

Table 1. Summary of multivariable conditional logistic regression model with significant bivariate factors.

Variable	OR (95% CI)	P-value
Total parenteral nutrition ¹	-	-
Central venous access	6.85 (3.17, 14.83)	<0.001
Pancreatic disease	2.47 (1.16, 5.24)	0.019
Invasive procedure	1.33 (0.70, 2.53)	0.386
H2 blockers	1.89 (0.87, 4.11)	0.106
Antibiotic use	5.56 (1.46, 21.12)	0.012
Antifungal use	7.02 (3.57, 13.84)	<0.001

¹TPN was excluded from the multivariable analysis due to independent correlation with CVA

antibiotic use, immunosuppression, and antifungal use. Bivariate conditional logistic regression models were used to study the association of individual factors with candidemia. Multivariable conditional logistic regression models were performed using factors with a P **Results:** Overall, 101 patients with candidemia and 505 matched controls were included. In the bivariate analysis, associations were detected between candidemia and TPN, CVA, pancreatic disease, invasive procedures, H₂ blocker use, antibiotic use, and antifungal use (all Ps **Conclusions:** Associations of candidemia with recent antifungal use and pancreatic disease were relatively novel findings. Neutropenia was not an independent risk factor for candidemia in this study. Future directions include further evaluations of previous antifungal use in patients with candidemia to identify opportunities for possible intervention and antifungal stewardship.

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Subject Category: Outbreaks

Management of a large tuberculosis contact investigation related to a contaminated bone graft product used in spinal surgery

Marci Drees; Lija Gireesh; Carol Briody; Charlotte Miller; Emily Hanlin; Ruoran Li; William Wilson; Noah Schwartz; Isaac Benowitz; Janet Glowicz and Tabe Mase

Background: In March–April 2021, 23 patients at a 906-bed hospital in Delaware had surgical implantation of a bone graft product contaminated with *Mycobacterium tuberculosis*; 17 patients were rehospitalized for surgical site infections and 6 developed pulmonary tuberculosis. In May 2021, we investigated this tuberculosis outbreak and conducted a large, multidisciplinary, contact investigation among healthcare personnel (HCP) and patients potentially exposed over an extended period in multiple departments. **Methods:** Exposed HCP were those identified by their managers as present, without the use of airborne precautions, in operating rooms (ORs) during index spine surgeries or subsequent procedures, the post-anesthesia care unit (PACU) when patients had draining wounds, inpatient rooms when wound care was performed, and the sterile processing department (SPD) on the days repeated surgeries were performed. We created and assigned an online education module and symptom screening questionnaire to exposed HCP. Employee health services (EHS) instituted a dedicated phlebotomy station to provide interferon-γ release assay (IGRA) testing for HCP at ≥8 weeks after last known exposure. EHS managed all exposed HCP, including nonemployees (eg, private surgeons) via automated e-mail reminders, which were escalated through supervisory chains as needed until follow-up completion. The infection prevention team notified exposed patients, defined as those who shared semiprivate rooms with case patients with transmissible tuberculosis. The Delaware Division of Public Health performed IGRA testing. **Results:** There were 506 exposed HCP in ORs (n = 100), the PACU (n = 87), inpatient units (n = 140), the SPD (n = 54), and other locations (n = 122); 83% were employed by the health system. Surgical masks and eye protection were routinely used during patient care. All exposed HCP completed screening by December 17, 2021. Furthermore, 2 HCP had positive IGRAs without symptoms or chest radiograph abnormalities, indicating latent

tuberculosis infection, but after further review of records and interviews, we discovered that they had previously tested positive and had been treated for latent tuberculosis infection. In addition, 5 exposed patients tested negative and 2 remain pending. **Conclusions:** This large investigation demonstrated the need for a systematic process that encompassed all exposed HCP including nonemployees and incorporated administrative controls to ensure complete follow-up. We did not identify any conversions related to this outbreak despite high burden of disease in case patients and multiple exposures to contaminated bone-graft material and infectious bodily fluids without respirator use. Transmission risk was likely reduced by baseline surgical mask use and rapid institution of airborne precautions after outbreak recognition.

