Project Title: Treatment of febrile neutropenia at the University of Virginia

Presenter’s Name: Tri Le, MD, Tanya Thomas, RN, Michael Keng, MD
Institution: University of Virginia, Emily Couric Cancer Center

Date: 10/8/2015
Institutional Overview

- The University of Virginia (UVA) Department of Hematology-Oncology at the Emily Couric Clinical Cancer Center is an NCI-designated cancer center and a tertiary referral center located in Charlottesville, Virginia.
- The UVA Cancer Center includes more than 130 researchers from 22 different academic departments.
- Over 30,000 patient visits for fiscal year 2014.
- Current clinical practice includes 7 attendings in malignant hematology, 3 in stem cell transplant, 3 in benign hematology, and 11 in oncology.
Problem Statement

- Febrile neutropenia is a common complication in oncology patients and is associated with significant morbidity and mortality if untreated. Both national and international guidelines recommend the administration of appropriate antibiotics within one hour of a febrile neutropenic episode. Upon review of time-to-antibiotic administration for febrile neutropenia events at our institution, a significant percentage (~55% in 2012) were not administered antibiotics within 1-hour of event.
# Team Members

**Team Leader:**
- Tri Le, MD (hematology-oncology fellow)

**Team Members:**
- Tanya Thomas, BSN, BA, RN, OCN (assistant nurse manager, oncology inpatient)
- Michael Keng, MD (hematology attending)
- Elizabeth Daniels, MSN, RN (nurse manager, oncology inpatient)
- Regina DeGennaro, DNP, RN, AOCN, CNL (oncology nursing)
- Stephanie Mallow-Corbett, PharmD (Director, Clinical Pharmacy Services)
- Joseph Moffett, RN (Medical Emergency Response RN)
- Costi Sifri, MD (Infectious Disease Attending, hospital epidemiology)
- Li Jin (Bioinformatics)
- Joshua Reuss (Internal Medicine Resident)

**Project Sponsor:**
- Michael E. Williams, MD (Hematology-Oncology division chair)

**Improvement Coach:**
- Amy E Guthrie RN, MSN, ACHPN, CPHQ
Patient with ANC <1000 /mm² AND temperature ≥38.0 C (100.4 F)

Initial Fever?

Has patient been afebrile for 24-hours?

Notify: On call fellow, on call housestaff, MET team
Diagnostics: Vital Signs¹, Cultures², Radiology Studies³, other labs⁴
Antibiotics⁵: Initiate within 60 minutes of febrile episode

LIP: Must perform complete physical assessment and enter the febrile neutropenia order set
RN: Must perform a complete physical assessment

¹ Obtain temperature, heart rate, respiratory rate, blood pressure and oxygen saturation every 15 min x 4, the hourly x 2 then every 4 hours. If the respiratory rate is ≥ 20, obtain a groin temperature.

² All cultures should be drawn or collected within 20 minutes of febrile episode. Cultures should include: blood cultures from each lumen of each central venous access device, 1 set of percutaneous cultures and a urinalysis with reflex microscopic and urine culture.

³ Chest x-rays,

⁴ Collect a stool specimen if patient is having diarrhea, culture any wound or lesion, collect a CBC with differential and CMP if one has not been collected within the past 24 hours, draw a lactate if patient meets SIRS criteria.

⁵ Initiate Antibiotics within 45 minutes of febrile episode. Empiric antibiotic coverage: Cefepime (if meets SIRS criteria or concern for gram positive infection add vancomycin). If PCN allergic, aztreonam and vancomycin.

⁶ All cultures should be drawn or collected within 20 minutes of febrile episode. Cultures should include: blood cultures from one lumen of the central venous access device, 1 set of percutaneous cultures and a urinalysis with reflex microscopic and urine culture.

⁷ For patients with hemodynamic stability: obtain temperature, heart rate, respiratory rate, blood pressure and oxygen saturation hourly x 2 followed by every 4 hours. For patients with hemodynamic instability (heart rate >90, respiratory rate >20 or PaCO₂<32 mmHg, MAP <65 and patient is not responding to intravenous fluids): obtain a full set of vital signs every 15 minutes for 1 hour followed by a full set of vital signs every hour x 2 then every four hours. If patients are unstable, more frequent vital signs may be necessary. If more frequent vital signs are necessary, the LIP will enter the appropriate vital sign frequency.
Cause & Effect Diagram

Clinical Knowledge
- Inconsistent definition of a fever
- Lack of adequate education related to febrile neutropenia
- No standard workflow related to LIPs, RNs, PCAs

Order Entry
- Conflicting orders
- Incorrect antibiotics ordered
- Delay in order entry after fever

Antibiotic (Abx) Availability
- Appropriate Abx not stocked on unit
- Delays in antibiotic delivery to the unit

Phlebotomy delays

Staff Resources
- Inadequate RN and PCA staffing
- Delays in administration of Abx once on unit
- Antibiotic (Abx) Availability

Delay in appropriate treatment for Febrile Neutropenia
Diagnostic Data

Knowledge Deficits
Inconsistent Entry
Order Pharmacy
Delays
Clinical Delays (blood cultures, radiology)
Insufficient Staff

Frequency
Cumulative percentage
Aim Statement

• By year-end 2015, we aim to increase percentage of patients receiving antibiotics within one hour for the first episode of febrile neutropenia to 80% in the acute care setting at the University of Virginia.
Measures

• Measure: Time to antibiotic administration for patients with the first episode of febrile neutropenia.

