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MAJOR ARTICLE

An Electronic Algorithm to Identify Vancomycin-Associated Acute Kidney Injury

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Background. The burden of vancomycin-associated acute kidney injury (V-AKI) is unclear because it is not systematically monitored. The objective of this study was to develop and validate an electronic algorithm to identify cases of V-AKI and to determine its incidence.

Methods. Adults and children admitted to 1 of 5 health system hospitals from January 2018 to December 2019 who received at least 1 dose of intravenous (IV) vancomycin were included. A subset of charts was reviewed using a V-AKI assessment framework to classify cases as unlikely, possible, or probable events. Based on review, an electronic algorithm was developed and then validated using another subset of charts. Percentage agreement and kappa coefficients were calculated. Sensitivity and specificity were determined at various cutoffs, using chart review as the reference standard. For courses ≥48 hours, the incidence of possible or probable V-AKI events was assessed.

Results. The algorithm was developed using 494 cases and validated using 200 cases. The percentage agreement between the electronic algorithm and chart review was 92.5% and the weighted kappa was 0.95. The electronic algorithm was 89.7% sensitive and 98.2% specific in detecting possible or probable V-AKI events. For the 11 073 courses of ≥48 hours of vancomycin among 8963 patients, the incidence of possible or probable V-AKI events was 14.0%; the V-AKI incidence rate was 22.8 per 1000 days of IV vancomycin therapy.

Conclusions. An electronic algorithm demonstrated substantial agreement with chart review and had excellent sensitivity and specificity in detecting possible or probable V-AKI events. The electronic algorithm may be useful for informing future interventions to reduce V-AKI.

Keywords. acute kidney injury; antimicrobial stewardship; electronic health record; nephrotoxicity; vancomycin.

INTRODUCTION

Early treatment of severe methicillin-resistant *Staphylococcus aureus* (MRSA) infections has been shown to improve clinical outcomes [1–5]. The concern for delayed treatment of potential MRSA infections has led to extensive empiric intravenous (IV) vancomycin use. Although IV vancomycin is among the most commonly prescribed antibiotics in the emergency department and inpatient settings, only a small proportion of patients who receive IV vancomycin have MRSA infections and up to 70% of IV vancomycin prescriptions are ultimately unnecessary [6–10]. The overuse of IV vancomycin is problematic because it causes harm not only by contributing to the global public health crisis of antibiotic resistance, but also by increasing the risk of adverse events. Nephrotoxicity is among the most common adverse events related to this agent with prior studies showing an incidence ranging from 5% to 43% [11, 12]. Although most patients who develop vancomycin-associated acute kidney injury (V-AKI) eventually experience recovery of renal function, V-AKI is associated with increased length of hospitalization, readmissions, and mortality [11, 13–16].

Despite the relatively high incidence of V-AKI in prior observational studies, the burden of V-AKI is not easily assessed in clinical practice and the risk of V-AKI may be overlooked when prescribing IV vancomycin. This is in part due to the lack of a systematic method to identify and quantify V-AKI events. Currently, identification of V-AKI events relies on manual chart review by clinicians, and assessments may be inconsistent given varying definitions for V-AKI used in prior literature [11, 17]. A reproducible, electronic method of identifying incident cases of V-AKI would allow for consistent tracking of V-AKI events to better quantify the harm due to IV

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vancomycin and provide this information to clinicians to improve future prescribing decisions.

Electronic systems have previously been developed to accurately detect AKI events using structured electronic health record (EHR) data elements, such as serum creatinine (sCr) laboratory results [18–20]. Thus, EHR data can potentially be used to identify cases of V-AKI in a systematic and reproducible manner; however, accurate identification of V-AKI events requires assessment of whether the AKI can be attributed to IV vancomycin because there may be other potential etiologies of AKI. Although prior electronic AKI identification systems have not addressed causality, EHRs contain data, such as medication administrations, other laboratory results, and diagnosis codes, which can be leveraged to make this assessment. Therefore, the objective of this study was to (1) develop and validate an electronic algorithm to identify cases of V-AKI using structured EHR data and (2) assess the incidence of V-AKI using the electronic algorithm.

