Do's and Don'ts of Bayesian Dosing Webinar.

Dosing software with a human side.

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DoseMeRx
A TRHC Solution

Today's moderator.

Kristi Kuper PharmD, BCPS, FIDSA
Director of Clinical Pharmacy
DoseMeRx

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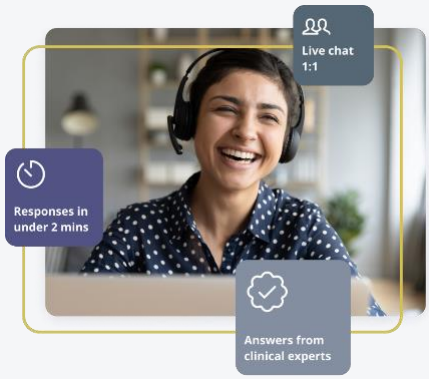
DoseMeRx A TRHC Solution

Trusted worldwide.

- **7,123 active** clinician users
- **1.4 million** medication doses calculated
- **10** Countries
- **42** Drug models
- HITRUST, HIPAA, ISO & FDA **compliant infrastructure**



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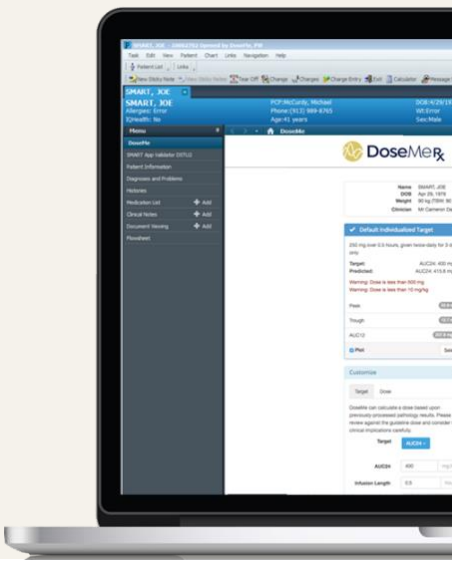
DoseMeRx A TRHC Solution

Implement Bayesian dosing without the headache.

ashp Cerner Epic Sentri7® VigiLanz Infectious Disease Connect ilúm Insight®



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DoseMeRx
A TRHC Solution

Our presenters.

Shivani Patel, PharmD, BCPS
Clinical Pharmacy Specialist, Infectious Diseases
Memorial Hermann Southwest Hospital

Dustin Orvin, PharmD, BCPS
Clinical Pharmacy Specialist
St. Joseph's/Candler

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Implementing DoseMeRx across a 13-hospital system

Shivani Patel PharmD, BCPS
Clinical Pharmacy Specialist, Infectious Diseases
Memorial Hermann Southwest Hospital

MEMORIAL HERMANN

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Who we are

13
Hospitals

~100,000
Vancomycin Days Per Year

200
Full-time Pharmacists

6
Part-time Clinical Specialists

7
Dedicated ID Clinical Specialists

Mix of pharmacy & physician dosing

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Why EHR integrated Bayesian dosing?

Scalability + Reduce levels + Guideline compliance + Improve quality = Standardize care

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Benefits of integrating into our EHR

No input of data required

Without data entry **limit errors**

Improved efficiency and productivity

Ability to access everything in a **single view**

Optimized pharmacists' time and allows us to **cover more patients** with current staff

