

# Febrile Neutropenia: Improving Care Through an Oncology Acute Care Clinic

Jennifer Frith, DNP, RN, NE-BC, OCN®, Deborah "Hutch" Allen, PhD, RN, CNS, FNP-BC, AOCNP®, Kerry Minor, ANP-BC, and Staci S. Reynolds, PhD, RN, ACNS-BC, CCRN, CNRN, SCR, CPHQ



**BACKGROUND:** Patients with cancer are at risk for oncologic emergencies, including febrile neutropenia (FN). Timely treatment of FN can prevent complications. Providing this care in the outpatient setting has been shown to be safe and effective.

**OBJECTIVES:** This project implemented and evaluated a new process using an outpatient acute care clinic (ACC) to manage FN in patients with hematologic cancer. The aims were to reduce the time from fever identification to antibiotic administration, decrease emergency department (ED) visit rates, and evaluate patient satisfaction.

**METHODS:** Using a pre-/postimplementation design, an interprofessional team was educated about a new process of caring for patients with hematologic cancer and FN at an outpatient ACC using a comprehensive algorithm.

**FINDINGS:** 31 patients participated in the project (15 pre- and 16 postimplementation). Time to antibiotic administration decreased from 144.88 minutes to 63.69 minutes. Participant visits to the ED decreased by 2.33 times per month on average. Overall, patients were satisfied with the ACC. These findings support using a dedicated outpatient ACC for patients with FN receiving hematology care.

## KEYWORDS

febrile neutropenia; antibiotics; outpatient; emergency department; ambulatory

## DIGITAL OBJECT IDENTIFIER

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**THE PREVALENCE OF CANCER CONTINUES TO GROW**, affecting nearly 15.5 million people each year, and is projected to increase to 26 million people by 2040 (Alfano et al., 2019). Patients with cancer are at risk for oncologic emergencies, such as febrile neutropenia (FN), tumor lysis syndrome, and hypercalcemia (Klemencic & Perkins, 2019). FN is a complication of cytotoxic chemotherapy, occurring in as many as 50% of patients with solid tumors and in as many as 80% of patients with hematologic malignancies (Klemencic & Perkins, 2019). Significant complications, including hypotension and acute respiratory, renal, or heart failure, can occur in about 30% of patients with FN (Taplitz et al., 2018). In addition, FN is associated with mortality rates of as much as 11% (Bruce, 2021; Taplitz et al., 2018). Appropriate and timely management of FN in patients with cancer is required.

Many patients with hematologic malignancies who develop FN are admitted to the emergency department (ED) or directly to an inpatient unit for care, which includes IV antibiotics or IV hydration and close monitoring. However, studies have shown that ED physicians do not consistently evaluate patients for FN (Alsharawneh et al., 2020; Richards, 2020). To treat and manage FN, the National Comprehensive Cancer Network (NCCN, 2022) recommends administering empiric broad-spectrum antibiotics within 60 minutes of the patient's presentation of neutropenic fever after blood cultures have been obtained. Delays in treatment, particularly in administering IV antibiotics, present significant risks to the patient (Alsharawneh et al., 2020). Factors contributing to antibiotic delays may include ED crowding, higher-acuity patients, and inconsistent definitions or treatment regimens for FN (Keng et al., 2015; Peltan et al., 2019). Treating patients with cancer and FN in the ED or inpatient settings may be an ineffective use of these resources. There have been calls to reduce the costly and potentially avoidable use of some healthcare services, such as ED visits and inpatient admissions (Lash et al., 2017). As healthcare systems and processes respond to these concerns, patients with FN at low risk for severe complications may receive treatment in the outpatient setting (Rivas-Ruiz et al., 2019). However, to prevent unnecessary admissions to the ED and inpatient settings, it may be necessary to establish infrastructure in the outpatient setting to quickly treat and manage FN (Coyle et al., 2019).

In the Duke University Health System, a comprehensive academic health system in Durham, North Carolina, patients with symptoms of an oncologic

emergency are directed to present to the ED because no outpatient setting is available to handle these emergencies. To provide high-quality patient care and lower the risk of unnecessary hospitalization, an acute care clinic (ACC) was needed to handle oncologic emergencies like FN. This quality improvement (QI) project implemented and evaluated an outpatient ACC to manage low-risk FN in patients with hematologic cancer. The aims of the project were to reduce the time from fever identification to antibiotic administration, decrease the rate of ED visits for patients with FN, and evaluate patient satisfaction with the ACC.