METHODS

Study Setting and Population

This study included a retrospective cohort of adult and pediatric patients who were admitted to any 1 of 5 of hospitals in the Johns Hopkins Health System (JHHS) in the Baltimore-Washington, DC region from January 2018 to December 2019 and who received at least 1 dose of IV vancomycin.

Patient Consent Statement

This study was approved by the Johns Hopkins Medicine Institutional Review Board with a waiver of informed consent.

Data Collection

Clinical data were electronically extracted from the JHHS EHR system (Epic Systems, Verona, WI) using Microsoft SQL Server Management Studio 18 (Microsoft Corporation, Redmond, WA). Extracted data included patient demographics, encounter information, vital signs, laboratory results, diagnoses, medication orders and administrations, and renal replacement therapy (RRT) from the encounter during which the patient received IV vancomycin. Serum creatinine values within the year before the index encounter were extracted to calculate baseline sCr. Outpatient prescription data for the 30 days before the index encounter were also extracted and linked to the index encounter medication administrations.

Vancomycin-Associated Acute Kidney Injury Assessment Framework

A framework was developed to ensure consistent assessment of V-AKI events. Acute kidney injury was defined as a rise in sCr of ≥0.3 mg/dL within 48 hours or ≥50% increase in baseline sCr occurring within 7 days based on the Kidney Disease: Improving Global Outcomes (KDIGO) criteria [21]. Due to accurate urine output measurements not being consistently recorded within the EHR, KDIGO's urine output criterion for AKI was not included in the definition. Baseline sCr was defined electronically as the median of sCr values recorded in the year before vancomycin initiation based on methods from Ehmann et al [22]. However, to account for potential changes in the baseline sCr during an encounter, the average of sCr values between 3 and 10 days prior was used as the baseline if there were at least 2 values, and the standard deviation of those values was ≤ 0.1. During chart review, baseline sCr was determined at the discretion of the reviewer.

An AKI that occurred after the first dose and up to 72 hours after the last dose of IV vancomycin was considered a potential V-AKI event. The 72-hour period after discontinuation of IV vancomycin was chosen to account for the potential lag in sCr changes after occurrence of an AKI and to account for time to clearance of IV vancomycin [23]. Only the first instance of an AKI occurring during a course of IV vancomycin was assessed. Doses of IV vancomycin that were administered within 96 hours of each other were considered part of the same treatment course. Patients could be evaluated more than once if they had vancomycin administrations that were separated by >96 hours in the same or different encounters.

Patients with a prior diagnosis of end-stage renal disease (ESRD) were excluded from the analysis because they are not at risk for V-AKI. Similarly, patients with RRT within 96 hours before meeting criteria for AKI were excluded because changes in sCr may reflect adjustment to baseline sCr rather than a new AKI event. Patients who received <48 hours of IV vancomycin therapy were not assessed for V-AKI (1) because V-AKI typically occurs with longer courses of IV vancomycin and (2) to account for a potential lag in sCr change, which may be indicative of an injury that started before receiving IV vancomycin [11, 23]. Forty-eight hours of therapy was defined as additional doses given ≥48 hours after the first dose of IV vancomycin or trough level ≥10 mg/L ≥ 48 hours after the first dose. Patients <1 month of age were excluded because sCr values may not reflect the patient's renal function but rather the maternal sCr [24]. Although patients who met any of these exclusion criteria were excluded from final assessment for V-AKI, they were included in the overall cohort to ensure accurate electronic capture of exclusion criteria.

