A multi-disciplinary approach to improving vancomycin trough level acquisition and interpretation using a computerized physician order entry system

Alicia Harvey[1,2]; Candy Tsourounis[2]; Stephanie Rennke[3]; Melisa Wong[3]; Tina Mammone[4]; Mendy Eckhaus[4]; Melissa Lee[4]; Joanne Foster[5]; Deborah French[5]; Steven Ludwin[3]; Dominic Chan[1]

[1]UCSF Medical Center; [2]UCSF School of Pharmacy; [3]UCSF Department of Medicine, [4]UCSF Department of Nursing, [5]UCSF Department of Laboratory Medicine

Contact person: Alicia Harvey **Email:** alicia.harvey@ucsf.edu

University of California San Francisco

BACKGROUND

- Vancomycin efficacy is dependent on therapeutic serum concentrations that increase bacterium exposure to time-dependent bactericidal activity (AUC:MIC)[1-3]
- Trough levels are utilized as surrogate measures to assess AUC:MIC; obtaining a trough prior to the 4th dose is ideal[4,5]
- Correct timing of trough levels is a challenge due to lack of process standardization and computerized physician order entry (CPOE) support
- A prior quality assurance (QA) evaluation at University of California, San Francisco (UCSF) Medical Center revealed that 13% were drawn appropriately (correct dose and timing)[6]

OBJECTIVE

- To increase accuracy of vancomycin trough levels through process changes within a CPOE system (EPIC®, Verona, WI)

METHODS

- A single center, multi-phase, prospective quality improvement project to assess the accuracy of vancomycin trough level acquisition after a pilot of medical center staff workflow changes on 2 acute care floors

	Pre-Intervention	Pilot Intervention
Provider	• Levels ordered as peaks, troughs, and random • Order priority = Routine • Timing of lab draw not based on administration data	Standardized order entry instructions: • Order as TIMED draw • Specify ACTUAL DATE for trough draw • Start time 0000 • Click "Before the 4th dose"
Nurse	• MAR NOTE documentation not required • No standard process to identify the 4th dose • Phlebotomy acquired level without verifying with RN	• MAR NOTE documentation of due time at order acknowledgment • MAR NOTE updated with dosing schedule changes • MAR NOTE checked before dose administration • Phlebotomy verifies with RN before trough draws
Pharmacist	• Notifies provider of correct timing of lab draw	• Discontinues incorrect orders and reorder correctly timed trough • Orders level if missing and indicated • Notifies RN if MAR Note is incorrect or missing

Inclusion Criteria: Patients receiving vancomcyin IV for empiric treatment or surgical prophylaxis, and treated for >48hrs

