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Outbreak of bacterial endocarditis associated with an oral surgery practice:

New Jersey public health surveillance, 2013 to 2014

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Abstract

Background.—In October and November 2014, the New Jersey Department of Health received reports of 3 patients who developed *Enterococcus faecalis* endocarditis after undergoing surgical procedures at the same oral surgery practice in New Jersey. Bacterial endocarditis is an uncommon but life-threatening condition; 3 patients with enterococcal endocarditis associated with a single oral surgery practice is unusual. An investigation was initiated because of the potential ongoing public health risk.

Methods.—Public health officials conducted retrospective surveillance to identify additional patients with endocarditis associated with the practice. They interviewed patients using a standardized questionnaire. An investigative public health team inspected the office environment, interviewed staff, and reviewed medical records.

Results.—Public health officials identified 15 confirmed patients with enterococcal endocarditis of those patients who underwent procedures from December 2012 through August 2014. Among these patients, 12 (80%) underwent cardiac surgery. One (7%) patient died from complications of endocarditis and subsequent cardiac surgery. Breaches of recommended infection prevention

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practices were identified that might have resulted in transmission of enterococci during the administration of intravenous sedation, including failure to perform hand hygiene and failure to maintain aseptic technique when performing procedures and handling medications.

Conclusions.—This investigation highlights the importance of adhering to infection prevention recommendations in dental care settings. No additional patients with endocarditis were identified after infection prevention and control recommendations were implemented.

Practical Implications.—Infection prevention training should be emphasized at all levels of professional dental training. All dental health care personnel establishing intravenous treatment and administering intravenous medications should be trained in safe injection practices.

Keywords

Endocarditis; Enterococcus faecalis; health care—associated outbreak; infection control; injection safety

Bacterial endocarditis is an uncommon but life-threatening condition[1] that occurs when bacteria in the bloodstream colonize and infect heart valves or the endocardium.[2] Bacteria can enter the bloodstream through direct portals (for example, central venous catheters) or from infections at various anatomic locations (for example, skin and soft tissue, oral cavity, gastrointestinal tract, and urinary tract).[3] In certain cases, bacterial endocarditis progresses slowly over months and can cause generalized symptoms, making the infection difficult to diagnose in some instances.[3]

Enterococci are part of the normal intestinal flora of humans and animals.[3] The genus *Enterococcus* consists of 35 recognized species; one of the most common species cultured from humans is *Enterococcus faecalis*.[3,4] Enterococci are a frequent cause of health care—associated infections. In US hospitals, enterococci are the second most common organism recovered from catheter-associated infections of the bloodstream and urinary tract, and from skin and soft-tissue infections.[5,6] The bacteria are hardy and can survive for substantial periods on environmental surfaces, contributing to their transmission.[3,7] Enterococci are usually spread by direct contact with hands, environmental surfaces, and medical equipment that have been contaminated by an infected or colonized person.[8]

The incidence rate of all patients with infective endocarditis in the United States is estimated to be 15 in 100,000 people per year; enterococci account for 5% to 15% of patients with endocarditis.[9,10] Therefore, an expected incidence rate of enterococcal endocarditis would be 1.5 patients per 100,000 per year; the number of patients with E. *faecalis* endocarditis would be even fewer. Enterococcal endocarditis is usually associated with gastrointestinal or genitourinary disease or invasive procedures involving these systems. Patients often have underlying medical conditions (for example, indwelling vascular or urinary catheters, active gastrointestinal or genitourinary disease, cancer, or receipt of dialysis).[9,11] Although *E. faecalis* has been implicated in endodontic infections, the organism is not a usual component of oral flora.[12,13]

In October 2014, in accordance with the New Jersey Department of Health (NJDOH) communicable disease reporting regulations, a New Jersey (NJ) infectious disease physician

notified the NJDOH Communicable Disease Service of a suspected health care—associated outbreak. Two people with no known risk factors received a diagnosis of *E. faecalis* endocarditis in October 2014 after undergoing oral surgical procedures at the same oral surgery practice in NJ in May and June 2014, respectively. In November 2014, NJDOH officials contacted representatives of the NJ Board of Dentistry (NJBOD), which regulates the practice of dentistry in the state, and investigators learned that NJBOD received an additional report of endocarditis associated with the same practice. The third patient had undergone an oral surgical procedure in December 2012 and received a diagnosis of *E. faecalis* endocarditis in January 2013.