The V-AKI events were classified into 1 of 3 causality categories (ie, unlikely, possible, or probable) using a modified Liverpool Adverse Drug Reaction Causality Assessment Tool (Liverpool ADR CAT) (Figure 1) [25]. Modifications to the Liverpool ADR CAT were based on data availability through structured EHR data fields, as well as the epidemiology and clinical course of V-AKI based on prior literature. Similar to other drug reaction causality tools, the Liverpool ADR CAT incorporates information regarding possible alternative etiologies, timing of onset, improvement with discontinuation or dose reduction, and supra-therapeutic drug levels to assess

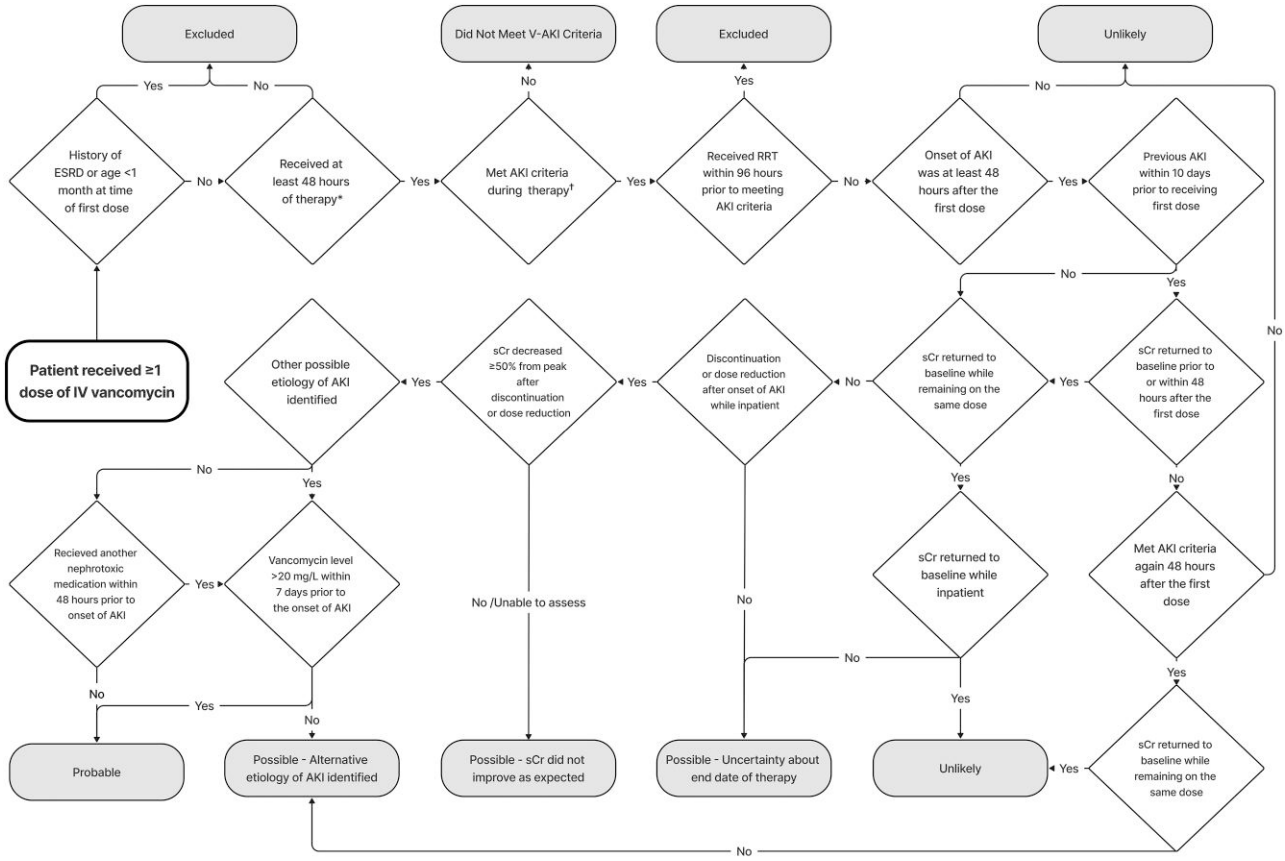

Figure 1. Flowchart representation of electronic algorithm to identify vancomycin-associated acute kidney injury. *Forty-eight hours of therapy was defined as additional doses given ≥48 hours the first dose of intravenous (IV) vancomycin or trough level ≥10 mg/L ≥48 hours the first dose. †Acute kidney injury (AKI) was defined as an increase in serum creatinine (sCr) ≥0.3 mg/dL within 48 hours or ≥50% increase in baseline sCr occurring within 7 days; occurring during therapy was defined as after the first dose of IV vancomycin and up to 72 hours after the last dose. Abbreviations: ESRD, end-stage renal disease; RRT, renal replacement therapy; V-AKI, vancomycin-associated acute kidney injury.

the strength of the causal relationship between the drug and the adverse event.