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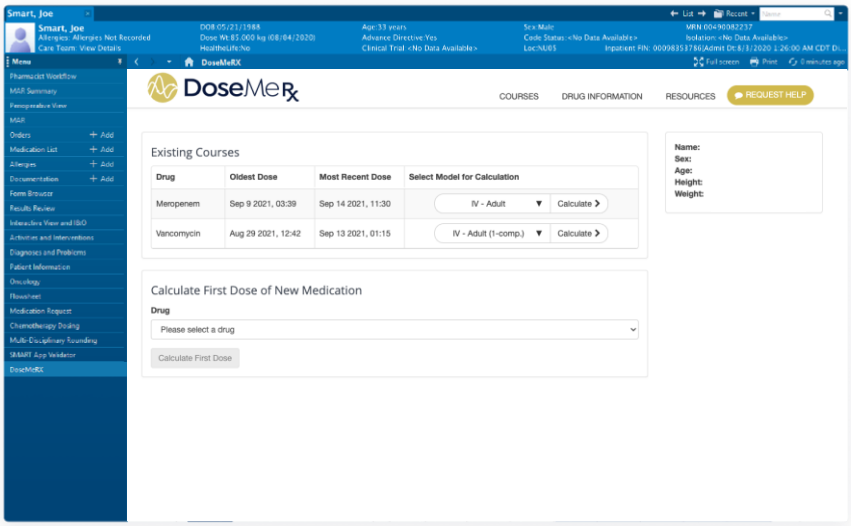
1. Workflow: Select course



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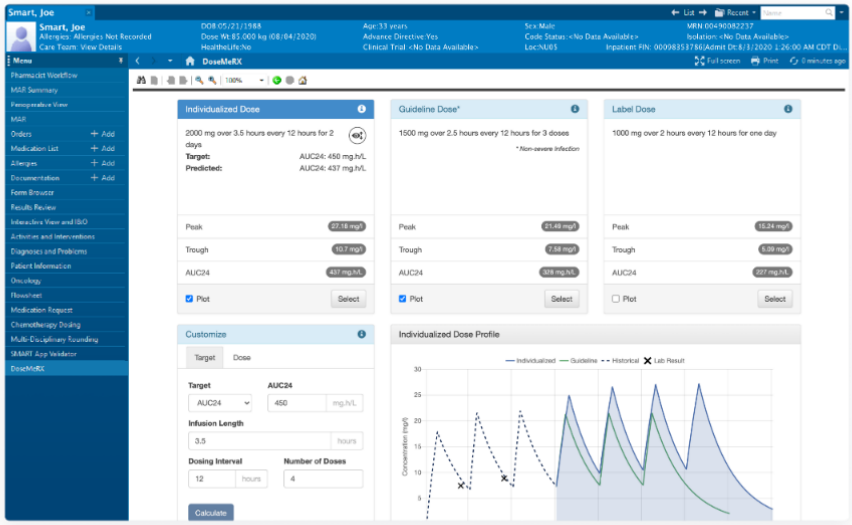
2. Workflow: View recommendations



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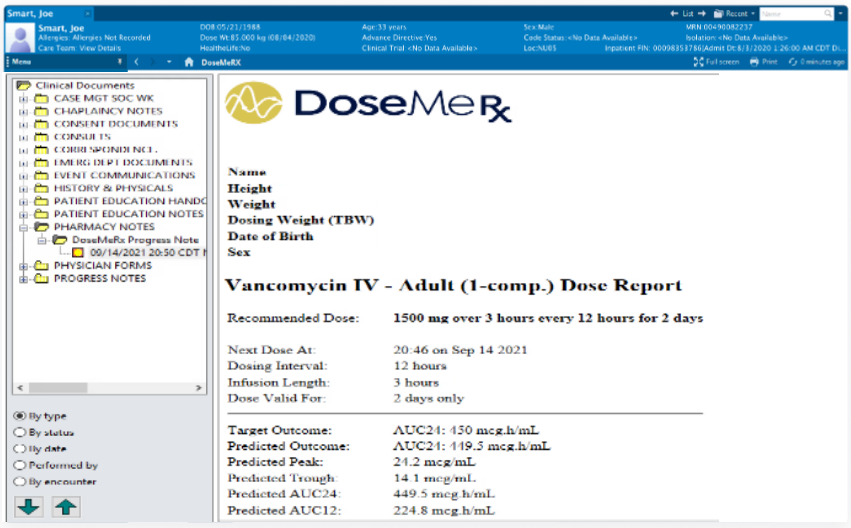
3. Workflow: Save progress note in EHR