Reports of these 3 patients prompted NJDOH to begin a public health investigation in conjunction with the local health department.

METHODS

Our investigation included assessing infection prevention practices and conducting surveillance to identify additional patients with enterococcal endocarditis of the patients treated at the oral surgery practice.

Infection control assessment: facility inspection and staff interviews

A multidisciplinary investigative team of medical and public health professionals was assembled, representing the local health department, NJDOH Communicable Disease Service, and the NJ Division of Consumer Affairs, representing NJBOD. Our team conducted 2 unannounced office inspections and environmental assessments in November 2014 and January 2015 that included inspecting medication and medical supply storage, medication preparation, and patient treatment areas; interviewing staff members about infection prevention practices; reviewing medical records and office documents; and examining regulated medical waste handling. We observed patient procedures and infection prevention practices during the initial site visit. We assessed infection prevention practices during the second site visit by observing staff members conducting mock procedures.

Surveillance: case finding, medical chart reviews, and patient interviews

To find additional patients with bacterial endocarditis, appointment records were initially obtained from the oral surgery practice to identify all patients who had visited the practice from January 1, 2013, through December 31, 2014. We chose this timeframe to include the calendar year of the site visit and the prior year. Appointment records before January 1, 2013, were unavailable.

Data from the NJ Discharge Data Collection System (NJDDCS), the state's electronic database for inpatient hospitalizations and emergency department visits, were matched with the appointment records by personally identifiable information (that is, name and date of birth) using a statistical software program (SAS 9.3, SAS). We identified patients of the oral surgery practice who were evaluated in an emergency department or hospitalized in NJ from January 1, 2013, through June 30, 2015. We chose this timeframe to capture any patients with procedure dates in 2014 who might not have developed symptoms until 2015.

We limited the list of patients generated by this matching process by selecting specific *International Classification of Diseases, Ninth Revision* (ICD-9)[14] diagnostic billing codes used for the health care encounters that were possible indicators of an enterococcal infection or endocarditis. We further investigated patients with 1 or more of the following ICD-9 codes: 421. (endocarditis), 041.04 (*Enterococcus*), 790.7 (bacteremia), 995.9 (sepsis), 038. (septicemia), 424. (other disease endocardium), or 528.3 (oral abscess). We reviewed medical records from the oral surgery practice and from health care facilities for all potential and reported patients with endocarditis. We obtained specific information about frequency of visits, types of procedures performed, and medications administered from the oral surgery practice's medical records.

We defined a confirmed case as a patient of the practice who received a diagnosis of infective endocarditis and documented *E. faecalis* bacteremia within 6 months after an oral surgical procedure at the practice, and no documentation of any additional risk factors for enterococcal bacteremia. A 6-month incubation period was chosen for the case definition because bacterial endocarditis can have mild to moderate symptoms that develop slowly and progress over weeks or months.[15]

We interviewed all patients who met the case definition using a standardized questionnaire to assess self-reported signs and symptoms (that is, fever, chills, fatigue, shortness of breath, achy or painful joints, cough, night sweats, muscle aches, weight loss, rash, and leg or ankle swelling), risk factors for endocarditis, and other potential sources of enterococcal infection.

After our initial retrospective surveillance for additional patients was conducted for the period January 2013 through December 2014, we conducted an additional case-finding investigation for the time period January 1, 2015, through December 31, 2015, in 2 ways. Initially, we matched and reviewed appointment records from the oral surgery practice for January 1, 2015 through December 31, 2015, and data from NJDDCS for January 1, 2015 through June 30, 2016, with the same process as described above. We obtained the additional 6 months of data from NJDDCS to capture any patients with procedure dates in 2015 who might not have developed symptoms until 2016. Second, NJDOH sent notification of the outbreak by email in March 2016 to health care providers through the NJ Local Information Network and Communication System Health Alert Network to capture any potential patients who may have received a diagnosis of enterococcal endocarditis with procedure dates after December 31, 2014. NJDOH also used e-mails and telephone calls to contact infectious disease specialists. NJDOH communications requested that these health care providers report patients with *E. faecalis* bacteremia or endocarditis if they had undergone an oral surgical procedure 6 months or less before symptom onset.

