# Optimizing Care through Clinical Surveillance

**Overall Learning Objectives for Pharmacists and Pharmacy Technicians**

1. Identify the prerequisites necessary for implementing a Clinical Surveillance system.
2. Articulate the benefits of using clinical surveillance tools in the pharmacy workflow.
3. Compare and contrast the features available with different systems in the marketplace.
4. Describe how a clinical surveillance system can improve clinical workflow.



# Overview

Bryan Shaw, PharmD
PGY-1 Resident, Non-Traditional
Northwestern Memorial Hospital

The speaker has no conflicts of interest to disclose in relation to this presentation.



## Technology in Healthcare

- Increased adoption of electronic health records (EHRs)
  - Technological trend
  - American Recovery and Reinvestment Act
- Increased adoption of supportive technologies
- All providing potentially relevant clinical data

## Technology in Healthcare

- Data overload
- Goals:
  - Present relevant data
  - Timing
  - Prevent fatigue

## Clinical Decision Support

"**…** is a process for enhancing health-related decisions and actions with pertinent, organized clinical knowledge and patient information to improve health and healthcare delivery."

- Examples:
  - Order strings
  - Order sets
  - Alerts
  - Clinical surveillance

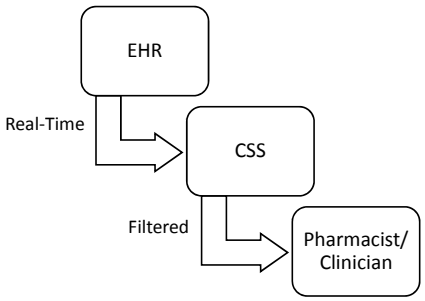
Improving outcomes with clinical decision support: an implementer's guide. Second Edition. HIMSS. 2011 (in press).



## Clinical Surveillance Systems (CSS)

- Process clinical data in real-time
- Goals:
  - Systematically filter data
  - Actionable
  - Timing
  - Efficiency
  - Safety!

## Clinical Surveillance






## CSS Capabilities

- Real-time EHR data feed
- Alerts and rules
  - Custom vs pre-built
- Reporting
- Documentation
- Intervention tracking



## CSS Applications

- Antimicrobial stewardship programs
- Infection control
- Communication
  - Daily rounding
- Intervention reporting



## CSS Vendors

- CareFusion – MedMined®
- Cerner
- Epic
- ICNet
- Premier – TheraDoc™
- Truven
- VigiLanz™
- Walters Kluwer – Sentri7®



## Takeaway Points

- CSS provides a systematic filter to real-time data
- Potential to increase efficiency
- Provides actionable data in a timely fashion
- Enables intervention tracking



## Q1: What do you need to establish a CSS?

A. Electronic health record
B. Point-person to maintain
C. Staff buy-in
D. All of the above

## Q2: What are the benefits of a CSS?

A. Alerts and rules
B. Reporting
C. Documentation
D. All of the above
E. Options B and C

# Optimizing Care Through Clinical Surveillance – Theradoc

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Hospital Sisters Health System, Belleville, IL
Adjunct Clinical Instructor
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## Disclosure

- The speaker has no actual or potential conflict of interest to disclose in relation to this presentation.



## Outline

- Background
- Overview of Theradoc
- Tools within Theradoc utilized by the Pharmacy Department



## Poll The Audience

Who uses Theradoc currently or has used it in the past?



## BACKGROUND



## Hospital Sisters Health System

- Multi-institutional health care system comprised of 14 hospitals across Illinois and Wisconsin

Hospital Sisters HEALTH SYSTEM

## HSHS St. Elizabeth's Hospital

- 303 bed community teaching hospital located in Belleville, IL
  - St. Louis Metro area
- Theradoc utilized by the Pharmacy Department, Infection Prevention, and Emergency Department Nurses



## OVERVIEW

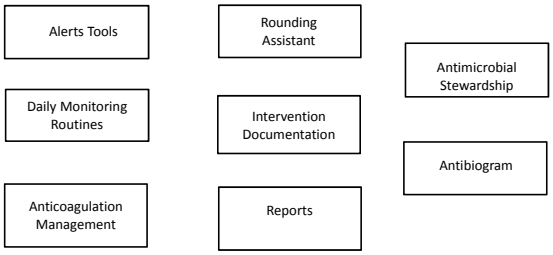


## Theradoc

- Standalone system that interfaces with the electronic medical record
- Originated as an infection prevention tool