### Literature Review

Clinical evidence has demonstrated considerable support for the outpatient treatment of FN in patients with cancer at low risk for developing severe complications (Lucas et al., 2018). A randomized controlled trial conducted by Coyle et al. (2019) found that providing evidence-based supportive oncology care in the outpatient setting decreased unplanned hospitalizations and associated costs. Lucas et al. (2018) found that for patients with FN who are at low risk for complications, management in the outpatient setting can be safe and effective. In addition, treating low-risk FN in the outpatient setting can significantly reduce healthcare costs by eliminating avoidable expenses resulting from lengthy hospital admissions (Nguyen et al., 2021; Tew et al., 2019). A systematic review by Rivas-Ruiz et al. (2019) of 10 randomized controlled trials with 994 participants found that the management of low-risk FN in patients with cancer in the outpatient setting did not lead to higher mortality or treatment failure rates than standard inpatient treatment, suggesting that care in the outpatient setting is safe and effective. This finding was reinforced by Ying et al. (2018), who implemented a comprehensive outpatient protocol for oncology nurses and clinicians that provided safe and effective FN treatment.

### Antibiotic Administration

If untreated or undiagnosed, a fever or infection in patients with cancer and FN can lead to sepsis and death (Goldsmith et al., 2018). To prevent complications, optimal care of patients with FN requires early recognition and timely administration of antibiotics (Goldsmith et al., 2018). According to Seltzer et al. (2022), implementing a protocol to optimize the management of FN was associated with a significant reduction in the time to antibiotic administration for patients with FN in the ED. Taplitz et al. (2018) endorsed patients receiving empiric antibiotic treatment within one hour of triage.

### ED Visits

For optimal outcomes, patients with FN require timely and effective treatment. Several studies have described gaps in care for FN by ED providers (Alsharawneh et al., 2020; Richards, 2020). A study by Alsharawneh et al. (2020) reported that antibiotic

**“An outpatient acute care clinic can provide safe and efficient treatment for febrile neutropenia in patients with hematologic cancer.”**

administration for patients with FN is routinely delayed in the ED and inpatient settings. In addition, Brown et al. (2016) found that the median time from fever identification to initial antibiotic administration in the ED ranged from 102 to 300 minutes, which indicates poor adherence to treatment guidelines. In addition, EDs with large patient volumes are not ideal for patients with cancer experiencing FN because of the increased risk of exposure to infections, such as influenza or other diseases (Richards, 2020). Offering interventions in the outpatient setting can reduce visits to the ED for patients with hematologic cancer and low-risk FN.

### Patient Satisfaction

Patient experience plays a vital role in defining and improving the quality of cancer care. Patients with increased satisfaction in their care delivery take more interest in their care plan, report emergencies more readily, miss fewer appointments, and have better continuity of care (Trant et al., 2019). In addition, better healthcare outcomes are associated with positive patient experiences (Bridge et al., 2019). Patient experience is a core measure of clinical success, and improving it through QI projects can drive advancements to the care delivery model (Bridge et al., 2019).

### Methods

#### Design, Setting, and Sample

This QI project used a pre-/postimplementation design. For this design, data were evaluated before and after implementing the new ACC process for FN management. Planning to implement the new process included regularly scheduled steering committee meetings with key stakeholders to ensure that all team members were aligned with the project aims. The project was implemented in the blood cancer center at Duke University Hospital in Durham, North Carolina, that cares for about 8,500 patients with cancer annually. Inclusion criteria were being diagnosed with FN using diagnosis-related group codes D70.9,

R50.0, or R50.81 and having hematologic malignancies (e.g., lymphoma, leukemia, multiple myeloma). Exclusion criteria were being aged younger than 18 years or older than 90 years. The project was deemed exempt by the health system's institutional review board and was not considered human subject research.