We calculated the incidence of enterococcal endocarditis among the total patient population for 2013, 2014, and 2013 through 2014. We used the number of unique patients who received care at the oral surgery practice during 2013, 2014, and 2013 through 2014 as the total patient population, which was derived from appointment records. We only counted a unique patient once, even if the patient had multiple visits. We excluded 1 patient with a procedure date in December 2012 from the incidence calculation because appointment records before January 1, 2013, were unavailable.

RESULTS

Infection control assessment: facility inspection and staff interviews

A single oral surgeon performed all procedures at the practice with at least 1 assistant in the room during procedures. Oral surgical procedures performed at the practice included extractions, biopsies, placement of oral implants, and bone grafting. Local anesthetics, inhaled nitrous oxide, and intravenous sedation were available for procedures. Appointment records documented that a median of 21 appointments were scheduled per day (range, 1–43) between January 1, 2013, and December 31, 2014.

Our assessment during the initial site visit identified multiple breaches of infection prevention practices recommended in the Centers for Disease Control and Prevention's (CDC) Guidelines for Infection Control in Dental Health Care Settings—2003 (also endorsed by the American Dental Association);[16] Guideline for Prevention of Surgical Site Infection, 1999;[17] Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings;[18] and Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008.[19] Breaches included failure to develop a written infection prevention program and have staff trained in infection prevention practices; failure to handle and store injectable medications properly (such as using single-use vials for multiple patients); failure to maintain sterility of products and instruments, maintain aseptic technique during procedures, and ensure a safe environment for care; failure to adequately monitor cleaning, disinfecting, and sterilization processes; and failure to use appropriate personal protective equipment. Detailed explanations of the infection control deficiencies identified are provided in Table 1.

As a result of these findings, infection prevention recommendations that adhere to CDC guidelines were provided to the oral surgery practice orally during the visit and subsequently in writing. In addition, the investigative team recommended that the facility immediately hire an infection preventionist to improve infection prevention practices and to assess staff competencies regarding infection prevention.

NJBOD retained external consultants for the second site visit. The external consultants had expertise in oral surgery and infection prevention specific to dental settings.

During this second site visit, investigators found that some infection prevention policies and procedures had changed since provision of recommendations during the first visit. Examples of these changes included relocating controlled substances and other injectable medications, including propofol, from the locked cabinet in the staff bathroom to a locked cabinet in the oral surgeon's private office; maintaining syringes and needles in packaging until the time of use; and purchasing single-use sterile adhesive dressings for securing intravenous catheters. Staff members also reported they no longer used single-use vials for more than 1 patient.

Despite these improvements, deficiencies in infection prevention practices were again noted. Recommendations that adhere to CDC infection control guidelines were reiterated orally and subsequently in writing. Examples of the infection prevention deficiencies noted during the second site visit are detailed in Table 2.

Surveillance: case finding, medical chart reviews, and patient interviews

Twelve additional confirmed patients with *E. faecalis* endocarditis were identified through initial retrospective surveillance conducted for January 1, 2013, through December 31, 2014, bringing the total of confirmed patients with *E. faecalis* endocarditis to 15 (Table 3). No additional patients with *E. faecalis* endocarditis were reported in response to the March 2016 NJ Local Information Network and Communication System Health Alert Network message and outreach to infectious disease physicians. No patients of the practice were identified who developed *E. faecalis* bacteremia without endocarditis. All patient isolates displayed sensitivity to the antibiotics tested by the treating facility, including ampicillin and vancomycin. Because the patients were identified retrospectively, the isolates were not available for molecular sequencing or matching.

