



Antimicrobial Stewardship Program Interventions Targeting Intravenous Vancomycin Use at a Community Hospital Improves Prescribing and Safety

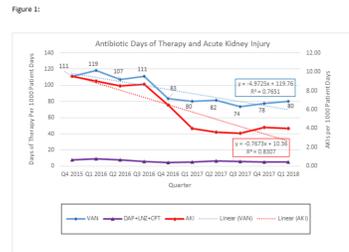
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Abstract

Antimicrobial Stewardship Program Interventions Targeting Intravenous Vancomycin Use at a Community Hospital Improves Prescribing and Safety
Background: Intravenous vancomycin (VAN) continues to be a workhorse for suspected or documented methicillin-resistant *Staphylococcus aureus* (MRSA) infections. VAN over-prescribing, and suboptimal dosing or monitoring can be detrimental to efficacy, safety, and resource utilization. A local antimicrobial stewardship program (ASP) was implemented in September 2015 as an expansion of a pre-existing health-system ASP. The local ASP included an infectious diseases (ID) pharmacist, partial FTE ID physician, ASP software, and a goal to decrease inappropriate vancomycin use and improve safety.
Methods: We performed a serial cross-sectional study assessing the impact of ASP interventions on VAN consumption and AKI incidence at a single-center community hospital from October 2015 through March 2018. ASP interventions included a revised vancomycin dosing and monitoring guideline, education, and prospective audit and feedback by clinical pharmacists working under the guidance of ID pharmacist and physician. Antibiotic days of therapy (DOT) were tracked and reported quarterly with Theradoc® software. Acute kidney injury was defined as an increase of ≥ 0.5 mg/dL or 50% in serum creatinine from baseline in all hospitalized patients with baseline < 2 mg/dL.

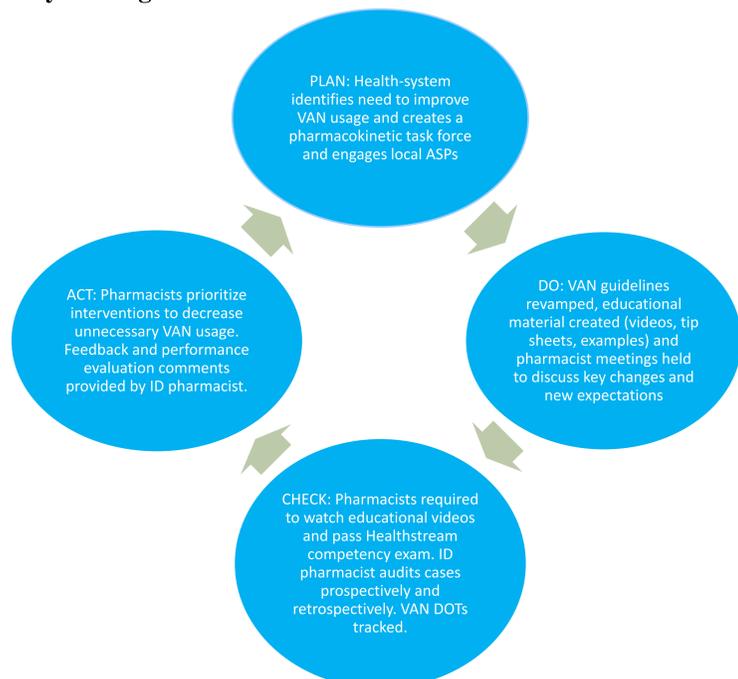
Results: Figure 1 demonstrates MRSA antibiotic utilization and AKI over time. VAN use declined from a peak quarterly use of 119 DOT/1000 PD to a minimum of 74 DOT/1000 PD (37.8% decrease). During the same timeframe AKI/1000 PD decreased over 50%. R-squared values of the trends are 76.5% and 83.1%, respectively. The use of VAN alternatives daptomycin (DAP), linezolid (LNZ), and ceftaroline (CPT) remained stable. There were 829 ASP recommendations made regarding VAN over-prescribing (primarily to de-escalate or discontinue VAN therapy) and 340 ID pharmacist interventions to improve VAN dosing and monitoring.



