

= 9, 26%), and surgery (n = 5, 15%). Patient were notified and offered testing in at least 6 investigations (18%) . Interventions included product removal, healthcare provider alerts, patient notification and testing, modification of injection safety practices and other general infection control practices, correction of improper storage and handling, and changes in product design, manufacturing processes, or instructions for use. **Conclusions:** Public health investigations identified intrinsic and extrinsic contamination of medications, devices, and other products as a cause of healthcare-associated infections. Healthcare facilities should consider contaminated products in investigations of healthcare-associated infections, take steps to identify local infection control concerns, and alert public health authorities to events that could suggest widespread contamination.

Funding: None

Disclosures: None

Doi:10.1017/ice.2020.508

Presentation Type:

Oral Presentation

Development and Evaluation of a Structured Tool to Assess the Preventability of Hospital-Onset Bacteremia and Fungemia

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Background: Hospital-onset bacteremia and fungemia (HOB) may be a preventable hospital-acquired condition and a potential healthcare quality measure. We developed and evaluated a tool to assess the preventability of HOB and compared it to a more traditional consensus panel approach. **Methods:** A 10-member healthcare epidemiology expert panel independently rated the preventability of 82 hypothetical HOB case scenarios using a 6-point Likert scale (range, 1= “Definitively or Almost Certainly Preventable” to 6= “Definitively or Almost Certainly Not Preventable”). Ratings on the 6-point scale were collapsed into 3 categories: Preventable (1–2), Uncertain (3–4), or Not preventable (5–6). Consensus was defined as concurrence on the same category among $\geq 70\%$ expert raters. Cases without consensus were deliberated via teleconference, web-based discussion, and a second round of rating. The proportion meeting consensus, overall and by pre-defined HOB source attribution, was calculated. A structured HOB preventability rating tool was developed to explicitly account for patient intrinsic and extrinsic healthcare-related risks (Fig. 1). Two additional physician reviewers independently applied this tool to adjudicate the same 82 case scenarios. The tool was iteratively revised based on reviewer feedback followed by repeat independent tool-based adjudication. Interrater reliability was evaluated using the Kappa statistic. Proportion of cases where tool-based preventability category matched expert consensus was calculated. **Results:** After expert panel round 1, consensus criteria were met for 29 cases (35%), which increased to 52 (63%) after round 2. Expert consensus was achieved more frequently for respiratory or surgical site infections than urinary tract and central-line-associated bloodstream infections (Fig. 2a). Most likely to be rated preventable were vascular catheter infections (64%) and contaminants (100%). For tool-based adjudication, following 2 rounds of rating with interim tool revisions, agreement between the 2 reviewers was 84% for cases overall (κ , 0.76; 95% CI, 0.64–0.88], and 87% for the 52 cases with expert consensus (κ , 0.79; 95% CI, 0.65–0.94). Among cases with expert consensus, tool-based rating matched expert consensus in 40 of 52 (77%) and 39 of 52 (75%) cases for reviewer 1 and reviewer 2, respectively. The proportion of cases rated “uncertain” was lower among tool-based adjudicated cases with reviewer agreement (15 of 69) than among cases with expert consensus (23 of 52) (Fig. 2b).

		PREVENTABILITY RELATIVE TO EXTRINSIC HEALTHCARE-RELATED RISK		
		LOW	MEDIUM	HIGH
INTRINSIC RISK DUE TO UNDERLYING CONDITIONS (ACUTE ILLNESS AND CHRONIC CO-MORBIDITY)	LOW	Less likely Preventable than Not (4)	Moderately Likely to be or Probably Preventable (2)	Definitively or Almost certainly Preventable (1)
	MEDIUM	Moderately likely to be or Probably Not Preventable (5)	More Likely Preventable than Not (3)	Moderately Likely to be or Probably Preventable (2)
	HIGH	Definitively or Almost certainly Not Preventable (6)	Moderately likely to be or Probably Not Preventable (5)	More Likely Preventable than Not (3)

Figure 1. Preventability matrix for rating of HOB case scenarios. Examples of intrinsic risk conditions include desquamating skin condition (high), neutropenia (high), solid organ transplant >30 days prior (medium), and acute myocardial infarction (low). Examples of preventability relative to extrinsic healthcare-related risk include arterial catheter infection (high), pressure ulcers that develop or worsen during the hospital stay (high), mechanical ventilation complicated by pneumonia (medium), and infection following contaminated/dirty surgical procedures (low).

Fig. 1.