All 15 patients underwent oral surgical procedures (for example, extractions, biopsies) with intravenous sedation at the practice from December 2012 through August 2014 (Figure 1). Eleven (73%) of the patients were male; median age at the time of the procedure was 46 years (mean, 41.8 years; range, 16–77 range). Eleven (73%) patients were younger than 60 years. The median number of days between the procedure date and the first positive *E. faecalis* blood culture collection date was 82 (mean, 87 days; range, 30–149 days).

Complete anesthesia and postoperative treatment records were available for 14 of 15 patients; the 14 patients received propofol and midazolam intravenously during their procedures. Other medications administered intravenously in different combinations included dexamethasone, metoclopramide, glycopyrrolate, ketamine, and fentanyl. No patients with endocarditis were identified among patients who underwent oral surgical procedures with local anesthetics, and without intravenous sedation.

Ten patients (67%) had documentation in hospital records of underlying medical conditions that might have placed them at increased risk of developing bacterial endocarditis. Among the 10, 2 had undiagnosed bicuspid aortic valves, 1 had undiagnosed partial anomalous pulmonary venous return, 3 had undiagnosed mitral valve prolapse, 2 had known mitral valve prolapse, 1 had known aortic insufficiency, and 1 had known aortic stenosis. Although these patients had conditions that might have placed them at increased risk, none of the 15 patients had a cardiac condition for which antimicrobial prophylaxis is specifically recommended before dental procedures.[1,20] No patient had any identified underlying illnesses at the time of diagnosis that placed him or her at increased risk of developing enterococcal bacteremia (for example, the presence of indwelling vascular or urinary catheters, active gastrointestinal or genitourinary disease, cancer, or receipt of dialysis). Thirteen patients received a prescription for azithromycin after their procedures; the indication for antibiotic therapy was not noted in the medical record.

Twelve (80%) of the 15 patients underwent cardiac surgery as a consequence of their infections. Among these 12 patients, 8 (67%) underwent valve replacement, and the remaining 4 (33%) underwent valve debridement and repair. One (7%) patient died as a result of complications of endocarditis and subsequent cardiac surgery; this patient was younger than 60 years and had no underlying medical conditions.

Fourteen of 15 patients underwent oral surgical procedures at the oral surgery practice from 2013 through 2014. Incidence of enterococcal endocarditis among the total patient population at the oral surgery practice was 372.7 of 100,000 patients during 2013 through 2014 (Table 4).

Methods and results reported in this article were described in a final report issued by NJDOH in July 2016.[21]

DISCUSSION

In this report, we have described a prolonged outbreak of enterococcal endocarditis associated with an oral surgery practice. We are unaware of any other reports in medical literature describing similar prolonged outbreaks of enterococcal endocarditis.

Bacterial endocarditis after dental procedures is rare; however, when it does occur, it is most commonly caused by bacteria found in normal oral flora. Enterococci are not commonly a part of typical human mouth flora and are not commonly associated with bacteremia after oral surgery.[12,22–24] Enterococci are, however, a frequent cause of health care—associated infections, particularly in US hospitals.[5,6]

Outbreaks of bacterial, viral, parasitic, and fungal infections have been associated with injection safety and basic infection prevention practice breaches in other outpatient settings (for example, surgical centers; dental, oral surgery, pain management, oncology, radiology, and primary care clinics; and health fairs).[25–27]

Since implementation of CDC's Guidelines for Infection Control in Dental Health Care Settings—2003, there have been 3 published reports describing transmission of hepatitis B virus and hepatitis C virus in 2 outpatient oral surgery practices, and 1 temporary dental clinic. In these reports, investigators identified lapses in infection prevention practices but were not always able to link a specific lapse to a transmission event. Examples of lapses included failure to heat-sterilize dental handpieces between patients, lack of training related to bloodborne pathogens for volunteers, and unsafe injection practices.[28]