Development of the Electronic Algorithm

A random subset of patient charts from the overall cohort of patients who received at least 1 dose of IV vancomycin was manually reviewed by physicians (J.P.C., J.H.L., and S.F.) and trained research assistants (G.F.J., P.B., T.H., and Z.V.) using the V-AKI framework. Each chart was reviewed by 2 reviewers with at least 1 being a physician. Disagreements were resolved through consensus. Each case was categorized as excluded, did not meet V-AKI criteria, unlikely, possible, or probable.

A rule-based electronic algorithm was developed based on the structure of the V-AKI framework. The agreement between the electronic and manual assessments of V-AKI events was evaluated. Based on initial chart review, the algorithm was refined until the final iteration (Figure 1) had substantial agreement with chart review. Further information regarding the structure of the electronic algorithm, rationale for design choices, and the EHR data used in the final electronic algorithm (Supplementary Tables 1 and 2) are detailed in the Supplementary Methods.

Validation of the Electronic Algorithm

From the overall cohort (ie, patients who had received ≥1 dose of IV vancomycin), 200 patients were randomly selected for chart review assessment with a goal of reviewing approximately equal numbers of patients who did and did not meet criteria for a potential V-AKI by the electronic algorithm. Each chart was initially reviewed by a single reviewer (J.P.C., G.F.J., J.H.L., or S.F.), and 15% of the charts were selected for assessment by a second reviewer (J.P.C.) to ensure consistency in chart review assessments. In cases of disagreements, the final adjudication was made by J.P.C.

Percentage agreement, an unweighted kappa statistic, and a quadratic weighted kappa statistic were used to compare agreement between chart review and the electronic algorithm assessments. Sensitivity and specificity of the electronic algorithm were calculated when assessing cases at various cutoffs: at least

unlikely (ie, unlikely, possible, or probable), at least possible (ie, possible, or probable), and probable.

Assessment of Vancomycin-Associated Acute Kidney Injury Incidence

Among the patients who met all criteria for V-AKI assessment (ie, received ≥48 hours of therapy, ≥1 month of age, and did not have a diagnosis of ESRD or recent RRT), the proportion of patients who had at least a possible V-AKI event (ie, possible or probable) was calculated, stratified by age group. The incidence rate of at least possible V-AKI events was also calculated, stratified by age group. Descriptive statistics were calculated using median (interquartile range [IQR]) or frequency count (percentage), as appropriate. Data were analyzed using STATA version 17.0 (StataCorp, College Station, TX).

Table 1. Baseline Characteristics of Hospitalized Patients Who Received Intravenous Vancomycin, by Eligibility for Vancomycin-Associated Acute Kidney Injury Assessment

Baseline Patient Characteristics[a]	Total Cohort (N = 27 033)	Eligible for V-AKI Assessment[b] (N = 8.963)	Not Eligible for V-AKI Assessment[b] (N = 18 070)
Age, years, median (IQR)	63 (48–74)	61 (45–72)	64 (49–75)
Female sex, no. (%)	12 964 (48.0)	4033 (45.0)	8931 (49.4)
Race/Ethnicity			
Asian	966 (3.6)	286 (3.2)	680 (3.8)
Black	7250 (26.8)	2340 (26.1)	4910 (27.2)
Hispanic	1178 (4.4)	369 (4.1)	809 (4.5)
Other	1511 (5.6)	523 (5.8)	988 (5.5)
White	16 128 (59.7)	5445 (60.7)	10 683 (59.1)
History of CKD, No. (%)			
Stage 1	68 (0.3)	24 (0.3)	44 (0.2)
Stage 2	329 (1.2)	135 (1.5)	194 (1.1)
Stage 3	2577 (9.5)	1033 (11.5)	1544 (8.5)
Stage 4	879 (3.3)	329 (3.7)	550 (3.0)
Stage 5	275 (1.0)	112 (1.2)	163 (0.9)
Unspecified	1186 (4.4)	487 (5.4)	699 (3.9)
Any stage	5314 (19.7)	2120 (23.7)	3194 (17.7)

Abbreviations: CKD, chronic kidney disease; IQR, interquartile range; sCr, serum creatinine; V-AKI, vancomycin-associated acute kidney injury.

