the Society for Healthcare Epidemiology of America (SHEA), Dallas, Texas, April 1, 2011. https://shea.confex.com/shea/2011/webprogram/Paper5086.html

42. Rao AK, Luckman E, Wise ME, MacCannell T, Blythe D, Lin Y, Xia G, Drobeniuc J, Noble-Wang J, Arudino MJ, Thompson ND, Patel PR, Wilson LE. Outbreak of hepatitis C virus infections at an outpatient hemodialysis facility: the importance of infection control competencies. Nephrology Nursing Journal 2013; 40(2), 101-110, 164.

43. New Jersey Department of Health and Senior Services, unpublished data, 2009.

44. Centers for Disease Control and Prevention. Hepatitis C virus transmission at an outpatient hemodialysis unit — New York, 2001–2008. MMWR 2009; 58:189-194.

45. Unpublished data, Pennsylvania Department of Health

46. Notes from the Field: Healthcare-associated Hepatitis C Virus Transmission in a Prolotherapy Clinic—California, 2015. Manuscript in preparation.

47. Unpublished data, Orange County California Department of Public Health

48. Coyle J, Goerge E, Kacynski K, Rodgers R, Raines P, Vail L, Lowhim S. Hepatitis C virus infections associated with unsafe injection practices at a pain management clinic, Michigan, 2014-2015. Pain Medicine 2017; 18: 322-9. https://academic.oup.com/painmedicine/article/18/2/322/2924725

49. Unpublished data, West Virginia Department of Public Health

50. Unpublished data, Utah Department of Public Health. Manuscript in preparation.

51. Jason Lake, Prathit Kulkarni, Jason Mehr, Duc Nguyen, Ellen Rudowski, Nicole Gualandi, Lindsay Hamilton, Joseph Forbi, Gilberto Vaughan, Guoliang Xia, Anne Moorman, Tina Tan, Priti Patel. Improving Infection Control in Hemodialysis Centers After Acute Hepatitis C Infections. National Kidney Foundation Spring Clinical Meeting 2016, Boston, MA, April 27 – May 1, 2016. Poster# 416

52. Unpublished data, Philadelphia Department of Public Health

53. Unpublished data, California Department of Public Health

54. Unpublished data, Pennsylvania Department of Health

55. McDonald R, Amler S, Southwick K, Clement E, Parker M, et al. Hepatitis C cluster in an alternative medicine practice- New York state, 2015-2017. Presented at: Council of State and Territorial Epidemiologists (CSTE) Annual Conference 2018, West Palm Beach, Florida, June 10-14. https://cste.confex.com/cste/2018/meetingapp.cgi/Paper/9169

Hepatitis B Immunization Guidelines

Use of Hepatitis B Vaccination for Adults with Diabetes Mellitus *(2011 update to 2006 guidelines below)*
https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6050a4.htm

A Comprehensive Immunization Strategy to Eliminate Transmission of Hepatitis B Virus Infection in the United States (2006)
https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5516a1.htm

Immunization of Health-Care Personnel. Recommendations of the Advisory Committee on Immunization Practices (ACIP)
https://www.cdc.gov/mmwr/preview/mmwrhtml/rr6007a1.htm?s_cid=rr6007a1_e

Infection Control Guidelines and Resources

Evidence-based infection prevention guidelines for healthcare settings including those for disinfection and sterilization, environmental cleaning, and hand hygiene available at: https://www.cdc.gov/hicpac/pubs.html

Injection safety resources available at:
https://www.cdc.gov/injectionsafety/providers.html
http://www.oneandonlycampaign.org/
Infection prevention resources for assisted monitoring of blood glucose available at:
https://www.cdc.gov/injectionsafety/blood-glucose-monitoring.html

Setting specific resources available at:

General Outpatient: https://www.cdc.gov/HAI/settings/outpatient/outpatient-settings.html

Outpatient Oncology: https://www.cdc.gov/HAI/settings/outpatient/basic-infection-control-prevention-plan-2011/index.html

Hemodialysis: https://www.cdc.gov/dialysis/provider/index.html

Long-term care: https://www.cdc.gov/HAI/settings/ltc_settings.html

Dental: https://www.cdc.gov/OralHealth/infectioncontrol/guidelines/index.htm and http://www.osap.org/?page=PortableMobile

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