## What is in Theradoc?






## Use within the Pharmacy Department

- Queries are written to identify patients
  - Daily monitoring and real-time alerting
  - Intervention documentation
- Integrated into daily workflow of pharmacists



## TOOLS WITHIN THERADOC

## Alerts

- "EZ Alerts"
  - Created by pharmacists
  - Image removed due to possible proprietary restriction

Theradoc©



## Alerts for Daily Monitoring Routines

- Anticoagulation Daily Monitoring
  - Warfarin
  - Rivaroxaban
  - Apixaban
- Pharmacy-to-Dose Protocols
  - Vancomycin
  - Aminoglycosides
  - Warfarin



## Real-Time Alerts

- Renal dosing
  - Piperacillin-Tazobactam CrCl >40 ml/min
- IV-to-PO conversions
  - Famotidine
- Core measures
  - Heart failure and myocardial infarction
- Antibiotic stewardship
  - Culture results
  - Broad spectrum antibacterial de-escalation
  - Redundant beta-lactam therapy



## Viewing Alerts

- Floor alerts
  - Shows all alerts by location
- Alerts by type
  - Renal dosing
  - IV to PO conversion
  - Anticoagulation
  - Core Measures
  - Antibiotic Stewardship



## Floor Alert View

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## Intervention Documentation

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## Intervention Subcategories






## Mobile Device Alerts

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## Reports

- Report filters:
  - By alert
  - By alert status (active or dismissed)
  - By patient location
  - By patient population
  - By institution
- Report data columns can be customized



## Self-Assessment Question

Tools for pharmacy within Theradoc include which of the following?

A. Real-time alerting
B. Intervention documentation
C. Rounding assistant
D. A and C
E. All of the above



## Self-Assessment Question

Interventions within Theradoc are:

A. Associated with cost-savings
B. Categorized by type of intervention
C. Unable to be viewed by colleagues
D. A and B
E. All of the above



## Acknowledgements


- Joshua Schmees, PharmD
- Maggie Wong, PharmD, BCPS

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# Optimizing Care through Clinical Surveillance

# VigiLanz ™

Rupal Patel, Pharm.D.

Anne & Robert H. Lurie Children's Hospital of Chicago

The speaker has no conflicts of interest to disclose in relation to this presentation



## Ann & Robert H. Lurie Children's Hospital of Chicago

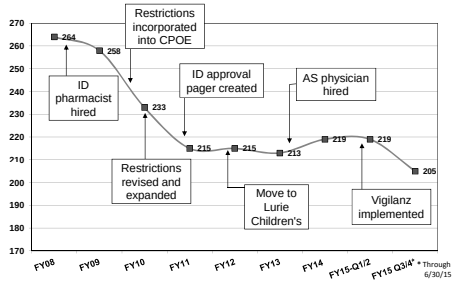
- 288 beds (capacity to increase to 313)
- 40 bed NICU
- 40 bed PICU
- 40 bed CCU

## Antimicrobial Stewardship

- Formulary Restriction
  - amikacin, cefotaxime, ceftriaxone, ceftazidime, ciprofloxacin, meropenem, levoflocaxin, vancomycin, linezolid, oxacillin, micafungin, voriconazole, amphotericin
  - all non-Formulary anti-infectives
- Prospective Audit and Feedback



## Targeted Antibiotics* DOT/1000 PD




* Includes: meropenem, piperacillin-tazobactam, ceftriaxone, cefotaxime, ceftazidime, cefepime, ciprofloxacin, levofloxacin, amikacin, tobramycin, linezolid, vancomycin IV



## VigiLanz Dynamic Monitoring Suite™

- Web based
- Multiple interfaces
- Rules-guided software
- Real-time decision support
- High alert notification
- Data mining
- Antibiogram
- Software as a Service



## VigiLanz™- Pharmacy Surveillance

- Antimicrobial stewardship
- 113 custom rules for real time alerting
  - New order for restricted antibiotic
  - Any antibiotic > 7 days and >14 days
  - Abnormal CSF parameters and NOT on appropriate antibiotic
  - De-escalation opportunities
  - Duplicate therapy (antifungal, anti-anaerobic, double gram negative)
  - Inappropriate antibiotic started based on diagnosis code
  - Organism-antibiotic mismatch
  - All positive CSF and blood cultures
  - Lab monitoring needed (vancomycin, aminoglycosides, voriconazole)
  - Alerts for antibiotics ordered that are on shortage