• Patient population: All patients being treated for febrile neutropenia in the inpatient setting.
  – Exclusions (if any): Patient being treated in the Emergency Department, Infusion Center, or ICU’s

• Calculation methodology:
  – Numerator & Denominator: Numerator: # of patients with first episode of neutropenic fever treated with antibiotics within one hour. Denominator: # of patients with first episode of neutropenic fever

• Data source: Clinical data repository, Epic, ICD Database

• Data collection frequency: Every 3 months

• Data quality (any limitations): Limits of our electronic patient database, inability to ensure that we are capturing all patients who present with febrile neutropenia.
Baseline Data

Time between Fever and Initial Antibiotic Administration by Year

Percentage of Patients

- <1 hr
- 2-3 hours
- 4-5 hours
- >5 hours

2012
2013
2014
### Prioritized List of Changes (Priority/Pay-Off Matrix)

<table>
<thead>
<tr>
<th>Impact</th>
<th>Ease of Implementation</th>
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</thead>
<tbody>
<tr>
<td>High</td>
<td>- Increasing staffing available during acute event</td>
</tr>
<tr>
<td></td>
<td>- Make Abx available on floor</td>
</tr>
<tr>
<td></td>
<td>- Creating an Epic order set</td>
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<tr>
<td></td>
<td>- Creating Epic Alert</td>
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<tr>
<td>Low</td>
<td>- Implementation of staff educational program</td>
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<tr>
<td></td>
<td>- Creation of an institutional clinical practice guideline</td>
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<tr>
<td></td>
<td>- Increase overall staffing</td>
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<tr>
<td></td>
<td>- Infectious diseases involvement with new cases</td>
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# PDSA Plan (Tests of Change)

<table>
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<tr>
<th>Date of PDSA cycle</th>
<th>Description of intervention</th>
<th>Results</th>
<th>Action steps</th>
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</table>
| 9/2013 - present   | **Clinical Practice Guideline** - Includes order set, educational materials, expected training, workflow  
                      **Epic Order set** - antibiotics, VS, notification  
                      **Clinical Workflow** - Workflow notification, vitals, cultures, antibiotic administration | Correct antibiotics ordered for all febrile neutropenic patients.  
Increase in number of patients treated within 1-hour. | Modify clinical workflow based on LIP, RN, and PCA input.  
Include the neutropenic order set as an option for all patients admitted to the inpatient heme-onc setting |
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| Education 12/2013 - present | Computer Based Learning Modules - modules created for LIPs, RNs, PCAs/PCTs  
IPE Simulation sessions related to identification and treatment of febrile neutropenia.  
Reference sheets created for other acute care units.  
Inpatient lectures for LIPs. | Increased confidence and competence in caring for oncology patients with febrile neutropenia in the inpatient setting. This increase is demonstrated via **pre- and post-simulation testing**. | Revise the CBLs and include the CBLs as part of the required training for all newly hired clinicians.  
Expand the simulation sessions to include pharmacy and other inpatient units. |
## PDSA Plan (Tests of Change)

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<td>EPIC BPA</td>
<td><strong>Best Practice Advisory</strong> created to identify patients who meet the criteria for febrile neutropenia. The BPA will notify the LIP, pharmacy, RN, PCA when they open the patient’s chart. A link to the order set will be included in the BPA notification.</td>
<td>Ongoing, BPA currently running in background, ensuring that correct patients are captured. Currently manually recording patients on 8-West to ensure proper BPA is triggered.</td>
<td>Anticipated late 2015 - Approval for the BPA to “Go-Live” for all patients in the inpatient setting.</td>
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Materials Developed

• Educational materials:
  – Simulation center training
  – Online learning modules
  – Monthly lecture given by inpatient fellow

• Established a new clinical practice guideline
  – Epic Order Set
  – New clinical workflow for floor staff
  – Automatic MET Nurse involvement
Time to Antibiotics

# of patients treated within 60-min, 60-180 min, and 180+ min
2013 vs 2015

Total Number of Patients

Antibiotic Administration Time

Under 60 minutes
60-180 minutes
180+ minutes

2013
2015
Time to Antibiotics

% of patients treated within 60-min, 60-180 min, and 180+ min
2013 vs 2015

Antibiotic Administration Time

% of patients treated

2013 (%)

2015 (%)
Conclusions

• With the implementation of our clinical practice guideline and educational materials, we have substantially increased the % of patients treated with antibiotics in under 60-minutes (84% in 2015 versus 19% in 2013)
• We are continuing to collect data for 2015, and hope to meet our goal of 80% of patients treated within 60-minutes
Next Steps/Plan for Sustainability

• Implementation of the Epic BPA
• Continue to measure the post intervention compliance and adherence to the practice standards outlined in the CPG
• Continuing the educational program, including CBL’s (updated yearly), simulation sessions, and monthly lectures
• Collaborate with key stakeholders in the Emergency Department, Pediatrics and the outpatient infusion center clinics to develop processes for expansion of the febrile neutropenia standard work to these settings