Reducing Time to Antibiotic Administration in Pediatric Patients with Fever and Suspected Neutropenia in the Emergency Department

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Introduction
In oncology patients, febrile neutropenia is a common and potentially life threatening complication of treatment. Prompt administration of broad-spectrum antibiotics is the standard of care as the risk of serious bacterial infection is greater in neutropenic patients, especially when the absolute neutrophil count (ANC) is less than 500 cells/mm3.

Oncology patients with fever account for <1% of the total emergency room visits at Palmetto Health Richland Emergency Department. Management of these patients varied greatly depending on the physician in the ED at the time. There was no set protocol at PHR for the resident or attending to follow for pediatric patients with fever and suspected neutropenia. These patients would usually progress quickly through triage, but the time to antibiotic administration varied greatly; some patients would receive antibiotics immediately after blood cultures while others would not receive antibiotics until the CBC returned and the resident spoke to the pediatric oncology attending on call.

The most recent guidelines by the Infectious Disease Society of America state that administration of antibiotics within 2 hours of presentation is ideal. The Surviving Sepsis Campaign advocates for antibiotic initiation within an hour. While evidence is lacking to support a specific target for time to antibiotics we set our goal at 60 minutes. A 1-year retrospective chart analysis at PHR of children who received antibiotics for fever and suspected neutropenia showed that over 95% exceeded the recommend 60 minutes from time of arrival to the ED to time of antibiotic administration. We believe that creating a standardized protocol for the ED physicians to follow could help improve time to antibiotic administration.

The aim of this project was to reduce time to antibiotic administration in the PHR Emergency Department in pediatric patients with fever and suspected neutropenia.

Methods
A protocol was created to standardize the process by which a febrile oncology patient receives antibiotics in the ED. The most important part of the protocol was to immediately give antibiotics after a blood culture was obtained from the patient’s central line. The protocol also tried to minimize the amount of extra lab tests that were run. For example; it states that chest x-rays should only be ordered on patient’s with respiratory symptoms and to only get urinalysis/urine cultures for patients with dysuria. The protocol used is shown in Figure 1. It was put into place in December 2014 and data was collected until May 2015. The protocol was presented to one of the chief attendings in the pediatric ED at PHR and he made the other ED attendings, nurses, and residents aware of the protocol. It was placed in a central location within the ED where all the residents and attending could easily reference it. Patients who met the inclusion criteria were those either undergoing or just finishing chemotherapy, who have a central catheter and presented with the chief complaint of fever. The primary outcome was the proportion of patients with suspected neutropenia who received antibiotics within 60 minutes of arrival to the ED.
Results
There were 24 patients in the pre-intervention group and 16 patients in the post-intervention group. The average time to antibiotics in the pre-intervention group was 197 minutes compared to the average time of 98 minutes in the post-intervention group. We did not meet our goal of 60 minutes for the post-intervention group but we were able to reduce the time to antibiotics by 99 minutes. Figures 2 and 3 show the time to antibiotics for patients before and after the initiation of the protocol respectively. We were also able to reduce the percentage of patients whose time to antibiotics was greater than 2 hours from 86% in the pre-intervention group to 25% in the post-intervention group as shown in figure 4. In addition, the percentage of patients to receive antibiotics in less than 60 minutes was increased from 4% to 25% again as shown in figure 4. Figure 5 shows both groups of patients with a trend line showing the decrease in time to antibiotics.

Discussion
By creating a protocol for the ED to follow we were able to decrease the average time to administration of antibiotics by 50%, going from 197 minutes to 98 minutes. We were able to increase the percentage of patients who received antibiotics within 60 minutes from 4% to 25%. A similar improvement project at Boston Children’s Hospital was able to decrease the mean time to antibiotic delivery in patients with known neutropenia from 99 minutes to 49 minutes and in patients with suspected neutropenia from 90 minutes to 81 minutes. They used a multidisciplinary team approach consisting of ED nurses, doctors, pharmacist, security director, and oncology clinicians. A flowchart was implemented to standardize the process of care these patients received in the ED. By using this model for improvement they were able to decrease the mean time to antibiotics by 50 minutes.

The protocol we implemented aimed to reduce variation in care among ED and oncology attendings in order to expedite antibiotic delivery. Variation in care can often lead to confusion and error, especially when working in a busy ED. Standardization of the way a patient with suspected neutropenia is worked-up allows for prompt administration of antibiotics. One of the hurdles in administering antibiotics quickly to these patients is accessing their Port-a-Caths. Sometimes parents refuse access by unfamiliar ED nurses and prefer an inpatient oncology nurse access the catheter. In the future a skill-based reeducation class could be given to all ED nurses in order to increase their proficiency in assessing Port-a-Caths. Hopefully this would allow families to be more comfortable with the ED nurses’ capability in accessing the patient’s port. Another barrier in administering antibiotics quickly is having a room available for the patient when they arrive in a busy ED. In the future, we could have a standard that the pediatric oncology attending call ahead to save a room in the ED when they know a febrile oncology patient in on the way.

For this project the initial PDSA cycle consisted of creating a flowchart that the ED staff could follow. The next step in this project could be to meet with a multidisciplinary team to review areas that could be improved. The next PDSA cycle could include reviewing each patients ED course to see where the major delays in antibiotic administration were occurring. Repeating these PDSA cycles with ongoing monitoring of treatment times will allow for continuous improvement in antibiotic administration to patients with febrile neutropenia.

Limitations of this project include the small sample size of patients for each of the groups and the limited amount of time that the post-intervention group was studied. It was also difficult to track all the patients seen in the ED for febrile neutropenia as each ED physician charted the diagnosis of the patients differently and if they did not document neutropenia as a problem the patient was missed in the chart review. In the future, part of the protocol can include
documenting febrile neutropenic patients correctly in order to improve data collection when using a chart review program.

In conclusion our results suggest that a simple intervention such as a standard protocol can reduce time to antibiotic administration in the ED in patients with fever and suspected neutropenia.

Works Cited


Fever & Neutropenia

**Goal: door-to-antibiotic time of less than 60 minutes**

1. NO rectal temp with vital signs
2. Notify Resident of patient
3. Apply Emla cream to port site
4. Resident performs thorough exam noting skin, visual GU, and visual rectal exam
5. Order CBC with manual diff and blood culture from port
6. Give ceftriaxone *immediately* after blood culture DO NOT wait on CBC Give 75 mg/kg MAX 2 grams.
   For ill-appearing patients give cefepime 50mg/kg MAX 2 grams
7. Consider the following tests:
   - CXR: if respiratory symptoms present
   - Clean Catch Urinalysis and culture: for older children that can give a history of dysuria. NO CATH urines should be obtained
8. Call heme/onc attending after neutrophil count returns
Figure 3

Pre-Intervention

Post-intervention

Avg 197 mins
Avg 98 mins

Minutes

Minutes
Figure 4

Pre-Intervention: Time to antibiotics

- >2 hour, 84%
- >60 min but <2h, 12%
- <60 min, 4%

Post-Intervention: Time to antibiotics

- >2h, 25%
- Less than 60 min, 25%
- >60 min but <2h, 50%
Figure 5

Time to Antibiotic Administration with Both Groups

- 1 patient
- Avg Time

Minutes

Pre-intervention

Post-intervention