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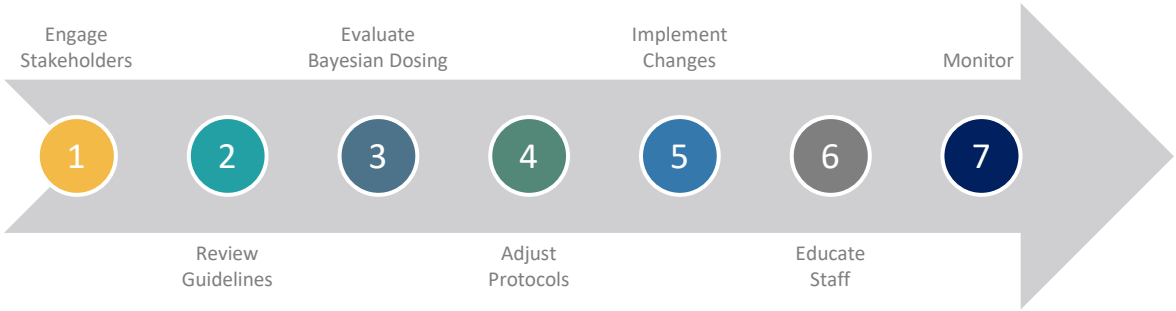
Our journey



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We got engaged…

Start from the top
- Hospital Administration & C-suite
- Quality & Safety
- Pharmacy Directors: streamline process, value-add

Get buy in
- Physicians: let us help you reduce AKI
- Nurses: reduced levels ☺
- Staff pharmacists: change is hard, prepare them

Gain support
- IT: Stay engaged with implementation process
- Staff pharmacists again: Education, support & follow up on mental well being

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Review Guidelines and Clinical Data

- ASHP/IDSA/PIDS/SIDP Vancomycin guidelines
  - Provide rationale for implementing AUC dosing
  - DO NOT provide a how to actually do this
- Decide on exclusion criteria
  - Unstable renal function
  - Central nervous system infections?
  - Continuous renal replacement therapy (CRRT)
  - Peritoneal dialysis
- Our goal was to maximize the number of patients we could dose with DoseMeRx.

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Creating the protocol

- Interdisciplinary collaboration over several months
  - ID physicians
  - ID pharmacists
  - Nursing
  - Laboratory/Phlebotomy
  - IT
- Decision point
  - Will you be renal function based, disease state based, or DoseMeRx model based?

Lesson learned: Make sure that your protocol development and work efforts are done in parallel with IT to keep on same timeline.

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Creating the protocol

AUC 400-600mcg*h/mL (default target set at 450mcg.h/mL

All indications unless part of the exception groups below

Trough based dosing (10-20mcg/mL)

- Continuous Renal Replacement Therapy (CRRT)
- Peritoneal Dialysis (PD)

Level based dosing (<20mcg/mL)

- Unstable renal function with a SCr of >6 mg/dL

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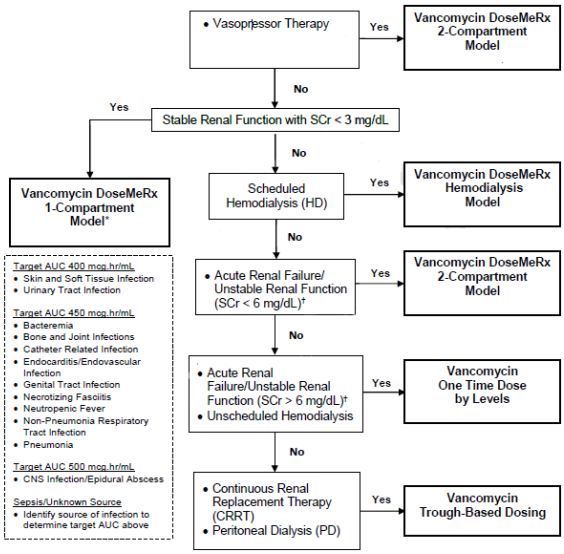
The decision tree



Carve out - managing pregnant and post partum patients

Image courtesy of Christy Su, PharmD

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Feedback and editing

- Staff pharmacists are invaluable
- It's the "Little Big" things
  - Understanding your serum creatinine and weight cutoffs and what patients you are eliminating
  - Implementation of the random level
    - > Holding doses and physicians discontinuing therapy
  - Keeping track of your vancomycin patients
- Handling "micro" changes in doses
- Key components of clinical notes and DoseMeRx documentation

Lesson learned: It took each new staff member who used DoseMeRx about 1 day to feel fully comfortable with software and 3-5 consecutive days for comfort with protocol.