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Learnings from a *Cutibacterium acnes* pseudo-outbreak in pediatric neurosurgical patients

Felicia Scaggs Huang; Andrea Ankrum; Cincinnati Hospital; Zheyi Teoh; Joshua Courter; ; Mangano and Karin Bierbrauer, Josh

Background: *Cutibacterium acnes* is normal skin flora as well as a common culture contaminant. It can cause infections in the setting of sterile implants, although clinical presentations can be subtle. Differentiating true infection from sample contamination is challenging and has implications for patient care. We describe an investigation of a cluster of 7 hospitalized pediatric patients with *C. acnes* isolated from anaerobic cultures of cerebrospinal fluid (CSF) over 3 weeks at a quaternary-care children’s hospital. **Methods:** An outbreak response was coordinated between the infection prevention and control (IPC), microbiology, and neurosurgery teams. We defined a case as a hospitalized patient with *C. acnes* isolated from a CSF culture beginning in November 2020. We reviewed charts of all cases and CSF culture collection on all case units, transport to and processing at the microbiology laboratory, and the IPC team measured adherence for all processes. **Results:** There were 8 positive cultures in 7 cases from November 10 to 27, 2020. The median case age was 2 months (range, 0–119). Cases occurred on 4 different units. All positive patients had at least 1 implanted neurosurgical device used for CSF drainage. There were no clear commonalities in surgeon responsible for device placement, hardware type placed, or staff collecting CSF samples. A standard protocol for CSF collection was followed for all cases. Overall, 3 patients cleared cultures without intervention, 2 received oral antibiotics, and 2 underwent surgical removal of their device. Specimen processing was unchanged, although due to supply issues, an alternative anaerobic culture media (Anaerobic Systems, Morgan Hills, CA) was used for 6 weeks, during which all cases were identified. Compared to routine media, the alternative is known to enhance organism detection. The company reported no concerns for media contamination or *C. acnes* outbreaks. Once routine media

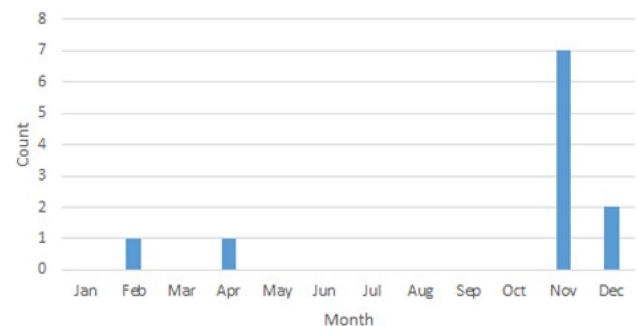


Fig. 1.

became available, CSF culture positivity for *C. acnes* returned to baseline (late November or early December) (Fig. 1). **Conclusions:** We identified a likely pseudo-outbreak related to temporary use of a more sensitive culture media. No direct patient harm was identified, although many had increased risk of harm by surgical intervention or prolonged length of stay. Technological advances may enhance organism identification but challenge existing paradigms of care. More studies are needed to better delineate the intersection of diagnostic advancements with patient care standards.

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Investigating a cluster of pediatric oncology invasive fungal infections—Lessons learned

Angelette Terk; Jennifer Ormsby; Paula Conrad; Catherine Svensson; David Barry; David Davis; Ana Vaughan Malloy and Tom Sandora

Background: In spring 2021, the infection prevention and control department at a pediatric academic medical center identified 3 oncology patients with concern for invasive *Rhizopus* spp infections. An in-depth investigation was conducted, but a common source of the fungus was not identified. In August 2021, an additional oncology patient with concern for invasive *Rhizopus* spp was identified, resulting in an extended investigation for possible sources of fungus. **Methods:** A multidisciplinary work group was assembled. The CDC Targeted Environmental Investigation Checklist for Outbreaks of Invasive Infections Caused by Environmental Fungi was used as a framework for conducting the investigation. Stakeholders were engaged throughout the process, including the hematology–oncology service, hospital leadership, environmental services, patient safety and quality, and facilities and engineering. The investigation included hospital incident command system (HICS) activation; visual inspection of patient rooms and common spaces; heating, ventilation, and air conditioning (HVAC) review; environmental sampling (surfaces, linen, and air); chart review; and process mapping. **Results:** By early October 2021, 2 environmental samples grew isolates (each at 1 CFU/m³) of the same species of *Rhizopus* as one of the affected patients. One sample was from a patient room, and the other from an outdoor garden space. No source of indoor amplification of *Rhizopus* was identified. The investigation revealed several opportunities for improvement: annual room maintenance schedules, use of gardens and outdoor spaces by at-risk patients, linen storage, construction and/or infection control risk assessment (ICRA) processes, and appliances used by families (eg, washing machines and refrigerators). Work streams were established to address each of these areas. **Conclusions:** No definite source was identified for the 4 invasive *Rhizopus* spp infections. This extensive investigation highlighted multiple opportunities for improvement; the changes implemented may prevent future invasive fungal infections in high-risk pediatric patients.