### Implementation

The outpatient clinic of the blood cancer center contains 60 infusion chairs that support numerous outpatient treatments, including chemotherapy administration, management of treatment complications, research treatments, and supportive care. The dedicated staff in the blood cancer center include one advanced practice provider (APP) and multiple RNs trained to manage FN. The ACC was embedded within the infusion area of the outpatient clinic to support the management of low-risk FN for patients with hematologic cancer. The ACC's hours of operation were Monday through Friday, 8 am–6 pm. The interprofessional team at the outpatient clinic were educated about the new ACC process through 5- to 10-minute in-service trainings during daily safety huddles. Education was provided by the oncology clinical operations director or designated APP and was delivered during five days in early December 2021, beginning two weeks before the implementation of the ACC. Education included training on how to route patients seeking treatment for FN and standardized communication for charge nurses. In addition, the interprofessional team was trained using a formal demonstration on how to assign a patient to the ACC. An algorithm describing the process was also available for reference (see Figure 1).

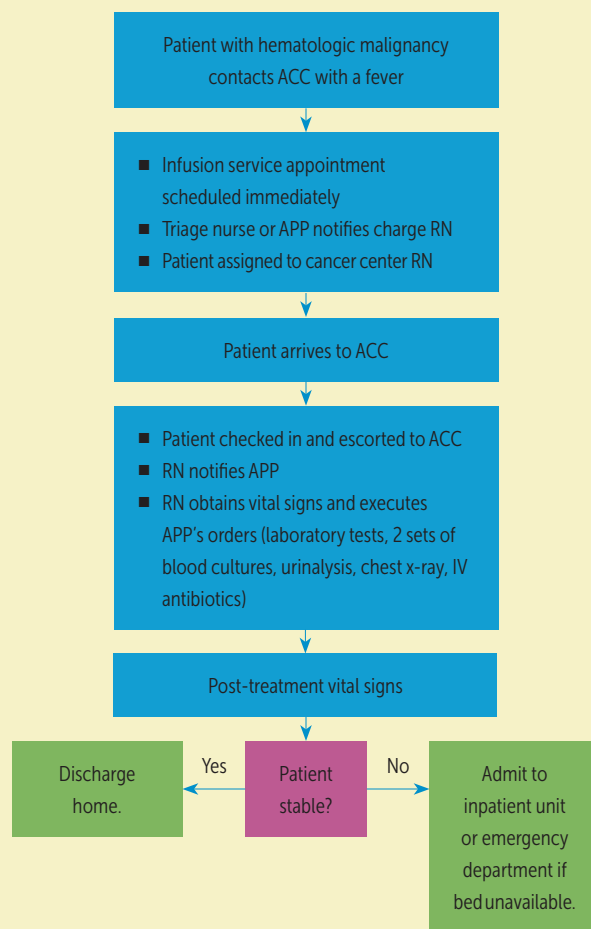
### Data Collection and Analysis

Preimplementation data were collected from November 1, 2020, to March 31, 2021. Postimplementation data were collected from January 1, 2022, to June 25, 2022. Staff training occurred in early December 2021, and the ACC opened in the middle of December 2021. Data were collected via a retrospective electronic health record review of patients with hematologic cancer and a diagnosis of FN. In addition, the following demographic data were collected: age, sex, race, diagnosis, and final disposition.

To evaluate time to antibiotic administration, the length of time (in minutes) between recording a fever of 100.4°F or greater and administering antibiotics was documented in the medication administration record. An independent samples *t* test assessed the average time from fever documentation to antibiotic administration. In addition, the QI project evaluated how often the NCCN recommendation of 60 minutes was met using a pre-/postimplementation code of yes or no; this was assessed using a Fisher's exact test.

To evaluate any change in ED visits by patients with FN, the patient's disposition after FN management was captured by reviewing the provider's clinic event notes. The QI project

**FIGURE 1.**  
ACC TREATMENT PROCESS FOR PATIENTS WITH FEBRILE NEUTROPENIA



ACC—acute care clinic; APP—advanced practice provider  
**Note.** Image courtesy of Duke University Hospital. Used with permission.

collected data only for patients visiting the ED between 8 am and 6 pm to match the ACC's hours of operation. Descriptive methods were used to assess the aggregate number of ED visits pre- and postimplementation.