[a]Only data from the first encounter during which a patient received intravenous (IV) vancomycin and was eligible for assessment was included. If a patient did not have any encounter with a course of IV vancomycin that was eligible for assessment, only data from the first encounter during which they received IV vancomycin was included.

[b]Patients with end-stage renal disease, who received renal replacement therapy within 96 hours before onset of acute kidney injury, <1 month of age, or received <48 hours of IV vancomycin were excluded from V-AKI assessment.

RESULTS

Study Population

In the overall cohort, a total of 27 033 patients had 36 216 instances where they received at least 1 dose of IV vancomycin from January 2018 to December 2019 (Table 1). After exclusion criteria were applied, there were a total of 8963 patients who received 11 073 courses of IV vancomycin that were ≥48 hours in duration and were eligible for V-AKI assessment (Table 2). Among patients eligible for V-AKI assessment, the median age was 61 years (IQR, 45–72) and, 55.0% were male, 3.2% were Asian, 26.1% were Black, 4.1% were Hispanic, and 60.7% were White. Among patients eligible for V-AKI assessment, a total of 2120 patients (23.7%) had a prior diagnosis of chronic kidney disease, the median baseline creatinine value was 1.0 (IQR, 0.8–1.3), and the median duration of IV vancomycin therapy was 5 days (IQR, 4–8).

Development and Validation of the Electronic Algorithm

A total of 494 patient EHR records were reviewed manually during the development of the electronic algorithm, and a total of 75 V-AKI events were identified: 19 unlikely, 43 possible, and 13 probable. Among the 200 patients randomly selected for validation, 96 patients were identified as being excluded or not meeting V-AKI criteria, and 104 patients were identified as having a V-AKI event by the electronic algorithm. On chart review assessment, 88 patients were excluded or did not meet criteria for V-AKI, and 123 were identified as having V-AKI events. There was substantial agreement between the electronic algorithm and chart review assessment, with an overall

Table 2. Patient Characteristics per Course of IV Vancomycin, by Vancomycin-Associated Acute Kidney Injury Status

Patient Characteristics per Course of IV Vancomycin[a]	Courses of Vancomycin Eligible for Assessment[b] (N = 110 873)	Course With a Possible or Probable V-AKI Event[b] (N = 1555)	Course Without a Possible or Probable V-AKI Event[b] (N = 9518)
Baseline sCr, mg/dL, median (IQR)	0.9 (0.7–1.2)	1.0 (0.8–1.3)	0.9 (0.7–1.2)
Duration of IV vancomycin therapy, days, median (IQR)	5 (4–7)	5 (4–8)	4 (4–7)
Received concomitant nephrotoxic medication, no. (%)	1947 (18.0)	1027 (66.1)	920 (9.7)

Abbreviations: IQR, interquartile range; IV, intravenous; sCr, Serum creatinine; V-AKI, vancomycin-associated acute kidney injury.

[a]A patient may contribute more than once if they received separate courses of IV vancomycin. A course of vancomycin was defined as IV vancomycin doses that were administered within 96 hours of each other.

[b]A course of therapy was excluded from assessment if patient had end-stage renal disease, received renal replacement therapy within 96 hours before onset of acute kidney injury, <1 month of age, or received <48 hours of IV vancomycin.