Aseptic technique refers to handling, preparing, and storing medications and injection equipment and supplies (for example, syringes, needles, and intravenous tubing) in such a manner as to prevent microbial contamination. Multiple breaches of aseptic technique were identified during this investigation that might have resulted in the introduction of *E. faecalis* into patients' bloodstreams during administration of intravenous sedation. Before infection prevention recommendations were implemented, controlled substances and other injectable medications, including propofol, were stored in a cabinet in a bathroom; environmental surfaces in a bathroom may be contaminated with gastrointestinal flora such as *Enterococcus*. Medications were drawn into syringes that were unwrapped well in advance of a procedure and stored in open boxes in a closet. These syringes were at times prepared greater than 24 hours before use, contrary to the recommended practice of administering medications from single-dose vials within 1 hour of preparation.[29] Single-use vials of medication, including propofol, were used for multiple patients. Single-dose medications typically lack antimicrobial preservatives and can become contaminated with microbes,

serving as a source of bacteremia if handled inappropriately.[17] Poor hand hygiene when handling medications was also noted.

Importantly, the bacterial transmission mechanism described above as the potential cause for this outbreak—that is, bacteremia introduced by improper medication storage or administration—is different than the usual mechanism thought to be associated with endocarditis after oral procedures, namely through bacteremia introduced by the disruption of mucosal surfaces in the oral cavity. Evidence to support the concept that contaminated medications or improper administration led to this outbreak includes multiple published reports of bacterial, viral, and fungal infections linked specifically to the administration of intravenous anesthetics, including propofol. Propofol, a lipid-based product, supports microbial growth and is only available as a single-use product.[30–36] Unless strict aseptic technique is followed when handling propofol, the product can be contaminated with bacteria. When the contaminated product is prepared in advance of the procedure, the bacteria can replicate and cause infection after injection. When used more than once, the contaminated vial serves as a source of infection for multiple patients. There are numerous reports of infections linked to the use of single-use vials of medication including propofol for multiple patients.[30–36] All 14 patients for whom complete oral surgery records were available received intravenous midazolam and propofol during their procedures; importantly, among patients who underwent oral surgical procedures without intravenous sedation, no patients with endocarditis were identified.

The expected incidence rate of enterococcal endocarditis caused by *E. faecalis* would be fewer than 1.5 patients per 100,000 a year. The incidence rate of enterococcal endocarditis among the total patient population at the oral surgery practice from 2013 through 2014 was more than 200 times the expected rate.

Nationally, 54% of patients with endocarditis caused by any organism are 60 years or older.[10] Most patients (73%) in this outbreak were younger than 60 years. None of the 15 patients had a high-risk condition for which antimicrobial prophylaxis was specifically recommended before dental procedures. Antimicrobial prophylaxis is recommended for patients at highest risk of developing endocarditis, including those with a history of infective endocarditis, a prosthetic heart valve, or other prosthetic material, certain types of congenital heart disease (not including partial anomalous pulmonary venous return), or cardiac valvulopathy after cardiac transplant.[1] Thirteen patients received a prescription for azithromycin after their procedures; most strains of *E. faecalis* are resistant to azithromycin.[37]

Preventing future outbreaks

CDC-recommended infection prevention and control practices are applicable to all settings in which health care is provided; however, outpatient settings sometimes fail to provide the infrastructure and resources to support infection prevention and surveillance activities and often lack regulatory oversight.[38–40] State professional boards that oversee dental professionals might also have different requirements regarding infection prevention and intravenous sedation.

The NJ Administrative Code mandates that, when providing dental services, all licensees and registrants must comply with CDC-recommended infection control practices for dentistry. The CDC Guidelines for Infection Control in Dental Health Care Settings—2003 provide guidance on infection prevention practices for dental professionals and represent the minimum standard of practice recommended for safe care in all dental settings.[16] In 2016, CDC published additional guidance, Summary of Infection Prevention Practices in Dental Settings: Basic Expectations for Safe Care;[41] this document summarizes infection prevention recommendations and expands on the 2003 guidelines, emphasizing the importance of infection prevention program administrative measures, infection prevention education and training, respiratory hygiene and cough etiquette, safe injection practices, and administrative measures for instrument processing. A checklist that can be used to monitor adherence to CDC recommendations is also provided.

