

with syndrome-specific antimicrobial stewardship efforts.¹ We adapted and validated the performance of an inpatient CAP electronic phenotype for antimicrobial stewardship interventions. **Methods:** An automated scoring system was created within the EHR (Epic Systems) to identify hospitalized patients with CAP based on the variables and logic listed in Fig. 1B. We adapted a score used by the Michigan Hospital Medicine Safety Consortium (HMS) to identify patients with CAP, with additions made to improve sensitivity (Fig. 1).¹ The score can be displayed in a column within the EHR patient list (Fig. 2). We validated the electronic phenotype via chart review of all hospitalized patients on systemic antimicrobials admitted to a medicine team consecutively between November 8 and 18, 2021. Patients who were readmitted within the validation time frame were excluded. We assessed the performance of the electronic phenotype by comparing the score to manual chart review, where “CAP diagnosis” was defined as (1) mention of “pneumonia” or “CAP” as part of the differential diagnosis in the admission documentation, (2) antimicrobials were started within 48 hours of admission, and (3) radiographic findings were suggestive of pneumonia. After initial evaluation, the scoring system was

Figure 1: EHR Rules for identifying CAP at HMS vs. Stanford

A) HMS Rules

Rule 1: CAP Antibiotic* orders administered during encounter within 48 hours of admission
AND
Rule 2: Active order for a CAP Antibiotic ordered for a “pulmonary” indication
CAP EHR POSITIVE: IF Rule 1 AND Rule 2 present, THEN Positive

*CAP Antibiotic = ampicillin/sulbactam, azithromycin, cefepime, ceftriaxone, levofloxacin, moxifloxacin, piperacillin/tazobactam, vancomycin



B) Stanford adjusted Rules

Rule 1: CAP Antibiotic* orders administered during encounter within 48 hours of admission (Score = 100,000)
AND
Rule 2: Any ONE of the following criteria met:
Added Score for each rule:
Rule 2A 1 Active order for a CAP Antibiotic ordered for a “pulmonary” indication
Rule 2B 10 CAP Antibiotic ordered with an indication of “bloodstream infection” AND CXR† ordered that admission
Rule 2C 100 CAP Antibiotic ordered with indication of “other” AND CXR ordered
Rule 2D 1000 CAP Antibiotic ordered AND Positive respiratory culture*
Rule 2E 10,000 CAP Antibiotic ordered AND RVP* ordered
CAP EHR SCORE POSITIVE: Add scores from Rule 1 and Rule 2. If SUM >100,000, then Positive Score

*CAP Antibiotic = amoxicillin/clavulanate, ampicillin/sulbactam, azithromycin, cefepime, ceftriaxone, cefpodoxime, doxycycline, levofloxacin, meropenem, moxifloxacin, piperacillin/tazobactam, vancomycin

†CXR = Chest X-ray

*Positive Respiratory Culture = Respiratory culture marked as “abnormal result” in EHR. Note: respiratory cultures with growth of flora are not marked as “abnormal result” in Stanford’s EHR

†RVP = Respiratory Viral Panel; RT-PCR including influenza A/B, respiratory syncytial virus, parainfluenza 1/2/3/4, metapneumovirus, rhinovirus, adenovirus