Conclusion: ASP initiatives, education, and interventions were associated with reduced VAN use and reduction in AKI at a community hospital.

Background & Changes Implemented

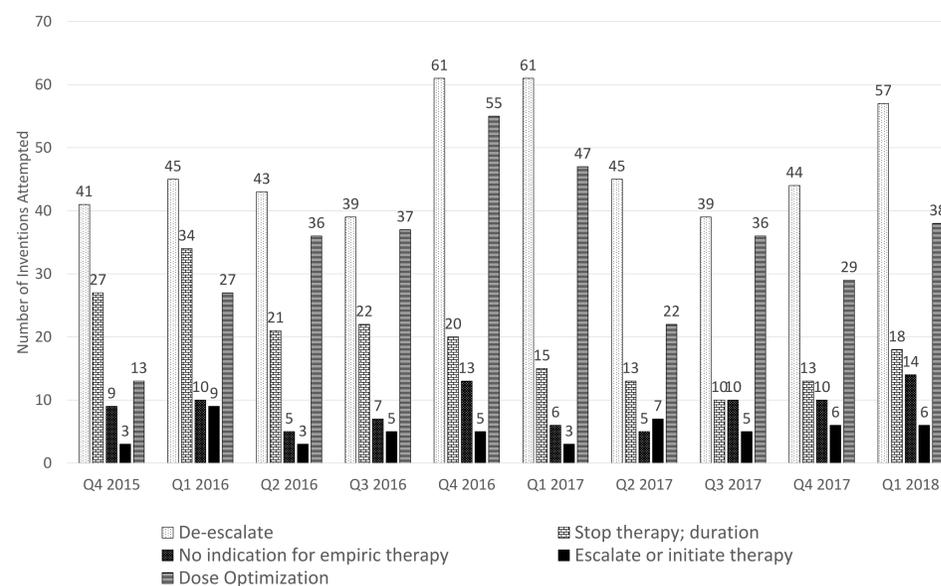
- Intravenous vancomycin (VAN) continues to be a workhorse for suspected or documented methicillin-resistant *Staphylococcus aureus* (MRSA) infections.
- VAN over-prescribing, and suboptimal dosing or monitoring can be detrimental to efficacy, safety, and resource utilization.
- A local antimicrobial stewardship program (ASP) was implemented in September 2015 as an expansion of a pre-existing health-system ASP. The local ASP included:
 - Full FTE Infectious Diseases (ID) pharmacist
 - Partial FTE ID physician
 - Computerized decision support software (Theradoc®)
- Plan, Do, Check, Act (PDCA) cycle of continuous improvement for vancomycin usage



