Introduction

We describe the utilization of an electronic vancomycin AKI monitoring tool regarding patient safety, and compare rates of AKI before and after implementation of a simplified pharmacist-driven vancomycin dosing strategy.

Methods

Study Design
This was an IRB exempt, cross-sectional interrupted time series conducted at Henry Ford Health-system, located in southeast Michigan.

Study Population
The study population included hospitalized patients who received intravenous vancomycin with an available serum creatinine (SCr) from November 2015 until April 2017. A revised pharmacist-driven vancomycin dosing strategy was implemented in April 2016. Data were collected from November 2016 until April 2017 from population-based electronic medical records.

Data Extraction Methods
Aggregate patient data are reported using an institutionally-developed VAN use identification query. Integral components of this query include: total numbers of VAN per month, AKI prevalence in VAN patients (VAN AKI), median VAN concentrations (mg/mL), and VAN days of therapy (DOT) per 1000 patient days. These data are used in order to create a separate query identifying the system-level AKI rate in order to compare perceived VAN AKI rates to the total AKI rates of the healthcare system.

In order to create an automated VAN identification query, other patient-level data are collected prior to de-identification and presentation as aggregate. These data, stored from the electronic medical record within a secured central database, include: patient name and location, admission date, SCr on admission and throughout hospitalization, and provider service. AKI definition was pre-determined as a pragmatic method to identify potential vancomycin-associated renal dysfunction. These data are then grouped and analyzed to create a monthly automated VAN AKI report and allow for trend comparisons.

The VAN use identification query was used to develop a time series analyses, and describe the effect of the revised pharmacist-driven vancomycin dosing strategy on AKI.

Key Definitions

Pharmacist-driven vancomycin dosing strategy: The revised dosing strategy included the following: modified weight-based creatinine clearance calculations, less aggressive targeted trough ranges, protocol-based dose adjustments, and trough “de-escalation” (to 10-15 mg/mL) when MSRA is not identified in culture.

Acute Kidney Injury (AKI): An increase in serum creatinine of at least 0.5 mg/dL or 50% from baseline

Statistical Analyses
Descriptive statistics were used to describe vancomycin use and AKI percent by month and in specified patient populations. All statistical analyses were performed using Microsoft Excel for Windows.

Results

Vancomycin Patient Population Characteristics

<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%) or median (IQR)</th>
<th>n=10453</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total AKI, VAN treated patients</td>
<td>999 (9.6%)</td>
<td></td>
</tr>
<tr>
<td>Median (IQR) VAN concentration (mg/mL), per month</td>
<td>16.2 (15.5-16.8)</td>
<td></td>
</tr>
<tr>
<td>Median (IQR) VAN DOT, days</td>
<td>3.8 (3.0-4.6)</td>
<td></td>
</tr>
</tbody>
</table>

VAN Use by Inpatient Setting

- ICU: 31%
- MICU: 29%
- SCU: 27%
- Dem: 1%
- Other: 1%

Variables
- Respiratory Tract
- Skin/SooT Tissue
- Bloodstream
- Intra-abdominal
- Bone and Joint
- Other
- Malignity
- Genitourinary
- Central Nervous

Acute Kidney Injury in Vancomycin Treated and Total Population

<table>
<thead>
<tr>
<th>Month</th>
<th>Pre-Mar15</th>
<th>Post-Mar16</th>
<th>Post-Mar17</th>
<th>Post-Jan17</th>
<th>AKI %, Total Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 16</td>
<td>0.63</td>
<td>0.64</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
</tr>
<tr>
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<td>0.63</td>
<td>0.65</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
</tr>
<tr>
<td>Apr 16</td>
<td>0.63</td>
<td>0.65</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
</tr>
<tr>
<td>May 16</td>
<td>0.63</td>
<td>0.65</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
</tr>
<tr>
<td>Jun 16</td>
<td>0.63</td>
<td>0.65</td>
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<td>0.69</td>
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<tr>
<td>Jul 16</td>
<td>0.63</td>
<td>0.65</td>
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<td>0.67</td>
<td>0.69</td>
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<tr>
<td>Aug 16</td>
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<td>0.65</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
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<tr>
<td>Sep 16</td>
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<td>0.65</td>
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<td>0.69</td>
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<tr>
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<td>0.69</td>
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<tr>
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<td>0.69</td>
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<tr>
<td>Dec 16</td>
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<td>0.65</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
</tr>
<tr>
<td>Jan 17</td>
<td>0.63</td>
<td>0.65</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
</tr>
<tr>
<td>Feb 17</td>
<td>0.63</td>
<td>0.65</td>
<td>0.66</td>
<td>0.67</td>
<td>0.69</td>
</tr>
</tbody>
</table>

Summary

- AKI was reduced in VAN treated patients after implementation of a simplified VAN dosing strategy
- EHR-based measures of antibiotic-related harm are promising tool for ASPs to quantify patient outcomes and improve patient safety