



**BAPTIST HEALTH**  
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# Comparing Vancomycin Pharmacokinetic Outcomes Utilizing Equation-Based Methodology versus Bayesian Modeling

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## Background

Pharmacists play a vital role in the dosing and monitoring of vancomycin. One of the various targets for vancomycin dosing is area under the curve (AUC). Calculation based AUC dosing using Excel and Bayesian Modeling using clinical support software are two methods used to estimate AUC for given regimens. Traditional equation-based methods utilize first order kinetics for predictions, followed by two levels at steady state to calculate AUC. Bayesian Modeling aims to individualize dosing by utilizing population kinetic data and continually customizing it to patient specific inputs. Software can be expensive, which poses a hurdle to institutions. However, software has the potential to improve calculation efficiency and save time. Equation-based methods can be time intensive and require more frequent levels, resulting in more blood draws from the patient. It is important to note that the guidelines for AUC dosing are based on the equation-based methodology. With the proposed improved accuracy of the Bayesian Modeling, it is unclear if the same AUC goal that is utilized for equation-based methodology applies. Additionally, most pharmacists are more familiar with the traditional method. Analyzing both techniques will provide guidance to institutions when determining which method is best for their practice and patients.

## Objectives

Primary:

- ❖ Assess the differences in calculated AUC using the two techniques to determine the need for revised guidelines for Bayesian Modeling

Secondary:

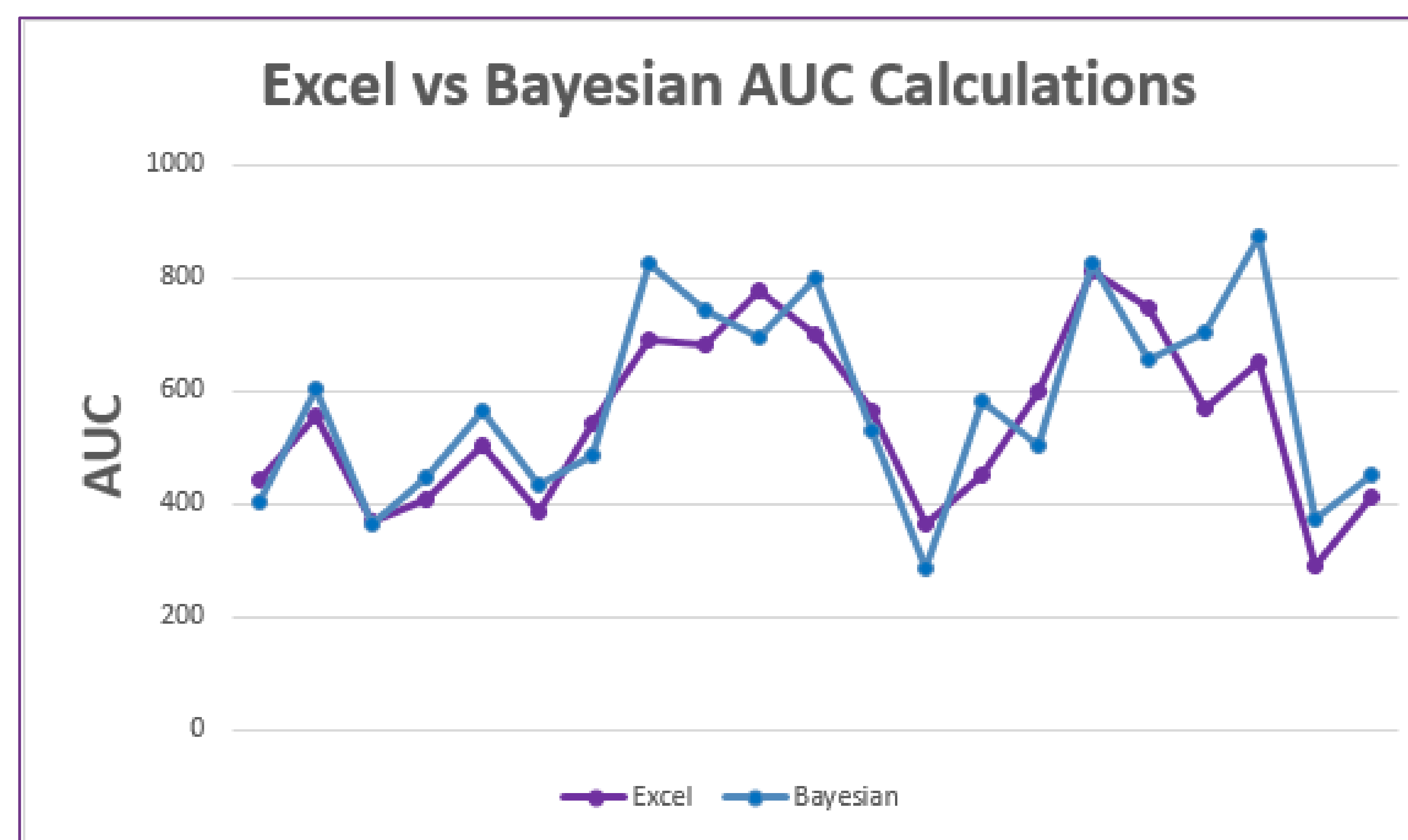
- ❖ Determine which calculation method is optimal for a rural teaching hospital

## Methods

The first step in this process was determining which information was pertinent to evaluate. A spreadsheet was utilized to input the necessary information. The clinical support software for the Bayesian method chose different models based on patient information. Next, estimates were compared from each method to the calculated results. A paired t-test was used to analyze the mean AUCs and the Wilcoxon Signed Ranks Test was used to analyze volume of distribution (Vd) calculations from each method. This information was also used to help decide which calculation method is best suited for a rural teaching hospital.

## Results

Utilizing the paired t-test with a sample size of 43 entries, the difference in calculated AUCs was statistically significant. The paired t-test was attempted for the volume of distribution (Vd), however, the Pearson correlation reflected an uneven distribution of data and the Wilcoxon Signed Ranks Test was conducted. Specific values can be seen below.



### Area Under the Curve (AUC) Calculation

Mean of Excel Calculated AUC	544.90
Mean of Bayesian Software Calculated AUC	586.46
Hypothesized Mean Difference	0
P(T<=t) two-tail	0.005

### Volume of Distribution (Vd) Calculation

Pearson Correlation	0.185
Sum of R+	826
Sum of R-	120
Critical Value	310
Sum of R-: Critical Value	120 < 310
P value	<0.05

## Conclusions

Primary Objective:

Both methods utilize AUC; however, the guidelines are based off of the equation based method. We were able to detect a difference of statistical significance in the calculation result of AUC between the two methods. In addition, when comparing the difference between volume of distribution calculations, there was also a statistically significant result.

Secondary Objective:

It is still unclear which method is best suited for rural hospitals. However, the financial burden is a significant barrier to the utilization of Bayesian Modeling software. Locally, pharmacists have more experience with equation-based methodology and there has been hesitation to trust a new method. This hesitation was only solidified by our results of statistically significant finding of differences between AUC calculations.

❖ Limitations of the study:

- ❖ Small sample size
- ❖ Cannot view software calculation formulas due to proprietary restrictions

## References

1. Rybak MJ, Le J, Lodise TP, et al. (19 March 2020) IDSA Vancomycin Dosing Guidelines
2. Stevens R, Balmes FC. (4 April 2019) Use AUC to Optimize Vancomycin Dosing

## Disclosures

Authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:

- Mayce Vinson: Nothing to Disclose
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