Figure 2: CAP EMR Score in a Patient List

PAF - medicine/PAMF 137 Patients

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Bed	MRN	Patient	Treatment Team Primary	Antibiotics Stewardship	Active antibiotics	CAP Patients	Broad Spectr ABX DOT	Vanco Protoc DOT	SCr chang past 25% 96h	Dialys 96h	Creati	CrCl/Lat	SHC Admitting	Probab Diagn	Diagn	Infect	Hand	Text	My On ABX Slick ID since	Share List?	reviews
			Tt, Med Univ 5a - Pgr 26400	10	10	101,000	—	—	—	—	0.7 mg...	77.1 mL/min	—	Acute re... fail	Acute re... fail	A... fa...	Off abx lu...	N... only	—	—	—
			Tt, Med Univ 2b - Pgr 12023	10	10	100,001	—	—	—	—	0.4 mg...	ideal weight	—	C... (c... ob...	Pu... un...	P... C...	—	—	—	—	Never revi...
			Tt, Med Univ 5b - Pgr 26401	20	20	100,001	2	●	2	—	0.4 mg...	141.6 mL/min (A)	—	Hy...	Hy...	H...	—	—	—	—	Never revi...
			Tt, Med Univ 3b - Pgr 12087	10	10	100,001	—	—	—	—	0.5 mg...	ideal weight	—	Hy...	C... with ac...	C... with a...	—	—	—	—	Never revi...
			Tt, Med Univ 6a - Pgr 22231	10	10	100,001	—	—	—	—	1.2 mg...	40.8 mL/min (A)	—	C... with ac...	C... with ac...	C... with a...	will c... I...	—	—	—	—
			Tt, Pamf Med 3 - Pgr 23433	10	10	100,001	—	—	6	—	1.1 mg...	ideal weight	—	Hy...	Hy...	H... u... h...	O... with	—	—	—	Never revi...
			Tt, Med Univ 6a - Pgr 22231	11	10	100,001	—	—	3	—	0.7 mg...	ideal weight	—	Hy...	Hy...	H...	—	—	—	—	Never revi...
			Tt, Med Univ 3a - Pgr 25906	11	10	100,001	—	—	3	—	0.9 mg...	58.8 mL/min	—	Fever of un...	Alt... m... st...	Al... m... st...	—	—	—	—	Never revi...
			Tt, Med Univ 2a - Pgr 25903	21	20	100,001	—	—	—	—	0.5 mg...	59 mL/min (A)	—	C...	C...	C...	C...	—	—	—	Never revi...

Table 1: Validation of CAP “electronic phenotype”

“CAP” electronic phenotype	CAP Diagnosis on Clinical Chart Review			
		Yes	No	Total
	Positive	23	13	36
	Negative	1	154	155
	Total	24	167	191

adjusted, and performance was re-evaluated during prospective audit and feedback performed on EHR CAP-positive patients over 13 days between July 2022 and December 2022. **Results:** We included 191 patients in our initial validation cohort. The CAP score had high sensitivity (95.83%), specificity (92.2%), and negative predictive value (99.35%), though lower positive predictive value (63.89%) was noted (Table 2). The rules were further refined to include bloodstream infection only with *Haemophilus influenza* or *Streptococcus pneumoniae* in rule 2B, and azithromycin was removed from “CAP antibiotics.” After these changes, repeated evaluation of 88 patients with positive CAP EHR score was performed, and only 20 (23%) were considered false-positive results. **Conclusions:** Electronic phenotypes can be used to create automated tools to identify patients with CAP with reasonable performance. Data from this tool can be used to guide more focused antimicrobial stewardship interventions and clinical decision support in the future. **Reference:** Vaughn VM, et al. A statewide collaborative quality initiative to improve antibiotic duration and outcomes in patients hospitalized with uncomplicated community-acquired pneumonia. *Clin Infect Dis* 2022;75:460–467.

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Poster Presentation - Oral Presentation

Subject Category: Infection Control in Low- and Middle-Income Countries

Hyperendemic carbapenem-resistant *Acinetobacter baumannii* at a hospital in Botswana: Insights from whole-genome sequencing

Jonathan Stryko; Tefelo Thela; Janet Thubuka; Tichaona Machiya; Jack Mkubwa; Celda Tiroyakgosi; Moses Vurayai; Kgomo Kgomanyane; Tlhalefo Dudu Ntereke; Tshiamo Zankere; Kwana Lechiile; Teresia Gatonye; Chimwemwe Tembo; Naledi Betsi Mannathoko; Margaret Mokomane; Andries Feder; Melissa Richard-Greenblatt;

David Goldfarb; Carolyn McGann; Susan Coffin; Ebbing Lautenbach; Corrado Cancedda; Dineo Bogoshi; Anthony Smith and Paul Planet