To evaluate patients' satisfaction with the care provided by the ACC, an anonymous researcher-developed survey using a four-point Likert-type scale with scores ranging from 1 (strongly disagree) to 4 (strongly agree) was administered to patients who received treatment for FN in the ACC. The survey was distributed via a direct message or QR code to the patient 24–72 hours after visiting the ACC. Descriptive statistics were calculated to summarize survey responses. All data were analyzed using IBM SPSS Statistics, version 28.0.

**TABLE 1.**  
PRE AND POST SAMPLE CHARACTERISTICS  
AND DISPOSITION

CHARACTERISTIC	PRE (N = 15)		POST (N = 16)		p
	$\bar{X}$	SD	$\bar{X}$	SD	
Age (years)	57.44	18	60.88	15.47	0.567
Time to antibiotic administration (minutes)	144.88	86.75	63.69	75.65	0.008
ED visits per month	3	–	0.67	–	–
CHARACTERISTIC	n		n		p
<b>Sex</b>					0.716
Male		11		9	
Female		4		7	
<b>Race</b>					0.149
Asian		–		1	
Black or African American		1		5	
White		13		10	
Not available		1		–	
<b>Diagnosis</b>					0.02
Lymphoma		7		4	
Acute myeloid leukemia		5		2	
Chronic lymphocytic leukemia		3		–	
Multiple myeloma		–		5	
Myelodysplastic syndrome		–		3	
Hairy cell leukemia		–		1	
Other		–		1	
<b>Disposition<sup>a</sup></b>					
Inpatient admission		–		7	
Home		–		5	
ED admission		–		4	

<sup>a</sup> Post only  
ED—emergency department; post—postimplementation; pre—preimplementation  
**Note.** Antibiotics were administered within 60 minutes for 2 patients in the pre group and 12 patients in the post group (p < 0.001).

**Results**

A total of 31 patients participated in the QI project, consisting of 15 patients in the preimplementation data and 16 in the postimplementation data. Most patients were male (n = 20) with a mean age of 59.48 years (SD = 16.8, range = 32–80). There were no significant differences in between-group demographics for sex (p = 0.716), age (p = 0.567), or race (p = 0.149). The greatest proportion of patients had a lymphoma diagnosis (n = 11), followed by acute myeloid leukemia (n = 7) (see Table 1).

An independent samples t test showed a statistically significant reduction in average time in minutes from FN diagnosis to antibiotic administration from pre- ( $\bar{X}$  = 144.88, SD = 86.75, range = 32–285) to postimplementation ( $\bar{X}$  = 63.69, SD = 75.65, range = 13–313) (t[30] = 2.82, p = 0.008). The effect size was considered large (Cohen’s d = 0.997). A Fisher’s exact test showed improvement in the rate of antibiotic administration within 60 minutes from 2 of 15 patients preimplementation to 12 of 16 patients postimplementation (p < 0.001).

All 15 patients preimplementation went to the ED ( $\bar{X}$  = 3 visits per month). Postimplementation, only 4 of the 16 patients went to the ED ( $\bar{X}$  = 0.67 visits per month) (see Figure 2). After visiting the ACC, the final dispositions of the patients were inpatient admission (n = 7), home (n = 5), and ED admission (n = 4). Among patients in the postimplementation cohort, 4 of 16 completed the patient satisfaction survey after visiting the ACC. Overall, patients were satisfied with the clinic ( $\bar{X}$  = 4, SD = 0).

**Discussion**

Based on the results of this QI project, implementing the ACC significantly improved the time to antibiotic administration and reduced ED visits for patients with FN. On average, the time from fever identification to antibiotic administration preimplementation was 144.88 minutes, which was significantly higher than the NCCN recommendation of 60 minutes. The average time from fever identification to the first dose of antibiotics decreased to 63.69 minutes postimplementation, approaching the NCCN (2022) recommendation. There was one outlier in the postimplementation data with a time of 313 minutes from fever identification to antibiotic administration. On chart review, this was found to have resulted from a delay in getting the patient to the treatment room by the clinic staff. To address this delay, staff were reeducated about the process. Because the ACC was embedded into an existing clinic, antibiotics were readily available from the clinic’s pharmacy. Patients requiring additional care after being seen in the ACC were instructed to return to the blood cancer center’s infusion room the following day for continued supportive care. These subsequent appointments were scheduled before the patient was discharged from the ACC. Patients were also provided with overnight contact information for any questions or concerns. This project’s findings align with those of Lee et al. (2020), who implemented a sepsis triage algorithm in the

outpatient setting that reduced the time to antibiotic administration from 51 minutes to 44 minutes ( $p < 0.001$ ). In addition, Bruce (2021) noted that timely treatment of FN minimized patient complications and supported improved patient outcomes.