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Educating staff

Pharmacists

- Baseline didactic education – prerecorded as a CE for staff
- Software and protocol education
- Focus on new workflow and logistics
- Creation of sample patient cases to assess understanding
- Pharmacist competency checklist

Physicians

- Who will have access to DoseMeRx
- ID physicians versus everyone else
- Don't worry about the details of the protocol
- Educate on quality, safety, and interpretation of the levels

Nurses

- Hospital wide education
- General rationale for AUC dosing
- Focus on transition from trough based dosing to AM levels
- When to draw timed levels
- Interpretation of levels – contact pharmacy with questions instead of MD

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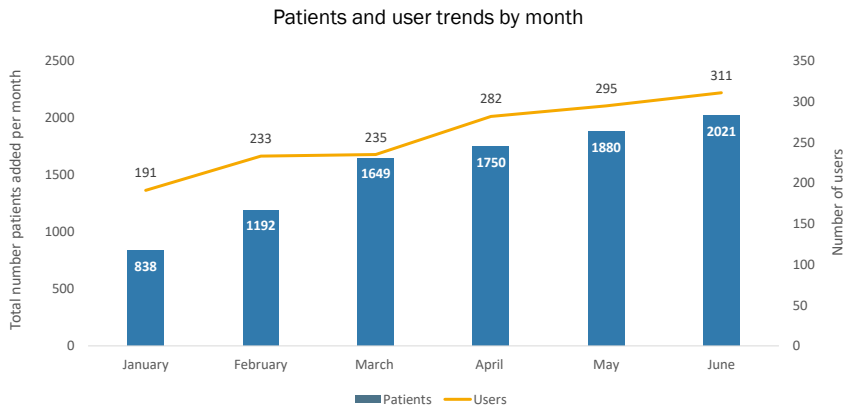
Volume Over Time: Jan – Jun 2021



80% of patients are dosed with the standard vancomycin model

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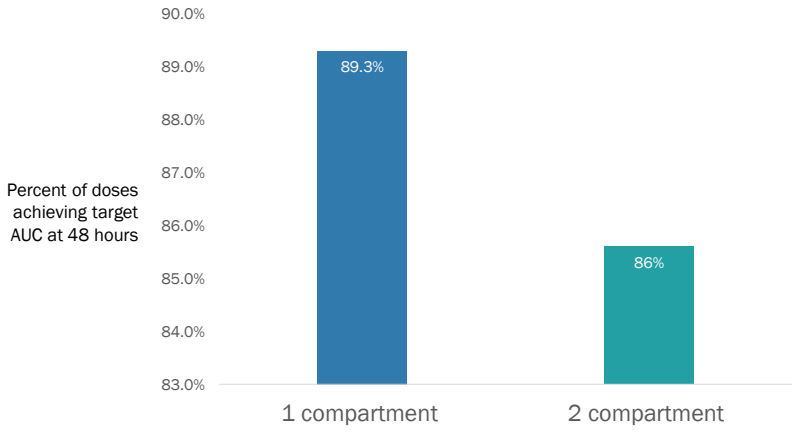
Calculating success! January to June 2021