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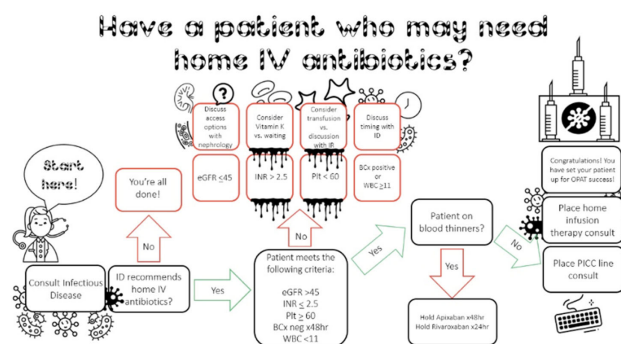
My patient needs home IV antibiotics—Now what? Assessing OPAT involvement at a Veterans’ Affairs hospital

Maddy Breeden; Elizabeth Scruggs; Payal Patel; Sarah Krein; Ronald Kendall; Andrea Starnes and Tracy Lopus

Background: Outpatient parenteral antimicrobial therapy (OPAT) involves the administration of intravenous antimicrobial therapy outside

the hospital. The literature suggests that inpatient providers are often unaware of OPAT programs and may not engage this multidisciplinary group in a timely fashion, leading to potentially inappropriate OPAT use. However, few studies have directly addressed this issue. We characterized current practices for coordinating OPAT and assessed provider understanding of OPAT services. We also conducted an exploratory analysis of placement of a peripherally inserted central catheter (PICC) consultation prior to an infectious disease (ID) consultation as a proxy for potentially avoidable OPAT use. **Methods:** This study was conducted between September and December 2021 at the Ann Arbor VA Healthcare System. All charts (n = 212) in which a consultation for a PICC was placed between January and September 2021 were reviewed, including free-text data entered by patient teams and inpatient progress notes in the days leading up to and following PICC consultation. Additionally, inpatient providers were surveyed using an online format regarding knowledge, utilization, and perceptions of OPAT. **Results:** Of the 212 charts reviewed, 108 patient encounters resulted in PICC placement; 80 (74.1%) were placed for the indication of home IV antibiotics. Of these, 3 (4.0%) had the PICC consult placed prior to the ID consultation. Of the 104 PICC consultations that were cancelled, 9 (8.7%) were cancelled because the ID staff did not recommend home IV antibiotics. Other reasons for cancellation included alternative device placement, duplicate order, referral to interventional radiology, failure to meet criteria, or unsuccessful placement. Of the 285 inpatient providers sent the electronic survey, 121 (46.9%) completed at least some portion. Overall, 17 respondents (14.0%) were familiar with the acronym OPAT; however, only 10 were able to expand the acronym correctly. Of the 118 respondents asked about their familiarity with the OPAT program at the local institution, 98 (83.1%) were not familiar at all or were only slightly familiar with the program. In contrast, 7 respondents (6.0%) were very or extremely familiar with the OPAT program. **Conclusions:** Further education and structural interventions are necessary to improve inpatient providers’ awareness and early engagement of local OPAT programs to ensure appropriate OPAT use. An educational intervention with an informative flowchart diagramming the steps for engaging the OPAT team could raise

Figure A: Workflow of Outpatient Parenteral Antimicrobial Therapy at the Ann Arbor VA Healthcare System



What is OPAT?

Outpatient Parenteral Antimicrobial Therapy (OPAT) involves the administration of parenteral (intravenous) antimicrobial therapy without an overnight hospital stay. Patients are frequently transitioned to OPAT following an inpatient hospitalization.

Is there an OPAT program at the Ann Arbor VA?

The Ann Arbor Veterans Affairs Hospital has a multidisciplinary OPAT program, consisting of Infectious Disease (ID) physicians, ID pharmacists, ID nursing, vascular access nursing, social workers, and community care workers, that works to provide appropriate monitoring and follow up for Veterans discharged from inpatient hospitalizations with IV antibiotic therapy. This team is crucial to ensure safety and appropriate follow up in the outpatient setting!