This study showed a clinically significant reduction in ED visits. These findings align with research conducted by Coyle et al. (2019), which concluded that providing evidence-based cancer care in a dedicated outpatient setting decreased unplanned admissions and reduced costs for patients with cancer. In comparison, Seltzer et al. (2022) recommended that a more extensive multicenter study would be beneficial to assess the effects of an FN treatment protocol in the ED on patient-focused clinical outcomes and resource use.

Although few participants completed satisfaction surveys, the response rate was adequate and characteristic of patient survey responses (Nayak & Narayan, 2019). Patients treated in the ACC reported high satisfaction with the care provided. This project's findings correlate with findings from a study by Hervàs et al. (2021) that reported consistent positive associations among patient safety, patient experience, and clinical success in the treatment of a wide range of diseases in the outpatient setting. In addition, adherence to patient treatment regimens is

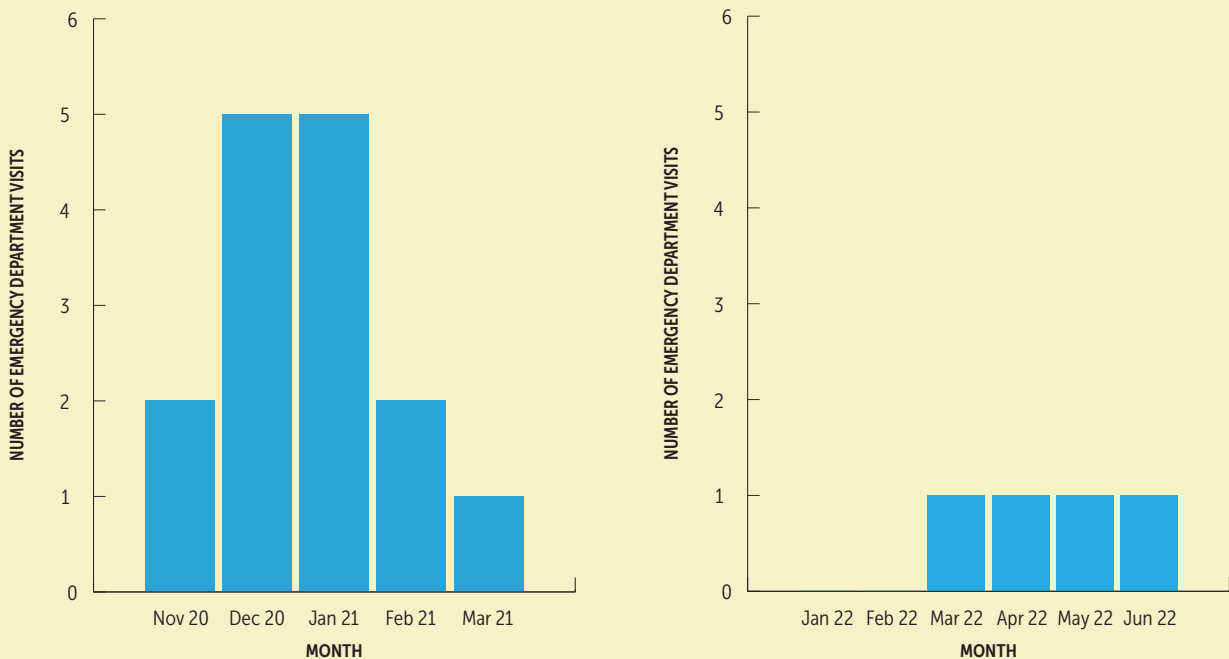
#### IMPLICATIONS FOR PRACTICE

- Reduce emergency department visits, length of stay, and morbidity and mortality through appropriate and timely management of febrile neutropenia in patients with cancer.
- Administer antibiotics within 60 minutes of an identified fever, which can be effectively managed in an outpatient setting.
- Consider using a dedicated acute care clinic to reduce time to antibiotic administration and emergency department visits.

associated with higher patient satisfaction, which could also lead to improved outcomes (Dharmasena et al., 2021).

