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Session: O-17. Diagnostic Stewardship

Background: Although antibiotic stewardship programs (ASPs) have had success in curtailing inappropriate antibiotic use, they remain time- and labor-intensive. To expand the reach of ASPs, approaches to more efficiently target ASP efforts are urgently needed. We developed and validated an electronic algorithm to identify inappropriate antibiotic use in patients hospitalized with community-acquired pneumonia (CAP).

Methods: Within the Hospital of the University of Pennsylvania (HUP) and Penn Presbyterian Medical Center (PPMC), we used ICD-10 diagnostic codes to identify inpatient patient encounters for pneumonia between 3/15/17 – 3/14/18 for which patients received a systemic antibiotic in the first 48 hours of hospitalization. Exclusion criteria included transfer from another facility, intensive care unit admission or death in first 48 hours, immunocompromising condition, or specific comorbidities. We randomly selected 300 subjects (150-HUP, 150-PPMC). Inappropriateness of antibiotic use based on chart review served as the basis for assessment of the electronic algorithm which was constructed using only data in the electronic health record (EHR). Criteria for appropriate prescribing, choice of antibiotic, and duration of therapy were based on established hospital and IDSA guidelines.

Results: Of 300 subjects, median age was 60, 53% were female, and median hospital stay was 4.25 days. Of the 300 subjects, 237 (79%) were admitted to general medicine, hospitalist, family medicine, or geriatrics services. On chart review, 295 (98%) subjects were correctly diagnosed with CAP. Of these subjects, the choice of initial antibiotic(s) was appropriate in 263 (89%). Of these 263 subjects, 222 (84%) had an appropriate duration of therapy. Test characteristics of the EHR algorithm (compared to chart review) are noted in the *Table*.

Conclusion: An electronic algorithm for identifying inappropriate prescribing, antibiotic choice, and duration is highly accurate for patients hospitalized for CAP. This algorithm could be used to efficiently target ASP initiatives. The impact of interventions based on this algorithm should be tested in future studies.

Test Characteristics of Electronic Algorithm for Inappropriate Prescribing, Agent, and Duration

Test Characteristic	Value
Inappropriate Prescribing	
Sensitivity	100% (5/5)
Specificity	100% (295/295)
Positive Predictive Value	100% (5/5)
Negative Predictive Value	100% (295/295)
Inappropriate Agent	
Sensitivity	100% (32/32)
Specificity	96% (253/263)
Positive Predictive Value	76% (32/42)
Negative Predictive Value	100% (253/253)
Inappropriate Duration	
Sensitivity	100% (41/41)
Specificity	89% (190/212)
Positive Predictive Value	65% (41/63)
Negative Predictive Value	100% (190/190)

Disclosures: **All Authors**: No reported disclosures

90. Incidence and Risk Factors for Inappropriate Use of Non-culture Based Fungal Assays: Implication for Diagnostic Stewardship

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Session: O-17. Diagnostic Stewardship

Background: Culture-based diagnostic tests are the gold standard for diagnosing invasive fungal diseases (IFDs). Because these tests have low sensitivity, non-culture-based fungal assays (NCBFAs) have been used increasingly to help diagnose IFDs. However, little is known about inappropriate use of NCBFAs. We aimed to investigate inappropriate use of NCBFAs in a tertiary academic hospital in Tokyo, Japan.

Methods: This retrospective cohort study included all patients who underwent testing with beta-D glucan (BDG) between January and March 2018, or galactomannan antigen (GMA) or cryptococcal antigen (CRAG) between January and June 2018. Patients who had received hematopoietic stem cell or solid organ transplantations were excluded. Appropriateness was assessed according to the previously published study. We compared patients with appropriate and inappropriate use of NCBFAs. Risk factors for inappropriate use were evaluated using multivariate logistic regression analysis.

Results: Of 1,140 patients (BDG, 1,009; GMA 273; CRAG, 310) who underwent tests, 470 patients (BDG, 394; GMA, 138; CRAG, 164) were included in this study. Four hundred thirty-eight patients (93.2%) were aged 18 or older. About 80% of NCBFAs (BDG, 334 patients [74.8%]; GMA, 117 patients [74.8%]; CRAG, 146 patients [89.0%])

were deemed inappropriate. The factors associated with inappropriate NCBFAs use included specialties of ordering physicians, risk factors for fungal infections, and recommendation from infectious disease physicians (Table). Sixty-four patients (13.6%) underwent three inappropriate NCBFAs simultaneously. Furthermore, during the study period, 408 patients (35.8%) with inappropriate NCBFAs underwent the same assays repeatedly during the study period; 643 times for BDG, 163 times for GMA, and 192 times for CRAG.