## VigiLanz™- Pharmacy Surveillance

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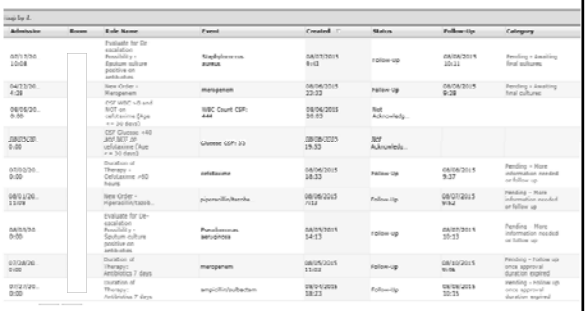
## VigiLanz™- Pharmacy Surveillance





## VigiLanz™- Pharmacy Surveillance

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## VigiLanz™- Pharmacy Surveillance

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## Data Collection-Interventions

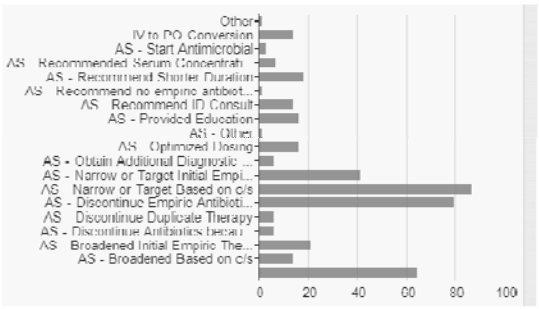
| | Accepted | Rejected |
|---|---|---|
| November | 19 | 2 |
| December | 19 | 0 |
| January | 23 | 1 |
| February | 29 | 3 |
| March | 53 | 5 |
| April | 47 | 2 |
| May | 43 | 4 |
| June | 50 | 5 |
| **July** | **75** | **5** |



## Data Collection-Interventions

| RuleInterventionCategory | 2015 July | 2015 June | 2015 May | 2015 April | 2015 March |
|---|---|---|---|---|---|
| A8 - Broadened Based on c/s | 4 | 4 | 1 | 2 | 1 |
| A3 - Broadened Initial Empiric Therapy | 11 | | 1 | 2 | 2 |
| A8 - Discontinue Antibiotics because Therapy is Finished | 1 | 2 | 2 | | 1 |
| A6 - Discontinue Duplicate Therapy | | 2 | 2 | 1 | 1 |
| A5 - Discontinue Empiric Antibiotics | 14 | 5 | 7 | 9 | 15 |
| A9 - Narrow or Target Based on c/s | 12 | 10 | 12 | 12 | 17 |
| A3 - Narrow or Target Initial Empiric Therapy | 0 | 12 | 5 | 6 | 3 |
| A4 - Obtain Additional Diagnostic Tests | 2 | 1 | | 2 | 1 |
| A3 - Optimized Dosing | 5 | 7 | | 1 | 1 |
| A3 - Other | | | 1 | | |
| A3 - Provided Education | 2 | 1 | 4 | 2 | 1 |
| A6 - Recommend ID Consult | 7 | 2 | 1 | 3 | 1 |
| A5 - Recommend no empiric antibiotics | 1 | | | | |
| A3 - Recommend Shorter Duration | 1 | 1 | 5 | 3 | 2 |
| A3 - Recommended Serum Concentration Monitoring | 3 | 2 | 1 | | 1 |
| A6 - Start Antimicrobial | 2 | | | 1 | |
| IV to PO Conversion | | 3 | 4 | 4 | 2 |
| Therapy Optimization - Antimicrobial - Culture Mismatch | | | | | |

## Data Collection-Interventions



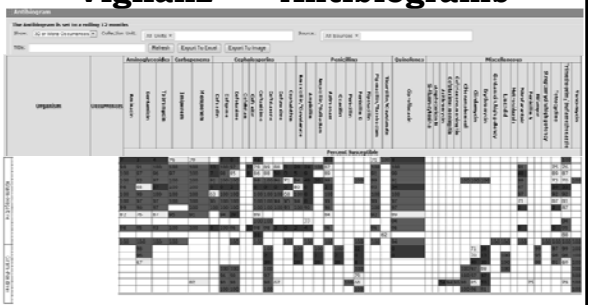



## Vigilanz™ - Antibiograms

- Rolling
- On demand
- Option to exclude <30 isolates
- Unit specific
- Source specific
- Exporting
  - Excel
  - Image