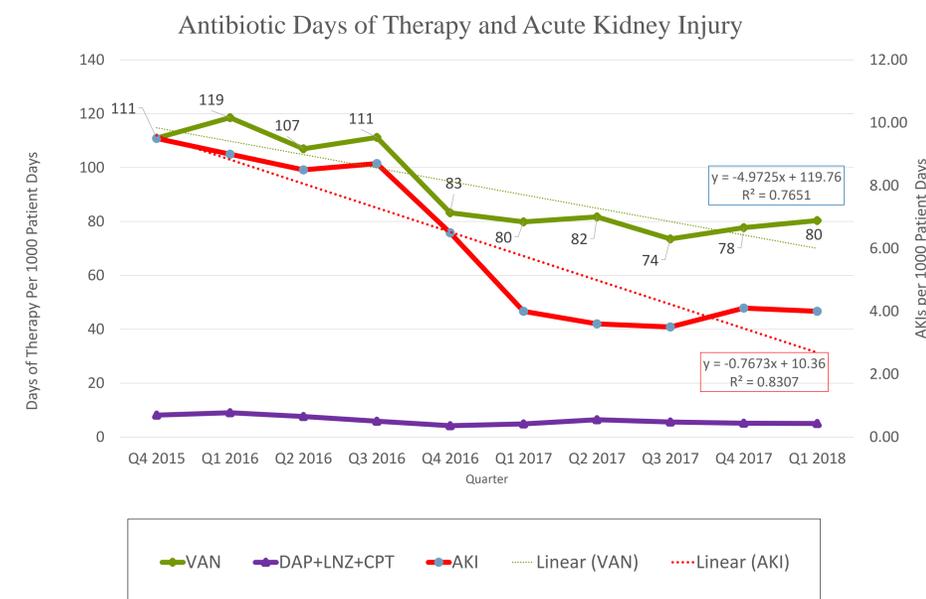
- Key changes to vancomycin guidelines included:
 - Education regarding patients with difficult-to-estimate creatinine clearances (conditions with falsely low serum creatinine concentrations)
 - More conservative empiric dosing nomogram
 - Information regarding trough monitoring underestimating the true 24-hour area-under-the-curve by up to 33% and subsequently using clinical judgment to not increase vancomycin dose just to meet the trough goal in patients
- Additional changes implemented:
 - Formal system ASP campaign “Curb Vancomycin Use” with top 10 tips and vancomycin days of therapy/1000 patient days available on website
 - Respiratory culture comment updated from “commensal flora only” to “Commensal respiratory flora: No MRSA/S. aureus or P. aeruginosa”
 - Procalcitonin testing made available and guidelines for use created and distributed
 - Pharmacist practice model redesigned
 - From centralized to de-centralized with physical pharmacist presence on each unit 7 days per week on first shift
 - Expectation created for each pharmacist to assist ID pharmacist with ASP functions, with emphasis on making “face-to-face” recommendations to providers

Results

- From October 2015 through March 2018 there were 1149 vancomycin-related interventions attempted by the ASP. Intervention types included:
 - De-escalation off vancomycin
 - No indication for antibiotics, recommend to discontinue
 - Stop vancomycin; duration of therapy sufficient
 - Initiate vancomycin therapy
 - Dose optimization by the ID pharmacist (done per protocol)
- Approximately 85% of non-dosing interventions accepted by prescribers
- Frequency of each time of attempted intervention in table below:



- Theradoc® software used quarterly to measure and report VAN days of therapy per 1000 patient-days.
- Quarterly acute kidney injury rate per 1000 patient-days calculated by the health-system quality department.



- VAN use declined from a peak quarterly use of 119 DOT/1000 PD to a minimum of 74 DOT/1000 PD (37.8% decrease).
- AKI was defined as an increase of ≥ 0.5 mg/dL in serum creatinine or 50% increase from baseline in all hospitalized patients with baseline < 2 mg/dL. AKI rate declined from a peak of 9 AKI/1000 PD to a minimum of 4 AKI/1000 PD.
- Combined DOT/1000 PD for VAN alternatives (daptomycin, linezolid, and ceftaroline) remained stable and less than 10 for the entire study period, indicating the decrease in VAN usage was not due to increased use of VAN alternatives.

Conclusion, Keys to Success, and Future Direction

- ASP initiatives, prescriber and pharmacist education, and prospective audit and feedback by an ID pharmacist was associated with reduced VAN use and reduction in overall AKI at a community hospital.
- After creation of a new VAN dosing guideline, auditing dosing and providing feedback to the dosing pharmacist created a culture of accountability and education.
- Face-to-face antimicrobial stewardship recommendations seemed to be accepted more frequently and in a more timely manner than making recommendations via pager or progress note in the electronic medical record.
- Future directions to decrease VAN use further include the use of MRSA nares swabs to discontinue vancomycin for lower respiratory tract infections when nares are MRSA negative and the creation of an antibiotic duration column in the electronic medical record patient list to help prescribers and pharmacists identify excessive durations of therapy.