Infection prevention training should be emphasized at all levels of professional training for all dental health care personnel.[16] All dental practices should have at least 1 staff member trained in infection prevention who is responsible for coordinating the practice's infection prevention program. All personnel should be trained in infection prevention practices on hire and should have ongoing education and oversight to ensure competency.[16] Training in safe injection practices is particularly important for all dental health care personnel but particularly for personnel who establish intravenous access and administer intravenous medications. Investigations from 2010 through 2014 conducted by public health authorities have documented incorrect uses of syringes, needles, and medication vials during routine health care procedures, such as administering injections, which have resulted in the transmission of infectious diseases.[27] Outbreaks related to unsafe injection practices indicate that certain health care personnel are either unaware of, do not understand, lack competency, or do not adhere to basic principles of infection prevention and aseptic techniques,[15] confirming the need for greater understanding and implementation of infection prevention recommendations.

Studies have shown that enrollment in educational courses and attendance at continuing dental education programs and professional meetings regarding infection prevention had positive effects on dentists' and oral surgeons' infection prevention practices.[42–46] Trainings that emphasize implementation of infection prevention practices are more effective when offered in different formats (for example, Internet-based learning, journal articles, and workshops).[47,48] Requiring continuing dental education credits for infection prevention specifically as a part of licensure or license renewal might be considered to ensure continued dissemination of national guidelines.

Investigation limitations

Use of administrative data for enhanced disease surveillance has inherent challenges. ICD is a complex diagnostic classification system, and the electronic databases that house these data are subject to data entry errors. The match between appointment records provided by the oral surgery practice and NJDDCS was performed by using a limited number of codes; patients whose illnesses were coded differently or who died without a coded diagnosis would not have been captured. In addition, if any patients sought care in another state, they

would not be captured by using this surveillance process. Because of these limitations, the number of patients affected in this outbreak might be greater than the 15 known to public health authorities.

NJBOD suspended the oral surgeon's license in August 2016 after a third site visit revealed continued deficiencies. As of the time of this writing, the suspension is pending a formal hearing at the State of New Jersey Office of Administrative Law.

CONCLUSIONS

This prolonged outbreak of enterococcal endocarditis in patients who received care at a single oral surgery practice remained undetected for approximately 20 months. Public health authorities were alerted to the outbreak by a physician who happened to treat 2 patients and recognize a common link. The investigation revealed a total of 15 patients with *E. faecalis* endocarditis that were likely associated with breaches in recommended infection prevention practices during the administration of intravenous sedation. This investigation highlights the importance of adherence to fundamental recommendations for preventing infections in dental care settings and the difficulties associated with detection of outbreaks, particularly in outpatient settings.

ABBREVIATION KEY

CDC	Centers for Disease Control and Prevention
ICD-9	International Classification of Diseases, Ninth Revision
NJ	New Jersey
NJBOD	New Jersey Board of Dentistry
NJDDCS	New Jersey Discharge Data Collection System
NJDOH	New Jersey Department of Health

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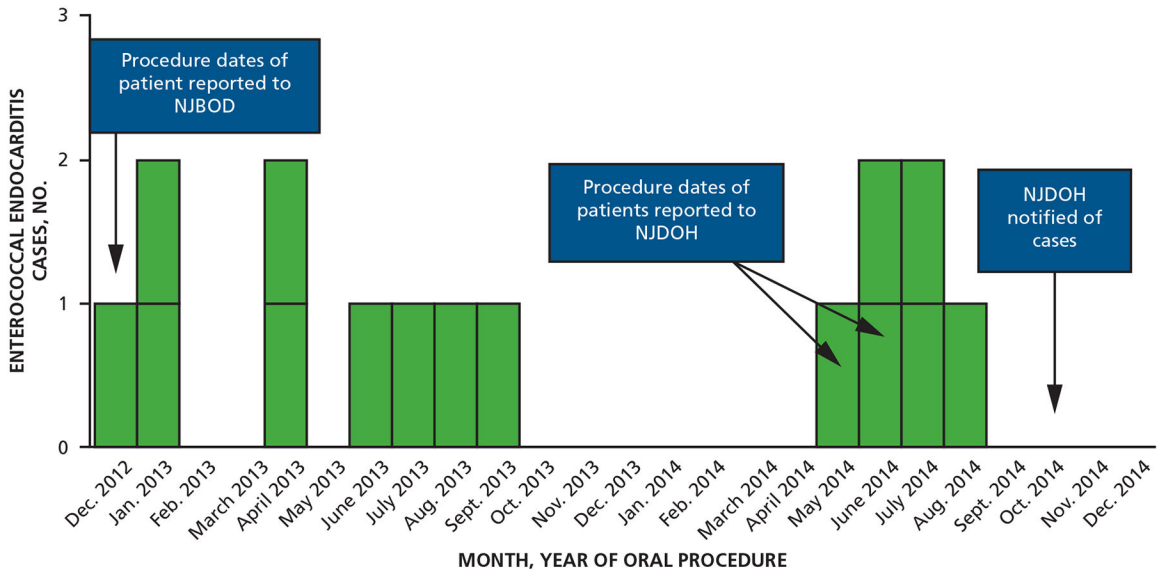