The Factors Associated with Inappropriate Use of Non-Culture Based Fungal Assays

Beta–D glucan	OR	95%CI
Transplant medicine*	4.7	1.1–19.9
Neutrophil >500 / μL	238	40.2–1,400
Use of enteral or oral nutrition	191	50.2–728
Without chronic obstructive pulmonary disease	13.1	2.6–66.3
Without high dose glucocorticoid† or immunosuppressants	7.7	2.7–22

Galactomannan antigen	OR	95%CI
Recommendation from ID physician	0.06	0.007–0.6
Without high dose glucocorticoid† or immunosupprsants	30	4.5–202

Cryptococcal antigen	OR	95%CI
Recommendation from ID physician	0.04	0.003–0.6
Without high dose glucocorticoid† or immunosuppressants	9.6	2.9–31.5

* Transplant surgery, hematology, and pediatric hematology
† ≥ 20 mg prednisone equivalents daily for four or more weeks
OR = odds ratio, CI = confidential interval, ID = infectious diseases

Conclusion: We found a large proportion of NCBFAs were deemed inappropriate and it was mostly driven by ordering physicians who generally care for transplant patients. Because inappropriate use of NCBFAs could lead to additional inappropriate tests and treatment with substantial costs to patients and health systems, diagnostic stewardship targeting NCBFAs is urgently needed.

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91. Development of an Electronic Algorithm to Identify Inappropriate Antibiotic Prescribing for Pediatric Otitis Media

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Session: O-17. Diagnostic Stewardship

Background: Antibiotic stewardship (AS) interventions have primarily focused on acute care settings. The majority of antibiotic use, however, occurs in outpatients. The electronic health record (EHR) might provide an effective and efficient tool for outpatient AS. We aimed to develop and validate an electronic algorithm to identify inappropriate antibiotic use for pediatric outpatients with acute otitis media (AOM).

Methods: Within the Children's Hospital of Philadelphia (CHOP) Care Network, we used ICD-10 diagnostic codes to identify patient encounters for AOM at any CHOP practice between 3/15/17 – 3/14/18. Exclusion criteria included underlying immunocompromising condition, comorbidities, and concurrent infections that might influence antibiotic use. We randomly selected 450 eligible subjects (150 each from academic practices, non-academic practices, and urgent care). Inappropriate antibiotic use based on CHOP and professional society guidelines were assessed via chart review and served as the basis for assessment of the electronic algorithm which was constructed using only data in the electronic health record (EHR). Criteria for appropriateness focused on the decision to prescribe, the choice of antibiotic, and duration of therapy.

Results: Of 450 subjects, median age was 2, 46% were female, and 88% were evaluated by a physician (vs. advanced practice provider). On chart review, the prescribing decision was correct in 438 (97%), of which 25 appropriately received no antibiotics. Of the 413 subjects who were appropriately prescribed an antibiotic, the choice of antibiotic was appropriate in 37 (9%). Finally, of the 413 patients who were appropriately treated, 412 (99.7%) received the correct duration. Test characteristics of the EHR algorithm (compared to chart review) are noted in the Table.

Conclusion: For children with AOM, an electronic algorithm for identification of inappropriate antibiotic prescribing is highly accurate. This algorithm can also highlight for which elements of prescribing the impact of an intervention might be greatest (i.e., choice of agent). Future work should validate this approach in other health systems and geographic regions and evaluate the impact of an audit and feedback intervention based on this tool.

Table. Test Characteristics of Electronic Algorithm for Inappropriate Prescribing, Agent, and Duration

Test Characteristic	Value
Inappropriate Prescribing	
Sensitivity	92% (11/12)
Specificity	100% (438/438)
Positive Predictive Value	100% (11/11)
Negative Predictive Value	99% (438/439)
Inappropriate Agent	
Sensitivity	100% (37/37)
Specificity	99% (372/376)
Positive Predictive Value	90% (37/41)
Negative Predictive Value	100% (372/372)
Inappropriate Duration	
Sensitivity	100% (1/1)
Specificity	99% (410/412)
Positive Predictive Value	33% (1/3)
Negative Predictive Value	100% (410/410)

Disclosures: **All Authors**: No reported disclosures

92. Successful Scale-up of an Intervention to Decrease Unnecessary Urine Cultures Led to Improvements in Antibiotic Use

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Session: O-17. Diagnostic Stewardship

Background: We previously conducted a successful single-site intervention to improve compliance with antibiotic stewardship guidelines for asymptomatic bacteriuria (ASB). In this dissemination project we explored whether we could facilitate antibiotic stewardship for ASB at a distance, in four distant VA medical centers.

Methods: Each site champion received a decision-aid algorithm, interactive teaching based on actual cases, and support with data collection. The focus of the intervention was on teaching providers in acute and long-term care to avoid ordering unnecessary urine cultures. We measured DOT (days of antibiotic therapy), LOT (length of antibiotic therapy) and urine cultures ordered per 1,000 bed-days monthly in the intervention sites and four matched control sites. Both DOT and LOT captured all systemic antibiotics initiated on day -1 to +2 of a urine culture order. We conducted segmented regression analyses for the three outcomes for the intervention and control sites separately, and difference in differences analysis for urine cultures.