## Vigilanz™ - Antibiograms





## Tracking Drug Utilization

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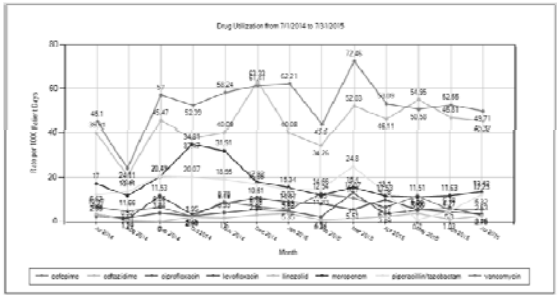
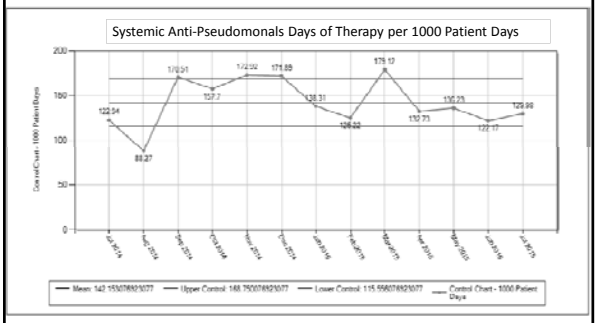
## Tracking Drug Utilization






## Tracking Drug Utilization



## Avoiding Adverse Events

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- Septic shock in PICU; Scr doubled since admit
- Vanc initiated at1550mg q6h with plan to check the trough after 4 doses
- Vigilanz alert- vanc + norepinephrine ordered
- Discontinued vancomycin order after one dose
- 9 hour level-17mcg/ml
- Acute renal insufficiency averted



## Challenges

- Rate limiting factor: custom rule build
- Alerts based on diagnosis
- Noise reduction
  - Three-tiered noise reduction feature
  - Layered alerts
- Data collection- validation
- Real time challenges
- Data retrieval for daily chart review
- Interventions not in EPIC



## Self-assessment question

Computer decision support surveillance software can enhance the productivity of an Antimicrobial Stewardship Program by:

A. Reporting real time organism-antibiotic mismatches.
B. Alerting clinicians to potential toxicity from antimicrobials.
C. Providing on demand data mining capability to provide information on antibiotic utilization on a specific inpatient floor.
D. All of the above.

# Optimizing Care Through Clinical Surveillance

## CareFusion Medmined®

Zahra Khudeira, PharmD, BCPS, CPPS
Sinai Health System
Medication Safety Officer

September 11, 2015

The speaker has no conflicts of interest



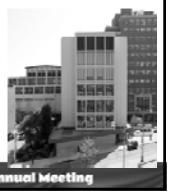
## Discussion Points

- Explain the potential impact of clinical decision support systems (CDSS) on patient safety, clinical outcomes, and cost savings
- Describe how CDSS can enhance an antimicrobial stewardship program and improve patient care



## Mount Sinai Hospital (MSH)

- 320-bed community teaching hospital in Chicago, IL
- Level I Trauma Center
- Level III NICU
- Implemented Medmined in October 2013
  - Infection Control
  - Pharmacy





## Clinical Decision Support System (CDSS)

- Software that integrates order information, patient information, and clinical practice guidelines into computer-system logic to provide feedback to clinicians
- Program identifies opportunities for pharmacists to optimize drug therapy and prevent an adverse drug event



## CareFusion MedMined®

- Web based surveillance software program interfaces with the hospital's electronic medical record
  - Filters pertinent patient data
  - Packages data as real-time alerts
  - Identifies opportunities for targeted clinical interventions
- Robust system that optimizes and prioritizes patient related events by generating alerts for the pharmacist
  - Provides opportunity for early intervention
  - Promotes patient safety by identifying potential adverse drug events



## CareFusion MedMined®

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## MSH Current Alerts

- Anticoagulation
- Antimicrobial
- Laboratory



## Anticoagulation Alerts

- No VTE prophylaxis
- Thrombocytopenia with anticoagulants
- High INR values >3.5



## Antimicrobial Alerts

- De-escalation
- Infection marker without treatment
- Bug-drug mismatch



## Laboratory Alerts

- Potassium level less than 3 meq/L
- Renal dosing of low molecular weight heparin
- Drug induced hyperkalemia