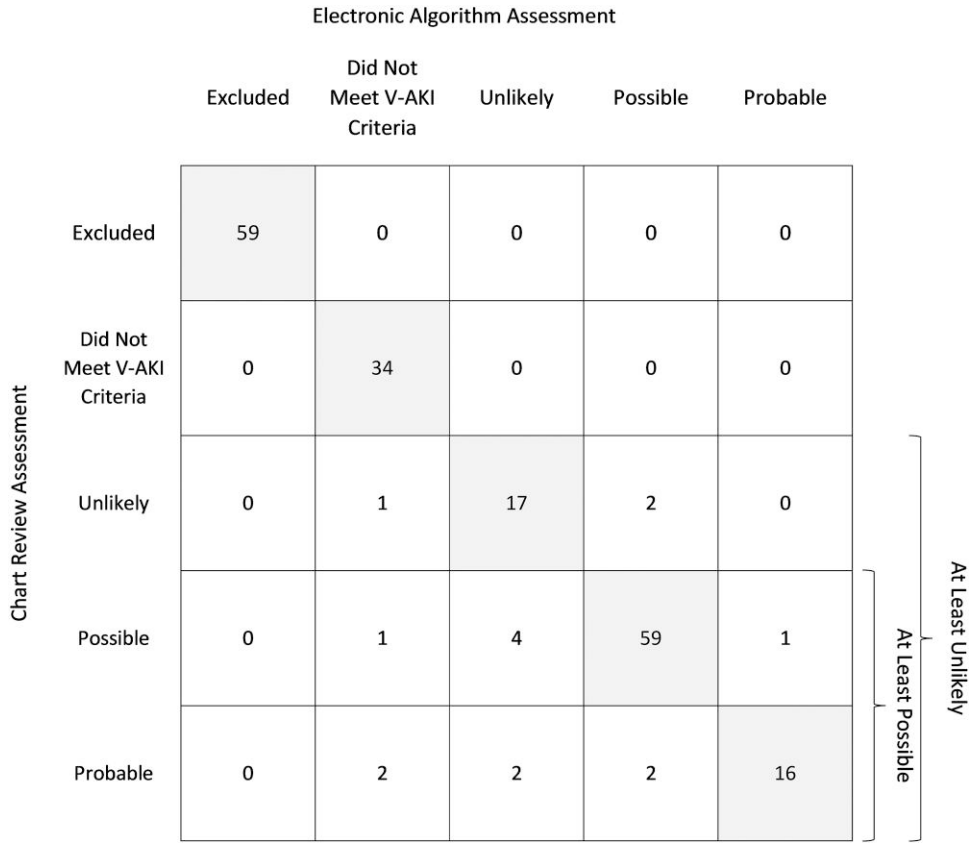

Figure 2. Electronic algorithm and chart review assessment crosstabulation for validation cohort. V-AKI, vancomycin-associated acute kidney injury.

percentage agreement of 92.5%, an unweighted kappa 0.90, and a quadratic weighted kappa of 0.95. The electronic algorithm accurately identified 95.5% of patients who were excluded, did not meet V-AKI criteria or had an unlikely V-AKI event, and 86.4% of patients who had at least possible events (Figure 2). The electronic algorithm was 96.3% sensitive and 100.0% specific in detecting at least unlikely events, 89.7% sensitive and 98.2% specific in detecting at least possible events, and 72.7% sensitive and 99.4% specific in detecting at least probable events. Among the 15 discrepant cases, the electronic algorithm tended to assess cases as a lower causal category (80.0%) and most often had a 1-category difference in assessment (66.7%) compared with chart review. The most common reasons for disagreement between the electronic algorithm and chart review assessment were differences in assessment of timing of the onset of AKI (20.0%) and assessment of a different AKI event during the same course of therapy (20.0%) (Supplementary Table 3).

Assessment of Vancomycin-Associated Acute Kidney Injury Incidence

Among the 11 073 courses of IV vancomycin from 8963 patients who met all criteria for assessment (ie, received ≥48 hours of therapy, ≥1 month of age, and did not have a diagnosis of ESRD or recent RRT) from January 2018 to December 2019, the electronic algorithm identified 8576 courses (68 579 days of therapy) that did not meet V-AKI criteria, and 1315 unlikely, 1259 possible, and 296 probable V-AKI events. The incidence of at least possible V-AKI events was 14.0% (1555 cases). The incidence rate of at least possible V-AKI events was 22.8 per 1000 days of IV vancomycin therapy. The incidence of at least possible V-AKI events increased with age (Table 3), and patients greater than 65 years of age had the highest incidence with 14.9% of patients developing