Results: Over the baseline and intervention years, 12,260 urine cultures were ordered in 6823 unique patients in the acute and long-term care wards at the 8 sites. During the baseline year, the average urine-culture related DOT was 45.1 and LOT was 34.7, per 1000 bed-days. Both DOT and LOT decreased significantly over the intervention period in the intervention sites (p < 0.05 for both); a significant decrease was not seen in the control sites (Figures 1 and 2). For urine cultures, at baseline the average number of cultures ordered per month per 1000 bed-days was 13.6. Both intervention and control sites saw a significant decrease in urine cultures over the baseline year. In the intervention year, urine cultures continued to decrease in the intervention sites (p=0.001) but increased in the control sites (Figure 3).

Figure 1. Days of Therapy (DOT) per 1,000 bed-days, for antibiotics started within -1 to +2 days of a urine culture
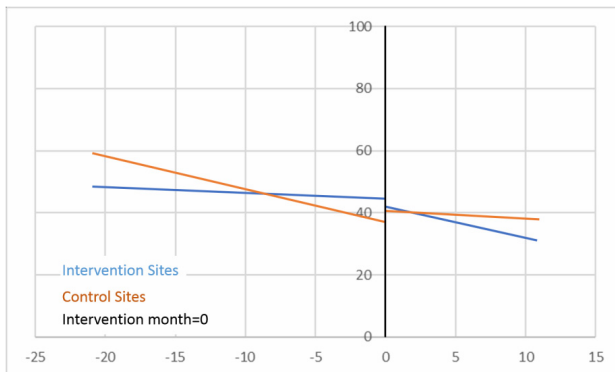

Figure 2. Length of Therapy (LOT) per 1,000 bed-days, for antibiotics started within -1 to +2 days of a urine culture
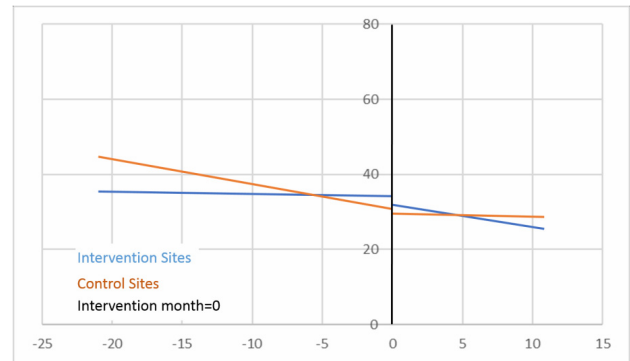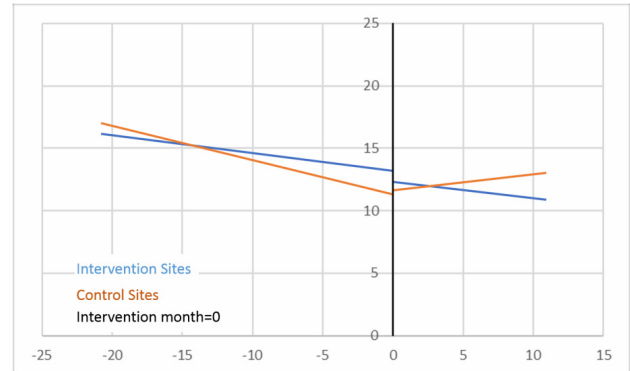

Figure 3. Urine Cultures per 1,000 bed-days

Conclusion: Our externally-facilitated intervention significantly decreased local antibiotic use (both DOT and LOT) and urine cultures. Unnecessary urine cultures are a major driver of unnecessary antibiotic use for ASB, and our focus on diagnostic stewardship for urine cultures led to antibiotic stewardship. Our next step will be to further disseminate our intervention to other VA facilities.

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93. Enhanced Oral Care as Prevention for Non-ventilator Hospital Acquired Pneumonia

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Hospital acquired pneumonia prevention: intervention, evaluation & research

Session: O-18. HAI Epidemiology and Prevention

Background: Non ventilator hospital-acquired pneumonia (NVHAP) is now the most common HAI. The purpose was to test primary source control through reduction of germs in the mouth as a modifiable risk factor for in NVHAP prevention.

Methods: The 12-month study (10/1/18–9/31/19) was conducted at an 800-bed tertiary medical center. 1 medical and 1 surgical unit were randomized to enhanced oral care (intervention) and matched with 1 medical and 1 surgical unit providing usual oral care (control). An American Dental Association oral care protocol was delivered by nurses/nursing assistants (Intervention) vs. usual care. Frequency of oral care was tracked. Pneumonia cases were identified using ICD-10 codes and confirmed using CDC criteria.

Results: For medical control (n=2059) v. intervention (n=2706), oral care/day increased from .96 to 2.2; there was an 85% reduction in NVHAP (1.41 to 0.21)/1000 patient days which was significant by Chi-square (p< 0.001), and Cramer's V effect size of 0.52. Using logistic regression, the odds of NVHAP were 7.1 times higher on the on the control unit v. intervention (OR:7.1 [CI 2.01:24.1] p=.002). For surgical control (n=2075) v. intervention (n=1830), oral care frequency/day increased from 1.2 to 2.1. There was a 56% reduction in NVHAP which was NS by Chi-square (p=.289), Cramer's V effect size of 0.02, and this group was underpowered to detect a difference (post hoc actual power=.61).

NVHAP demographics