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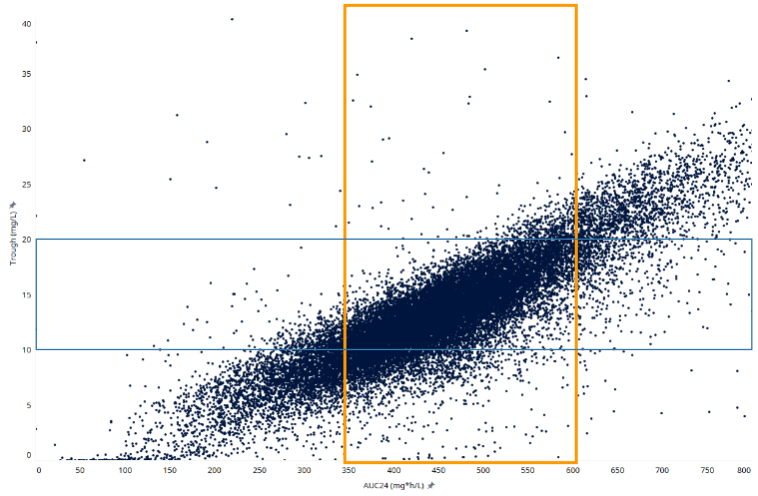
Vancomycin Trough vs AUC24



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Do

- Keep continuous lines of communication open with IT even after launch
- Be ready to be available to answer questions for the staff
- Have clinical staff/specialists “shadow” other pharmacists to confirm dose selections and protocol adherence
- Know that there will be a learning curve
- Keep a living FAQ document
- Follow discontinued vancomycin orders
- Therapy not warranted OR concern over random AM level and toxicity?

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Don't

- Assume that the written protocol will not need to be refined post launch
- Assume that all staff will do everything exactly as you intended
- Forget to prepare for EMR downtime situations

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Clinical, Financial, and Operational Benefits of Bayesian Dosing

Dustin Orvin, PharmD, BCPS
Clinical Pharmacy Specialist
St. Joseph's/Candler Health System

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St. Joseph's/Candler Health System

Candler Hospital

- Community health network
- 714 beds divided between two anchor hospitals

St. Joseph's Hospital

St. Joseph's|Candler

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Who we are

2 Hospitals	~108 Vancomycin days per 1000 patient days	Pharmacy responsible for all vancomycin dosing via automatic consult
57 Pharmacists	3 Dedicated ID Clinical Specialists	5 Clinical faculty from colleges of pharmacy

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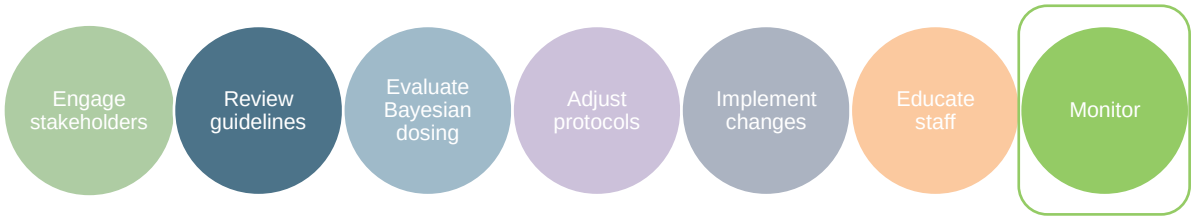
Journey so far: the final stage



How will you define success?

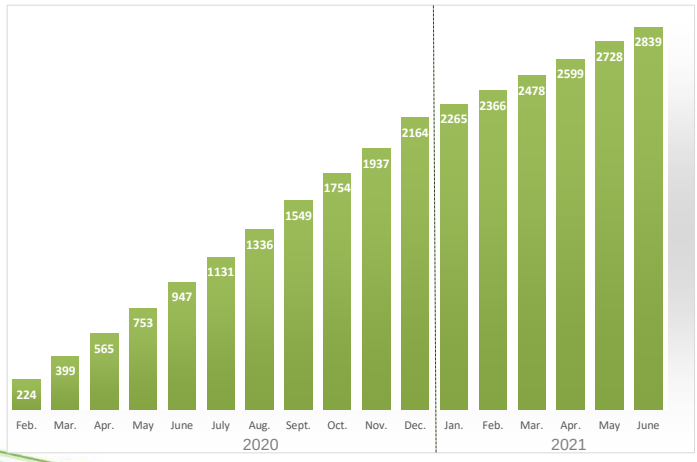
- Improved clinical outcomes?
- Cost avoidance?
- What metrics will you monitor?
  - Serum creatinine increase/AKI rate
  - Time to therapeutic AUC
  - Doses yielding an AUC above goal ranges
  - Length of stay
- What baseline metrics do you have already?