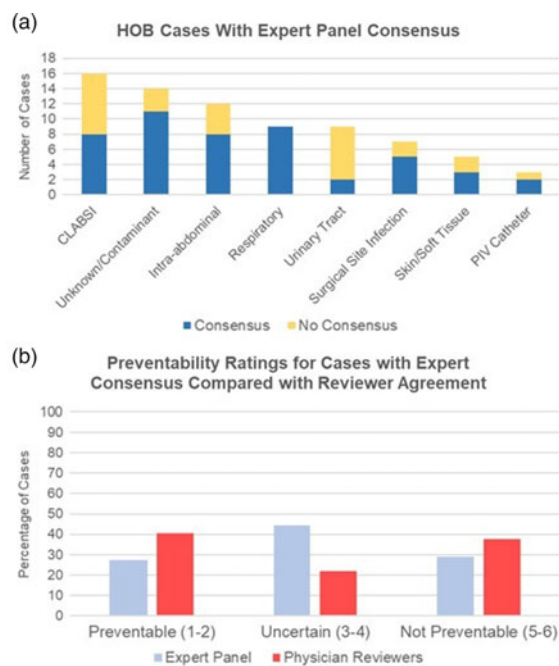


Figure 2. 2a. Pre-defined sources of HOB and associated ability of expert panel to achieve consensus on preventability rating. 2b. Distribution of preventability rating categories for cases that reached consensus among the expert panel (n=52) compared to cases with reviewer agreement (n=69). Abbreviations: HOB, Hospital-onset bacteremia and fungemia. CLABSI, Central line-associated bloodstream infection. PIV, peripheral intravenous

Fig. 2.

Conclusions: Healthcare epidemiology experts hold varying perspectives on HOB preventability. Structured tool-based preventability rating had high interreviewer reliability, matched expert consensus in most cases, and rated fewer cases with uncertain preventability compared to expert consensus. This tool is a step toward standardized assessment of preventability in future HOB evaluations.

Funding: None

Disclosures: None

Doi:[10.1017/ice.2020.509](https://doi.org/10.1017/ice.2020.509)

Presentation Type:

Oral Presentation

Development of an Electronic Algorithm to Target Outpatient Antimicrobial Stewardship Efforts for Acute Bronchitis

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Background: Antibiotic resistance has increased at alarming rates, driven predominantly by antibiotic overuse. Although most antibiotic use occurs in outpatients, antimicrobial stewardship programs have primarily focused on inpatient settings. A major

challenge for outpatient stewardship is the lack of accurate and accessible electronic data to target interventions. We sought to develop and validate an electronic algorithm to identify inappropriate antibiotic use for outpatients with acute bronchitis. **Methods:** This study was conducted within the University of Pennsylvania Health System (UPHS). We used ICD-10 diagnostic codes to identify encounters for acute bronchitis at any outpatient UPHS practice between March 15, 2017, and March 14, 2018. Exclusion criteria included underlying immunocompromising condition, other comorbidity influencing the need for antibiotics (eg, emphysema), or ICD-10 code at the same visit for a concurrent infection (eg, sinusitis). We randomly selected 300 (150 from academic practices and 150 from nonacademic practices) eligible subjects for detailed chart abstraction that assessed patient demographics and practice and prescriber characteristics. Appropriateness of antibiotic use based on chart review served as the gold standard for assessment of the electronic algorithm. Because antibiotic use is not indicated for this study population, appropriateness was assessed based upon whether an antibiotic was prescribed or not. **Results:** Of 300 subjects, median age was 61 years (interquartile range, 50–68), 62% were women, 74% were seen in internal medicine (vs family medicine) practices, and 75% were seen by a physician (vs an advanced practice provider). On chart review, 167 (56%) subjects received an antibiotic. Of these subjects, 1 had documented concern for pertussis and 4 had excluding conditions for which there were no ICD-10 codes. One received an antibiotic prescription for a planned dental procedure. Thus, based on chart review, 161 (54%) subjects received antibiotics inappropriately. Using the electronic algorithm based on diagnostic codes, underlying and concurrent conditions, and prescribing data, the number of subjects with inappropriate prescribing was 170 (56%) because 3 subjects had antibiotic prescribing not noted based on chart review. The test characteristics of the electronic algorithm (compared to gold standard chart review) for identification of inappropriate antibiotic prescribing were the following: sensitivity, 100% (161 of 161); specificity, 94% (130 of 139); positive predictive value, 95% (161 of 170); and negative predictive value, 100% (130 of 130). **Conclusions:** For outpatients with acute bronchitis, an electronic algorithm for identification of inappropriate antibiotic prescribing is highly accurate. This algorithm could be used to efficiently assess prescribing among practices and individual clinicians. The impact of interventions based on this algorithm should be tested in future studies.

Funding: None

Disclosures: None

Doi:[10.1017/ice.2020.510](https://doi.org/10.1017/ice.2020.510)

Presentation Type:

Oral Presentation

Direct Data Mining from the Electronic Medical Record to Assess and Improve Compliance With Infection Prevention Bundles

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Background: Bundles have been proven to reduce the risk of health-care-associated infections and to provide for rapid recognition and response for the best outcome in patients with sepsis. Each element alone does not provide the statistical significance that all elements together allow. Providing near real-time compliance with bundle measures to clinical staff can drive performance improvement with