Figure.

Oral surgical procedure timeline, 2012–2014, of 15 patients including the 3 who were initially reported with enterococcal endocarditis diagnoses reported to New Jersey dental and health officials. NJBOD: New Jersey Board of Dentistry. NJDOH: New Jersey Department of Health.

Table 1.

Deviations from recommended infection prevention and safety recommendations identified in 2014 at a New Jersey oral surgery office with a cluster of enterococcal endocarditis cases.

CATEGORY	FINDINGS
Failure to Develop a Written Infection Control Program	• Staff members not adequately trained in infection prevention and instrument reprocessing • No existing job descriptions to document which staff members were responsible for various duties throughout the office
Improper Handling and Storage of Medications	• Single-dose vials of medication routinely used for more than 1 patient, including single-dose vials of propofol • Medication drawn into syringes well in advance of procedures, at times greater than 24 hours • Multiple syringes filled with medication, including controlled substances located on countertops and in drawers in procedure rooms • Syringes labeled with only the name of the medication; date, time, concentration, and name of person preparing medication were not indicated • Multiple-dose vials of medication did not have beyond-use dates indicated on the vial to establish shelf life • No dedicated medication preparation room; multiple- and single-dose vials of medication were prepared for multiple patients in the immediate patient care area • Aseptic technique not followed when accessing medication vials; staff members reported using nonsterile gauze with alcohol from a pump-top dispenser to cleanse the vial's septum • Controlled substances stored in a locked cabinet within an unlocked employee bathroom • Staff members could not account for medication waste, including waste of controlled substances • Before procedures, staff prepared medication packages for each patient; packages consisted of filled syringes with medications wrapped in gauze that might be needed during the procedure; these packages included filled syringes labeled as propofol, dexamethasone, midazolam, glycopyrrolate, and ketamine; and an unwrapped intravenous catheter
Failure to Maintain Sterility of Products and Instruments, to Maintain Aseptic Technique During Procedures, and to Ensure a Safe Environment for Care	• Syringes (with needles attached) and intravenous catheters removed from sterile packages and stored outside of packages well in advance of use; boxes of unwrapped syringes in the storage closet; unwrapped syringes and intravenous catheters in drawers in immediate patient care area • Instruments routinely removed from sterile pouches with nonsterile gloves, placed on nonsterile trays, and covered with nonsterile drapes or plastic; a stack of these trays was stored in a lower cabinet in immediate patient care area • Aseptic technique not followed when starting intravenous catheter; nonsterile gauze with alcohol from a pump dispenser used to wipe site before entry, entry site not covered with sterile dressing, catheter secured using nonmedical grade adhesive tape • Sterile gloves not used for oral surgical procedures • Surgical hand scrub not used for oral surgical procedures • Hand hygiene not routinely performed with soap and water; alcohol-based hand sanitizer not available • Tap water instead of the recommended sterile water used for irrigation during oral surgical procedures
Failure to Adequately Monitor the Cleaning, Disinfection, and Sterilization Process	• Staff members not adequately trained in instrument reprocessing • Time, temperature, and pressure not recorded for any load of sterilized instruments