Background: Carbapenem-resistant *Acinetobacter baumannii* (CRAB) has emerged as a major cause of bloodstream infection among hospitalized patients in low- and middle-income countries (LMICs). CRAB infections can be difficult to treat and are devastating in neonates (~30% mortality). CRAB outbreaks are hypothesized to arise from reservoirs in the hospital environment, but outbreak investigations in LMICs seldom incorporate whole-genome sequencing (WGS). **Methods:** WGS (Illumina NextSeq) was performed at the National Institute for Communicable Diseases (South Africa) on 43 preserved *A. baumannii* isolates from a 530-bed referral hospital in Gaborone, Botswana, from March 2021–August 2022. This included 23 blood-culture isolates from 21 unique patients (aged 2 days–69 years) and 20 environmental isolates collected at the 36-bed neonatal unit in April–June 2021. Infections were considered healthcare-associated if the culture was obtained >72 hours after hospital arrival (or sooner in inborn infants). Blood cultures were incubated using an automated system (BACT/ALERT, BioMérieux) and were identified using manual methods. Environmental isolates were identified using selective or differential chromogenic media (CHROMagar™). Taxonomic assignment, multilocus sequence typing (MLST), antimicrobial resistance gene identification, and phylogenetic analyses were performed using publicly accessible analysis pipelines. Single-nucleotide polymorphism (SNP) matrices were used to assess clonal lineage. **Results:** All 23 blood isolates and 5 (25%) of 20 environmental isolates were confirmed as *A. baumannii*; thus, 28 *A. baumannii* isolates were included in the phylogenetic analysis. MLST revealed that 22 (79%) of 28 isolates were sequence type 1 (ST1), including all 19 healthcare-associated blood isolates and 3 (60%) of 5 environmental isolates. Genes encoding for carbapenemases (*bla*NDM-1, *bla*OXA-23) and biocide resistance (*qacE*) were present in all 22 ST1 isolates; colistin resistance genes were not identified. Phylogenetic analysis of the ST1 clade demonstrated spatial clustering by hospital unit. Related isolates spanned wide ranges in time (>1 year), suggesting ongoing transmission from environmental sources (Fig. 1). An exclusively neonatal clade (0–2 SNPs) containing all 8 neonatal blood isolates was closely associated with 3 environmental isolates from the neonatal unit: a sink drain, bed rail, and a healthcare worker’s hand. **Conclusions:** WGS analysis of clinical and environmental *A. baumannii* revealed the presence of unit-specific CRAB clones, with evidence of ongoing transmission likely driven by persistent environmental reservoirs. This research highlights the potential of WGS to detect hospital outbreaks and reaffirms the importance of environmental sampling to identify and remediate reservoirs (eg, sinks) and vehicles (eg, hands and equipment) within the healthcare environment. **Disclosures:** None

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Subject Category: Long-term Care
Transmission of multidrug-resistant organisms by VA CLC residents: A multisite prospective study
Lona Mody; Kristen Gibson; Marco Cassone; Sanjay Saint; Sarah Krein; Julia Mantey; Mary Janevic; Alexandria Nguyen; Taissa Bej; Oteshia Hicks; Lillian Min; Andrzej Galecki; M Todd Greene; Laxmi Chigurupat and Robin Jump

Background: Veterans Health Administration (VHA) community living centers (CLCs) provide postacute and long-term care. CLC veterans visit myriad locations outside their rooms (eg, rehabilitation, dialysis). Pathogen transmission during out-of-room visits is unknown. **Methods:** We recruited newly admitted veterans at 3 CLCs. After obtaining informed consent, we cultured nares, groin, hands, and 7 surfaces in the patient rooms. We accompanied veterans to up to 5 out-of-room visits and cultured patients’ hands and surfaces they touched. We tested for multi-drug-resistant organisms (MDROs) including methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant *Enterococcus* (VRE), and quinolone, carbapenem, and/or ceftazidime-resistant gram-negative bacteria (R-GNB). We defined transmission as a positive culture following an initial negative culture during the same visit. **Results:** We enrolled 137 veterans (median follow-up, 29 days; mean, 5.9 visits); 97% were postacute patients. We conducted 539 patient-room sampling visits (mean, 3.9 per veteran; 5,490 swabs) and accompanied 97 veterans to 266 out-of-room sampling visits (mean, 2.7 per veteran; 2,360 swabs). Of 137 patients, 47 (35%) were colonized with an MDRO at enrollment and 74 (58%) of 128 patients were colonized on any follow-up patient-room visits. Of 133 patients, 55 (41%) acquired a new MDRO, most often VRE (31 of 97, 32%). In patient rooms, toilet seats [114 (21%) of 538], curtains [101 (19%) of 530] and bedrails [98 (18%) of 539] were most frequently conta-