Table 3. Incidence and Incidence Rate of at Least Possible Vancomycin-Associated Kidney Injury Events, by Age Category

Age Category	Incidence of At Least Possible V-AKI Events	Incidence Rate of At Least Possible V-AKI Events per 1000 Days of Vancomycin Therapy
1 month–2 years	4 (2.9%)	4.9
2–11 years	9 (4.7%)	7.4
12–17 years	5 (4.5%)	7.9
18–64 years	874 (14.1%)	21.7
≥65 years	663 (14.9%)	26.2

Abbreviations: V-AKI, vancomycin-associated acute kidney injury.

at least possible V-AKI events (incidence rate of 26.2 per 1000 days of IV vancomycin therapy).

There was a larger proportion of patients who received concurrent nephrotoxic medications along with IV vancomycin among those who developed at least possible V-AKI events (66.1%) compared to those who did not (9.7%) (Table 2). The most common concurrent nephrotoxic medications were piperacillin-tazobactam (12.7%) and furosemide (11.2%), with a greater proportion of patients who had an at least possible V-AKI event receiving these medications (piperacillin-tazobactam 47.9%, furosemide 43.2%) compared to those who did not (piperacillin-tazobactam 7.0%, furosemide 6.0%).

DISCUSSION

We created a systematic and reproducible method of identifying V-AKI events by developing and validating an electronic algorithm using structured EHR data. The final electronic algorithm showed substantial agreement with chart review assessment and was subsequently used to evaluate the incidence of V-AKI events among inpatients over a 2-year period across 5 hospitals. Similar to prior studies, the overall incidence of at least possible V-AKI events was 14.0% (incidence rate 22.8 cases per 1000 days of IV vancomycin therapy) and the incidence was found to increase with age [11, 12].

Currently, identification of V-AKI events relies on manual review of cases by clinicians, which is resource-intensive and thus occurs uncommonly in clinical practice. In addition, assessment of V-AKI events by clinicians may be highly variable, given the varying definitions of V-AKI applied and, typically, lack of adherence to a formal causality assessment tool [11, 17]. Therefore, the potential harms of therapy may be overlooked when prescribing IV vancomycin empirically.

The electronic algorithm developed in this study offers several advantages. The algorithm uses a V-AKI assessment framework that is based on validated AKI criteria and a causality tool to create a systematic and reproducible method of assessing V-AKI events. The rule-based nature of the algorithm allows for transparency and interpretability of how the assessment was reached, whereas the electronic nature of the algorithm allows for an automated and less resource-intensive method of identifying V-AKI events. Furthermore, the algorithm uses only structured EHR data elements found across most EHR systems, facilitating its adaptation for other settings. The substantial agreement between the electronic and chart review assessments noted by the weighted kappa statistic of 0.95 suggests that the electronic algorithm is an accurate method of assessing V-AKI events. The algorithm was able to evaluate at least unlikely and at least possible events with excellent sensitivity and specificity. Although it had fair sensitivity in identifying at least probable events, specificity remained excellent. In most cases in which the electronic algorithm assessment was discrepant compared with chart review, there was only a 1-category difference in assessment. Overall, these findings suggest that the electronic algorithm is a viable method of identifying V-AKI events in clinical practice.

Among patients who developed V-AKI events, a greater proportion received a concurrent nephrotoxic medication (66.1%) compared to those who did not (9.7%). This has been observed in prior studies and may be due to synergistic nephrotoxicity when IV vancomycin is administered concurrently with other nephrotoxic medications, as has been well described with simultaneous aminoglycoside therapy [11, 12, 26]. It is notable that piperacillin-tazobactam was the most commonly coadministered medication that was classified as a potential nephrotoxin, and patients who developed an at least possible V-AKI event were more likely to have received the medication (47.9%) compared to those who did not (7.0%). However, it is not clear whether these represent true AKI events or rather a pseudo-toxicity due to altered tubular secretion of creatinine when both piperacillin-tazobactam and vancomycin are coadministered [27, 28]. Given the possibility of pseudo-toxicity rather than true nephrotoxicity, patients who received the medication concurrently with IV vancomycin could at most have a possible V-AKI event per our definition unless there was evidence of recent supratherapeutic vancomycin levels before onset of AKI.