CATEGORY	FINDINGS
	• Instruments improperly packaged for processing; hinged instruments placed in pouches in the closed position, pouches overstuffed, and sharp instruments punctured pouches
	• Biologic testing typically conducted monthly or bimonthly, unless sterilizer failed the test, prompting more frequent testing
	• No policies or procedures to track and recall loads if a biologic indicator failed
	• No preventive maintenance of the sterilizer
	• Staff members did not wear appropriate personal protective equipment (gloves, mask, or eye protection) when reprocessing instruments
Failure to Use Appropriate Personal Protective Equipment and Other Protective Devices	• Staff members routinely wore eye protection without solid side shields
	• Staff members did not wear procedure gowns
	• Staff members wore scrubs with exposed arms during procedures
	• Needles and other sharp devices used for intraoral and intravenous procedures lacked safety features (for example, intravenous catheter)

Table 2.

Deviations from recommended infection prevention and safety recommendations identified in 2015 at a New Jersey oral surgery office with a cluster of enterococcal endocarditis cases.

CATEGORY	FINDINGS
Failure to Develop a Written Infection Control Program	• Staff members not adequately trained in infection prevention and instrument reprocessing • No existing job descriptions to document which staff members were responsible for various duties throughout the office
Improper Handling and Storage of Medication	• Multiple-dose vials of medication did not have beyond-use dates indicated on the vial to establish shelf life • Multiple-dose vials of medication prepared for multiple patients in immediate patient care area • Nonsterile alcohol swabs marketed for home use available for use • Medication and other patient care materials stored in kitchen refrigerator with food
Failure to Maintain Sterility of Products and Instruments, to Maintain Aseptic Technique During Procedures, and to Ensure a Safe Environment for Care	• Unwrapped intravenous catheters in immediate patient care area • Instruments were removed from sterile pouches and handled with nonsterile gloves before use; gloves that were worn were used to handle items in the environment • Hand hygiene not routinely practiced before donning gloves and after removing gloves • Surgical hand scrub not used for oral surgical procedures • Nonsterile alcohol swabs marketed for home use available for use with intravenous catheter sites that should be prepped using sterile alcohol swabs • One tourniquet re-used for surgical patients within procedure room; staff members reported cleaning this tourniquet with CaviCide (Metrex) between patients, although it contained a hard-to-clean Velcro-type section; this item was placed on a tray with sterile items for starting the intravenous catheter • A drawer within laboratory area contained unwrapped metal impression molds
Failure to Adequately Monitor the Cleaning, Disinfection, and Sterilization Process	• Staff members improperly packaged instruments for processing; instruments placed in a single pouch with some pouches too small for instruments
Failure to Use Appropriate Personal Protective Equipment and Other Protective Devices	• Staff members routinely wore eye protection without solid side shields • Staff members did not wear procedure gowns • Staff members wore scrubs with exposed arms during procedures • Needles and other sharp devices used for intraoral and intravenous procedures lacked safety features (for example, intravenous catheter)

Table 3.

Characteristics of endocarditis cases associated with a New Jersey oral surgery office with a cluster of enterococcal endocarditis cases.

PATIENT DEMOGRAPHICS	**N = 15 (%)**
Male	11 (73)
Age	
< 30 years of age at time of procedure	7 (47)
≥ 30 and < 60 years of age at time of procedure	4 (27)
≥ 60 years of age at time of procedure	4 (27)
Dental Treatment Provided	
Extraction	13 (87)
Biopsy	2 (13)
Medications Received	
Intravenous sedation	15 (100)
Propofol *	14 (100)
Midazolam *	14 (100)
Number of Days Between Procedure and Positive Blood Culture	
Median	82
Range	30–149
Patient Outcomes	
Postinfection cardiac surgery	12 (80)
Valve replacement	8 (53)
Valve debridement and repair	4 (27)
Death	1 (7)

* Data available for only 14 of the 15 patients.

Table 4.

Incidence rates of enterococcal endocarditis in 2013 and 2014 at a New Jersey oral surgery office with a cluster of cases.

YEARS	NO. OF CASES	NUMBER OF UNIQUE PATIENTS	INCIDENCE PER 100,000 PATIENT POPULATION
2013	8	2,143	373.3
2014	6	1,954	307.0
2013–2014	14	3,756	372.7