Primary outcome: Percentage of accurate levels acquired at steady state

Secondary outcome: Compliance of disciplines to new workflow

RESULTS

Figure 1. Accuracy of Vancomycin Trough Levels

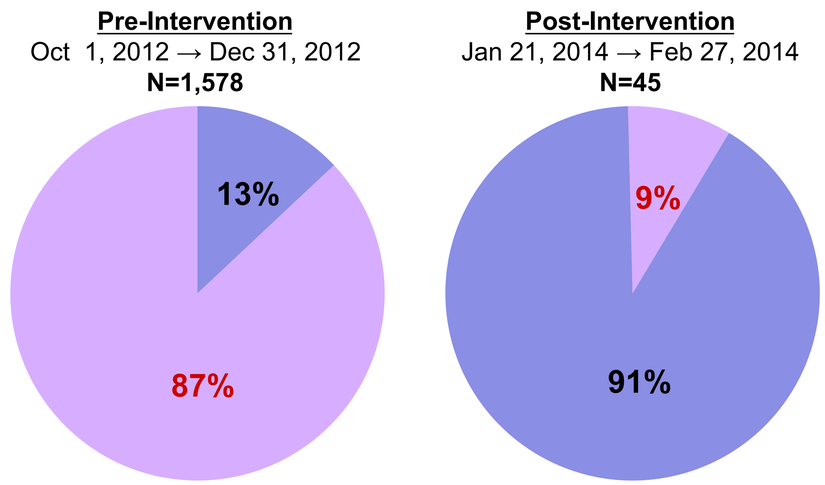


Figure 2. Provider Order Priority, N=52

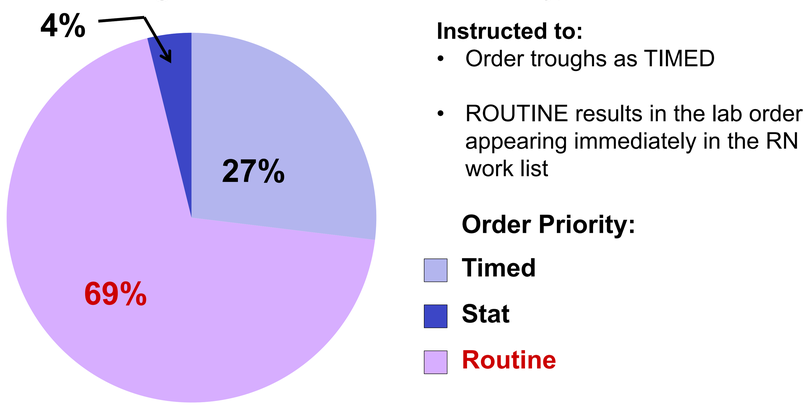


Figure 3. Nurse MAR Note Documentation of Trough Timing, N=52

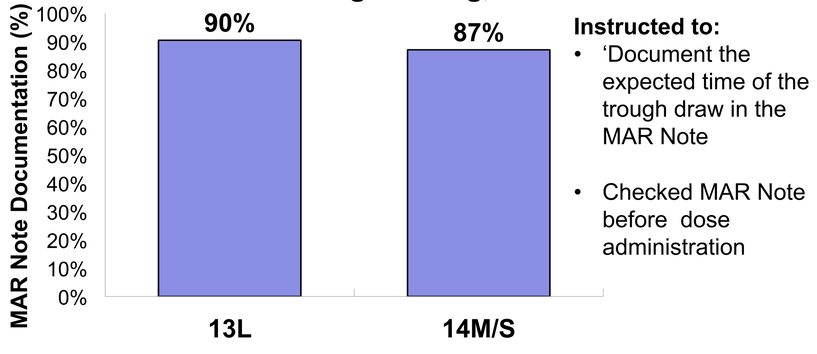
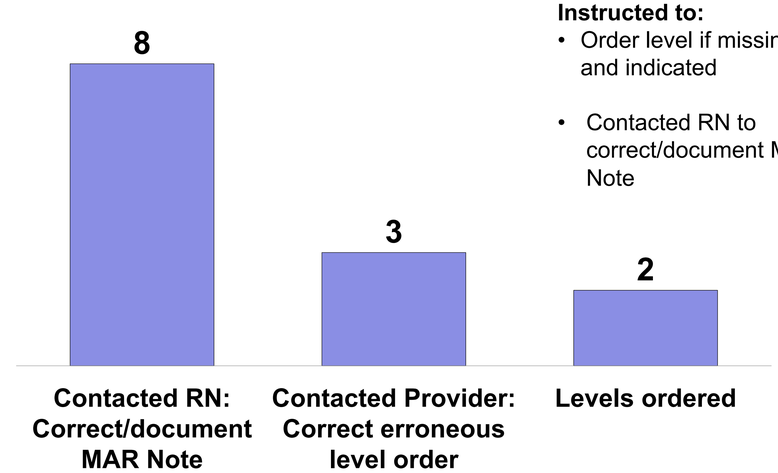


Figure 4. Pharmacist Interventions



DISCUSSION

- 52 levels were ordered: 21 on 13L and 31 on 14M/S
  - 7 levels were discontinued prior to acquisition
- >90% of levels in the pilot were acquired at steady state, within 30minutes of the 4th dose, versus 13% during the QA audit
- Providers uniformly specified the date the level was due in the order; however, only 27% of orders were correctly prioritized as "timed"
- Nurses' documentation was approximately 90%
  - In a post-pilot survey, >70% of nurses believed the MAR Note documentation increased accuracy of level draws
- Pharmacists ordered 2 vancomycin trough levels

CONCLUSIONS

- A multidisciplinary quality improvement approach increased the accuracy of vancomycin trough level acquisition
- Future initiatives will involve the expansion of the pilot hospital-wide and the roll out of the 2012 P&T decision to have pharmacists order vancomycin trough levels
- A cost saving and hospital outcomes analysis will be conducted after the pilot is expanded hospital-wide
- Limitations:
  Small sample size, the lack of a comparison to a non-pilot medical unit

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