The ability to monitor V-AKI events systematically and reproducibly is necessary because the harm associated with IV vancomycin is often overlooked despite it being among the most frequently prescribed antibiotics in the inpatient setting, a significant proportion of which are unnecessary [6–10]. The electronic algorithm in this study offers an additional tool for antibiotic stewardship programs to encourage judicious use of IV vancomycin by feeding data regarding V-AKI events back to clinicians. In addition, V-AKI incidence rates may serve as a potential balancing measure to sepsis measures that may encourage overuse of IV vancomycin [29, 30]. Increasing awareness of V-AKI events among clinicians may change prescribing behavior by altering preconceived notions that play a role in the risk-benefit assessment when prescribing IV vancomycin.

Although the electronic algorithm developed in this study to identify V-AKI events is promising, further studies are needed to externally validate the electronic algorithm in other health systems, including those with different EHR systems to assess generalizability. Additional work is also needed to assess whether feedback of data regarding antibiotic-associated adverse events impacts prescribing behavior and improves patient outcomes including reducing the incidence of V-AKI. This may additionally give insights into how accurate the algorithm would need to be in practice to be viewed as actionable by providers. Further studies investigating whether the framework and electronic algorithm can be generalized to assess AKI

events due to other antibiotics and to assess other antibiotic-associated adverse events are necessary. Not only can tracking data about antibiotic adverse events potentially equip antibiotic stewardship programs with additional data to improve antibiotic use, but it can also serve as a method of post-marketing surveillance for adverse events due to newer antibiotics because their use in a single institution may be too low to detect signals of harm.

This study has limitations. The electronic algorithm used only structured EHR data elements to aid in generalizability; however, some information may only be captured in unstructured fields (eg, scanned-in laboratory results). In addition, there are more data points available for patients in the inpatient setting; assessment of V-AKI events occurring in the outpatient setting may not be as reliable. Although structured EHR data were specifically used to improve generalizability to other EHRs, there may still be some data that are not captured in a similar manner in other EHR systems, requiring additional modification of the algorithm. Another limitation is the use of sCr for assessment of AKI, because it is not always an accurate marker of renal function (eg, patients with low muscle mass) and changes in sCr can lag after the occurrence of AKI; however, sCr is the most commonly used marker of renal function in the prior literature, as well as in clinical practice [23]. Similar to other EHR-based electronic AKI detection systems, we were unable to use KDIGO urine output criterion to assess for AKI because this information is often not accurately recorded in the EHR [18–21]. In addition, patients with <48 hours of therapy were not assessed for V-AKI events, because V-AKI events typically occur with more prolonged courses of therapy [11]. However, there may be cases of V-AKI that occur with short courses of IV vancomycin, particularly at higher doses. Finally, the electronic algorithm was developed based on expert chart review and chart review was considered the gold standard during validation. However, chart review assessments may be variable at times and may not reflect a single "truth," because there is currently no definitive diagnostic method to identify V-AKI cases. However, the electronic algorithm remains a valuable tool that can potentially be used to replace manual chart review, which is the current standard for V-AKI assessment.

CONCLUSIONS

In conclusion, we developed and validated an electronic algorithm to accurately identify V-AKI events using structured EHR data. The electronic algorithm noted a relatively high incidence of V-AKI events, consistent with prior literature, which highlights the harm caused by this agent. Tracking incident V-AKI events may be helpful in increasing awareness of the harms associated with IV vancomycin to improve use. Further studies are needed to assess whether the electronic algorithm we developed can accurately identify V-AKI events in other EHR systems and whether data regarding these events can be used to change prescribing behavior and reduce harm.

Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

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Disclaimer. The content is solely the responsibility of the authors and does not necessarily represent the official views of the US Food and Drug Administration, Centers for Disease Control and Prevention, or National Institutes of Health.

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Potential conflicts of interest. All authors: No reported conflicts of interest.

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