Program structure

- Implemented AUC dosing with web-based version of DoseMeRx in February 2020
- Pharmacy responsible for 100% of dosing via automatic consult
- Utilize AUC dosing for all adult patients receiving vancomycin targeting AUC of 400-600 mg.hr/L
- Derive AUC from a single trough concentration in majority of cases

AUC dosing program: Key facts

Cumulative vancomycin courses dosed using DoseMeRx since program inception



2,496 Unique Patients

Why Bayesian dosing?

Why we implemented AUC ahead of guideline recommendations?

- Reduce AKI rate
  Presented MUE data to P&T in 2019 showing ~14% AKI rate across the board
- Key changes to dosing were proposed & AUC dosing identified

Why Bayesian, not first order kinetics?

- Seamless workflow integration
- Reproducibility
- Clinician confidence
- Cost effective
- Practical

Our AUC dosing goals

Clinical
Improve patient safety and maintain efficacy

Operational
Improve standardization of dosing practices among pharmacists with minimal changes to workflow

Financial
Implement AUC-based dosing with minimal impact on budget

Clinical benefits

Clinical | Operational | Financial

Reproducible results every time

- Improved consistency between pharmacists and care settings.
- Easily accessible dosing reports saved within the platform.

Improved pharmacist confidence

- Accurate and reliable results allowing us to focus on executing our patient care plan.

Increased prescriber confidence

- Physicians place more trust in pharmacy dosing plans.
- Direct correlation with AKI reduction and rare “toxic vancomycin levels.”

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Clinical | Operational | Financial

Safety

- Serum creatinine increases by ≥0.3 mg/dL
- Percentage of doses with AUC above 600 mg.hr/L

Efficacy

- Percentage of courses reaching target AUC by selected time intervals
- Median time to therapeutic AUC

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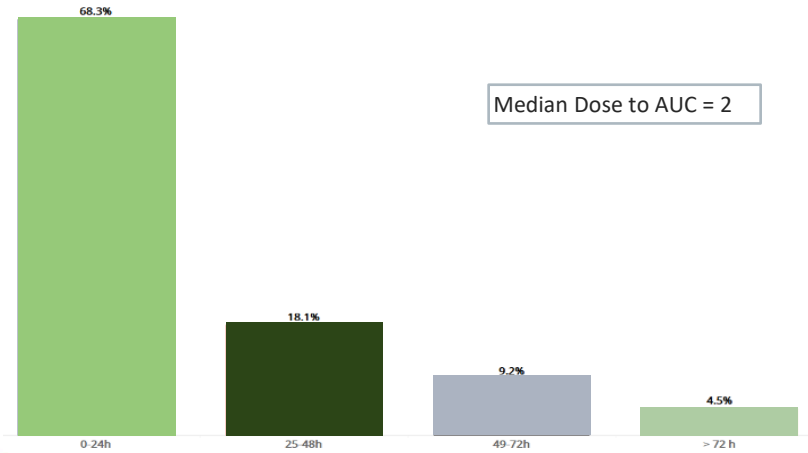
Safety Metrics
(since program inception)

Clinical | Operational | Financial

Description	Result	Interpretation
Serum creatinine increases by ≥0.3 mg/dL	3.3%	Very few patients had increases in serum creatinine while on therapy
Percentage of doses with AUC above 600 mg.hr/L	5.4%	In most cases, this was only a single dose throughout the entire course

Time to AUC24 of 400mg*h/L
(since program inception)