## Patient Event Advisor

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## Alerts

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## Labs

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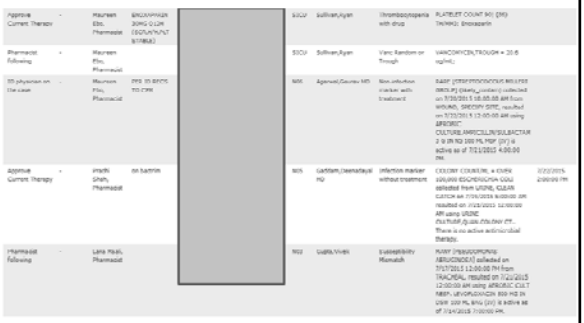



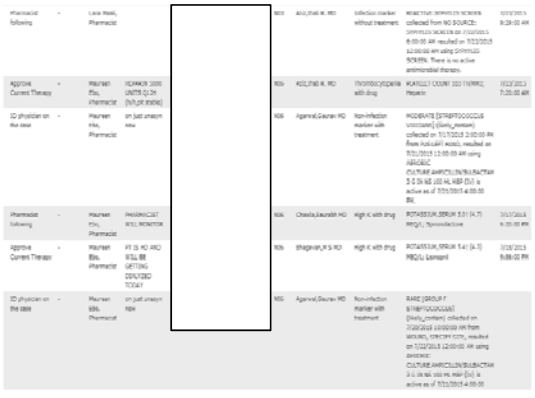

## Intervention Types

- Pharmacist following: pharmacist aware
- Accepted intervention: made a recommendation or contacted prescriber for therapy change
- Approve current therapy: accepted intervention but no change made
- Rejected intervention



| Intervention Types | User Comment | Alert Type | Alert Detail |
|---|---|---|---|
| Pharmacist Following | Antibiotic changed to ampicillin | Bug-drug mismatch | Few enterococcus faecalis collected on 5/22/2015 from aerobic culture of paracolic abscess and resulted on 5/27/2015. Ceftriaxone 2G Vial (IV) is active as of 5/27/2015 |
| Accepted Intervention | Suggested 1 mEq/kg potassium rider for a pediatric patient | K less than 3 | K = (2.6 meq/L). Dropped from 7.2 on 5/27/2015 to 2.6 on 5/31/2015 |
| Approve Current Therapy | Hold chemical prophylaxis secondary to GI bleed | No VTE prophylaxis | No active VTE prophylaxis |
| Rejected Intervention | Pt with Acute Kidney Injury | High BNP and no ACE-I | BNP 611 and no active ACE-inhibitor |

## Thrombocytopenia Example

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## Electrolyte Example

Medication Alerts

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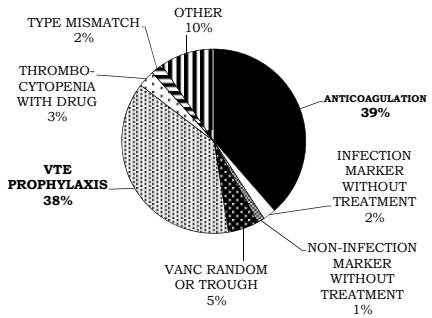
## MSH Medmined Alerts

July 2014-July 2015



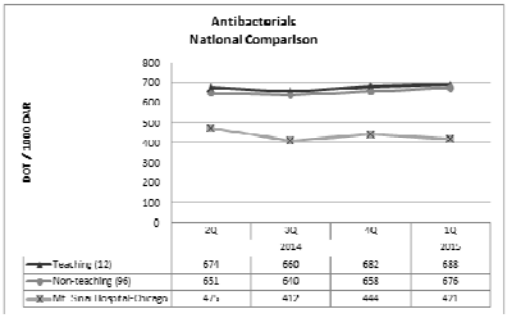



## Antimicrobial Stewardship Program (ASPs)

- ASPs improve patient safety, quality of care, and significantly reduce the rate of hospital-acquired infections like *Clostridium difficile* infection (CDI).
- ASPs are endorsed by the CDC, IDSA, ASHP, and the Joint Commission.