Findings from this project support the need for a dedicated ACC for treating FN in patients with cancer. Other healthcare systems may consider implementing a similar clinic to manage patients with cancer and FN in the outpatient setting. To ensure engagement throughout the process, project teams should first identify key stakeholders, such as operational, nursing, pharmacy, and physician leadership. In addition, developing education and strategies specific to each medical discipline and healthcare profession can ensure success. Anecdotal feedback provided by staff identified that having an on-site pharmacy promoted timely antibiotic administration and was a key contributor to reduced time to treatment. Input from the interprofessional team also indicated that having specialized staff trained in treating FN, as

**FIGURE 2.** EMERGENCY DEPARTMENT VISITS BEFORE AND AFTER IMPLEMENTATION OF ACUTE CARE CLINIC



Apr—April; Dec—December; Feb—February; Jan—January; Jun—June; Mar—March; Nov—November  
**Note.** Graph on the left shows data before implementation, and graph on the right shows data after implementation.

well as a dedicated APP in the clinical area at all times, assisted with successful early identification and management of FN. Developing a standardized algorithm process promoted clarity and helped educate everyone involved.

### Limitations

There were several limitations to this QI project. First, it was conducted within one facility in an academic health system, which limits generalizability. The small sample size and limited six-month duration of evaluation warrant continued monitoring to determine the sustainability of outcomes and long-term effects. The preimplementation data were collected based on specific diagnosis codes entered in the ED setting, which may not accurately reflect all FN encounters. Only four patients who visited the ACC completed a patient satisfaction survey. Finally, this QI project was implemented during the COVID-19 pandemic amid staffing challenges, which may have affected outcome data.

### Implications for Nursing

Clinical oncology nurses can apply the results from this project when caring for patients with cancer. The ACC was embedded in an established infusion area of the blood cancer center that typically provides outpatient management of FN to patients receiving blood and marrow transplantation. For this project, frontline staff were already trained in managing FN in this patient population, so training was mainly focused on the new process for patients with hematologic cancer. No incremental frontline staff positions were acquired during this QI project. To remain productive, staff were expected to continue providing care for patients outside of the ACC. The frontline staff were knowledgeable, recognized the importance of ensuring timely delivery of antibiotics, and were engaged in providing the same standard of care to patients with hematologic cancer. Although this project focused on treating FN, other oncologic complications, such as shortness of breath, pain management, dehydration, nausea, vomiting, and constipation, could benefit from a similar ACC-based approach. Implementing an ACC to manage additional complications could allow for increased productivity and efficiency in treating these symptoms.

### Conclusion

FN is an oncologic emergency that is often associated with the administration of cytotoxic chemotherapy and can lead to life-threatening complications if not identified and treated early. Many patients who present with FN are admitted to the inpatient unit via the ED for IV antibiotics, which may cause a significant delay in managing this condition. Based on the results from this QI project, an outpatient ACC can provide safe and efficient treatment for FN in patients with hematologic cancer.

**Jennifer Frith, DNP, RN, NE-BC, OCN®**, is the clinical operations director at Duke University Hospital; **Deborah "Hutch" Allen, PhD, RN, CNS, FNP-BC, AOCNP®**, is a nurse scientist and the director of nursing research and evidence-based practice at the Duke University Health System; **Kerry Minor, ANP-BC**, is a nurse practitioner in hematologic malignancies and cellular therapy at Duke University Hospital; and **Staci S. Reynolds, PhD, RN, ACNS-BC, CCRN, CNRN, SCRNP, CPHQ**, is an associate professor in the School of Nursing at Duke University and a clinical nurse specialist at Duke University Hospital, all in Durham, NC. Frith can be reached at [jennifer.frith@duke.edu](mailto:jennifer.frith@duke.edu), with copy to [CJONEditor@ons.org](mailto:CJONEditor@ons.org). (Submitted July 2022. Accepted November 10, 2022.)

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