Clinical | Operational | Financial



Operational benefits

Clinical | **Operational** | Financial

DoseMeRx ensured all pharmacists are uniformly determining AUC

- Variety of trough-based dosing practices previously
- Anecdotal experiences greatly impacted individual practices

Allowed for implementation of AUC with fewer vancomycin assays

- Little to no impact on nursing or lab staff
- Prescribers continued to see the customary troughs reported in EHR

Reduced education needs during implementation process

- Allowed us to target the clinicians who needed it most

Clinical and software action by day/month

Clinical | **Operational** | Financial

- Bayesian support software can identify top performers and facilitate reproducible results
- Track clinician specific activity data

Post-launch assessment

Clinical | **Operational** | Financial

Post AUC implementation assessment

- Evaluating dosing practices in a subset of case matched patients who were dosed targeting trough vs AUC

Unexpected findings during analysis

- Clinical uncertainty in the immediate transition period
- Fewer peak concentrations used than our protocol recommended
- AUC group had more troughs in “goal range”

Don’t forget differences in PK parameter estimates when providing education!

Crosby C, Bland C, Jones B, Orvin D. Poster SP-373 – ASHP Midyear 2020

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National survey results

Clinical | **Operational** | Financial

Transitioning from guideline approval to practical implementation of AUC-based monitoring of vancomycin

- Surveyed American College of Clinical Pharmacy’s Critical Care and Infectious Diseases Practice and Research Networks in May and June of 2020
- 18% of respondents stated plans to continue trough-based dosing. Why?

Bland C, et al. AJHP. 2021;

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How do you get the necessary budget support?

1 Determine potential safety benefit for your institution

- Determine your current AKI rate in vancomycin patients
- Estimate cost savings with a 50% AKI reduction

2 Compare Bayesian vs first order kinetics

- Bayesian – known fixed cost regardless of patient volume
- First order kinetics –uncertain incremental costs for each treated patient

The St. Joseph's/Candler Experience

- As part of our post implementation assessment, we also conducted a financial analysis
- 100 patients in each group – equally case matched based on demographics and Charleston Comorbidity Index
- Time frame: AUC group March 2020-February 2021, Trough group Jan 2019-December 2019
- Acute kidney injury defined as a SCr increase by > to 0.3 mg/dL within 48 hours or SCr 1.5x baseline

Results

Clinical | Operational | **Financial**

Variable	Trough group (n=100)	AUC group (n=100)
Average Duration of Therapy (days)	4.64	4.98
Average number of dose changes per patient	1.04	0.93
Troughs within range (10-20)	58.7%	63.5%
Average trough (mcg/mL)	15.59	12.91
Percentage of doses with AUC above 600 mg.hr/L	5.4%	In most cases, this was only a single dose throughout the entire course
Nephrotoxicity *	**12%**	**2%**
Average cost per patient day ($)	16.56	16.21

Crosby C, Bland C, Jones B, Orvin D. Poster SP-373 – ASHP Midyear 2020

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Financial Implications of AKI

Clinical | Operational | **Financial**

- The rate of AKI in the trough-based group was six times higher than in the AUC based group (12% vs 2%, p=0.0056)
- Total excess hospitalization costs associated with one episode of AKI is $7,928.45

Dosing methodology	Potential AKI cases (n=2496)	Total excess hospitalization costs associated with AKI
Trough based dosing	300	$2,378,535
AUC based dosing	50	$ 396,422

Difference: $1,982,122

Patel N, Huang D, Lodise T. Clinical Drug Investigation 2021;