## Benchmarking



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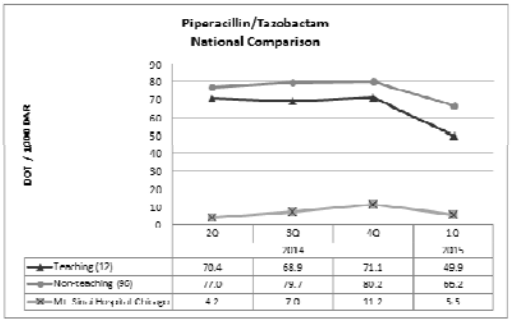
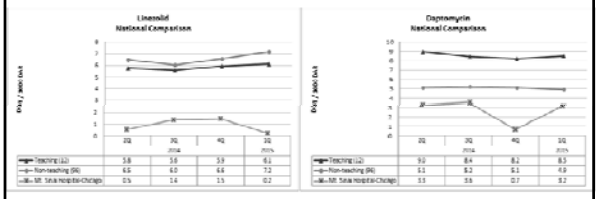


## Benchmarking





## NIM Evaluation Process

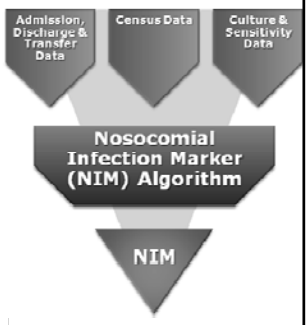
**Every** positive isolate is evaluated

**The NIM algorithm screens for:**
- Community-acquired pathogens
- Contaminants and colonization
- Duplicate isolates
- Present on admission

The result is an objective, consisten reproducible marker for HAI case finding

Published, peer-reviewed sensitivity (86%) and specificity (98%),*

*Brossette S, et al. A Laboratory –Based, Hospital-Wide, Electronic Marker for Nosocomial Infection. American Journal of Clinical Pathology. 2006; 125: 34-39






## NIM Rates vs National Averages*

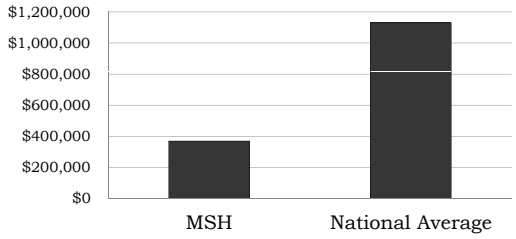
| NIM Source | % of Admissions | National Average | National Comparison |
|---|---|---|---|
| Patient NIMs | 2.38% | 4.51% | 47.2% lower |
| Total NIMs | 3.17% | 5.75% | 44.9% lower |
| Blood NIMs | 0.41% | 0.68% | 39.2% lower |
| Resp NIMs | 0.91% | 1.18% | 22.7% lower |
| Urine NIMs | 0.99% | 1.93% | 48.8% lower |
| Wound NIMs | 0.50% | 0.91% | 44.8% lower |
| Stool NIMs | 0.10% | 0.56% | 81.7% lower |
| Other NIMs | 0.25% | 0.49% | 49.3% lower |

* Based on CareFusion analysis of .67M inpatient admissions from Academic facilities during 2Q14-1Q15.



## Benchmarking - CDI

### Total CDI Cost






## Audience Participation

1. Which of the following alerts would be most beneficial to a hospital pharmacist?

A. Bug-drug mismatch
B. Thrombocytopenia with anticoagulants
C. Drug induced hyperkalemia
D. No VTE prophylaxis
E. All of the above



## Audience Participation

2. The goal of CDSS is to help:

A. Alert the physician on what labs to order
B. Alert the pharmacist about patients at potential risk of harm
C. Inform the pharmacy technician on what medications to fill
D. Generate drug interaction reports

## Audience Participation

3. How do the alerts from CDSS contribute to patient care?

A. Help enhance patient safety
B. Increase medication compliance
C. Decrease lab errors
D. Monitor drug administration times



## Summary

- CDSS is a promising application that focuses pharmacist's attention, manages information, and provides patient-specific information management.



## Questions?

# Optimizing Care Through Clinical Surveillance

## Epic Antimicrobial Stewardship

Michelle Geurink, RPH
OSF Healthcare System
No Conflicts of Interest



## Plan Your Surveillance

- Bug-Drug
- IV to PO
- Targeted Drugs
- De-Escalation
- Duplicate Therapy



## Scoring System—Find It

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## Find It- Example: Bug-Drug

- General Mismatch
- MIC
- Fluconazole/Candida Sputum
- Vanco/VRE



## Document It

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## Document-Closer View

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## Intervention/Note

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## Barriers

- Resources
  - Build of Scoring
  - Implementation
- System
  - Finding Patients
    - Large Lists Load Slow
  - Knowing Lab Processes



## Next Steps

- Pharmacy Acuity System
- Total Score Columns
  - General Pharmacy Scoring
    - Exists; being optimized
    - IV/PO, High INR, Decreasing CrCl, ADE
  - Antimicrobial Stewardship Scoring
  - Anti-thrombosis Scoring (future)
  - Others