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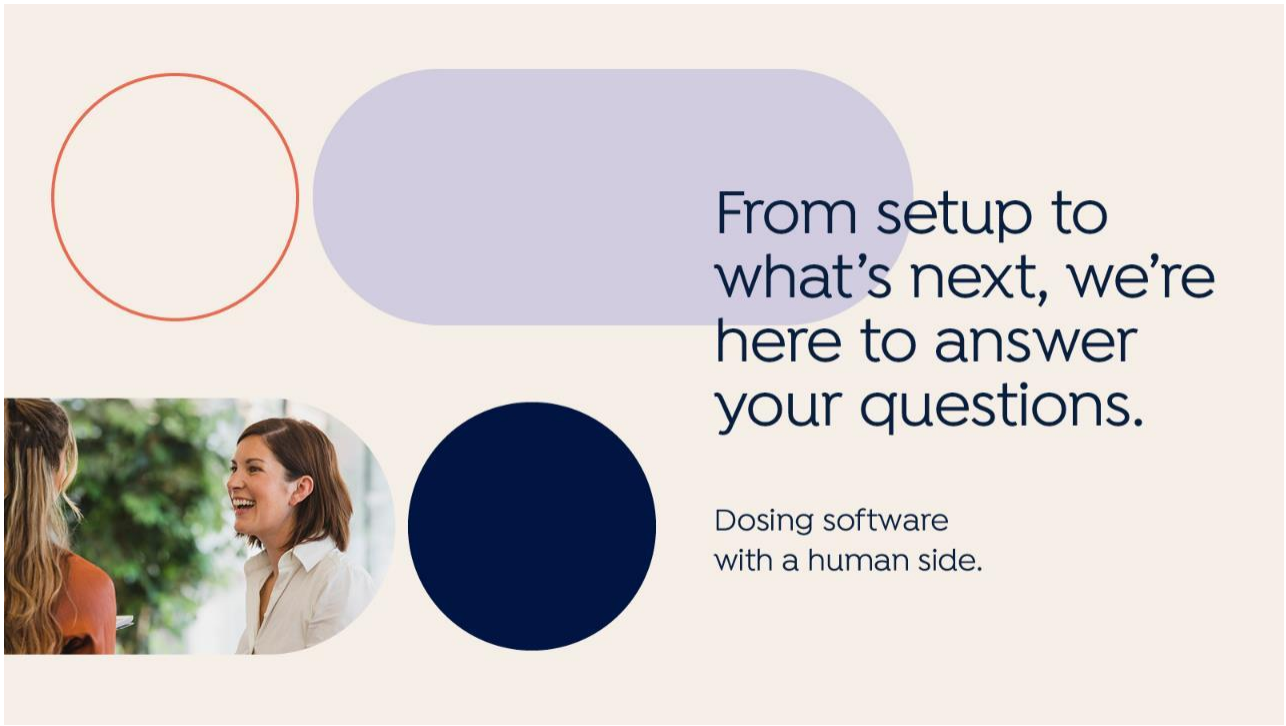
Do

- Consider how Bayesian clinical decision support software can meet your dosing and monitoring needs.
- Pick metrics to monitor the most important goals of your transition.
- Communicate your success stories early and often.
- Provide open lines of communication for stakeholder feedback.
- Continuously utilize data to refine your process.

Don't

- Take monitoring for granted when evaluating Bayesian dosing.
  - A useful monitoring program requires thoughtful consideration of your goals how to practically capture data.
- Assume AUC or Bayesian dosing is too expensive without evaluating the benefits to your patients and institution.
- Underestimate the financial impact AKI reductions can have at your institution.



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DoseMeRx A TRHC Solution

Contact us.

Start a Free Trial:
www.doseme-rx.com/start-trial

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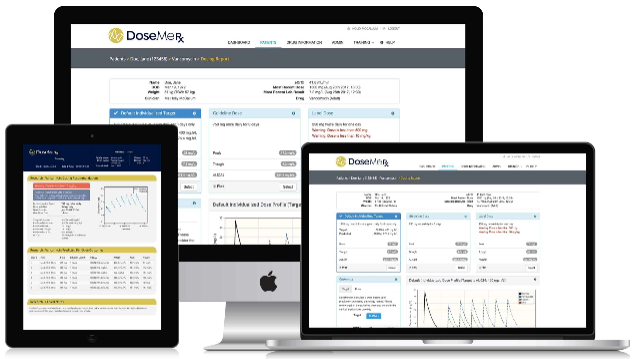
Email: hello@doseme-rx.com



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