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Casereport

Acute Febrile Neutropenia Requiring Hospital Admission Managed Within Hospial-at-Home

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Introduction

Febrile neutropenia is a known complication of cytotoxic therapies for cancers and malignant blood dyscrasias, with an incidence of 7.8 per 1000 patients translating to 2.4-15.4 million cases each year [1]. Despite evidence-based guidelines for when patients with febrile neutropenia (FN) should be hospitalized, prior studies have found 95% of patients presenting to the Emergency Department (ED) are admitted [2]. Hospital at Home (HaH) is a novel acute care delivery model with the potential to decrease costs of care and reduce the risk of hospital-acquired infections, which carries particular importance in this patient population. Moreover, this care model offers a unique value proposition to cancer patients already burdened by high out-of-pocket costs for treatment and recurrent hospital and healthcare facility visits [3,4]. Recent reports have even described how HaH for complex cancer patients may facilitate multidisciplinary communication [5].

Our organization's prior experience implementing HaH has been previously described [6]. In this case study, we discuss the presentation of an elderly patient with chemotherapy-related FN meeting inpatient admission criteria who we successfully managed in a HaH program instead of a traditional brick-and-mortar setting. To the best of our knowledge, management of FN within the home in a patient requiring inpatient hospitalization from the ED has not been previously reported. We are hopeful that this case report will alert clinicians to the possibility of an alternative management approach for patients with cancer-associated FN requiring acute hospitalization and spur further research on this topic.

Case Presentation

A 73-year-old woman with a past medical history notable for a left breast cancer Stage IA, pT1bN0M0 in 2011 treated with lumpectomy, adjuvant radiation therapy and adjuvant aromatase inhibitor for 10 years, with a recently diagnosed with Stage IB pT2N0M0 ER+PR+HER2- right breast infiltrating ductal carcinoma ,with Oncotype DX® recurrence score 66, status post lumpectomy. She presented to the ED with new-onset fever and chills following her first cycle of chemotherapy. Ten days prior to presenting to the ED, she received her first treatment with docetaxel and cyclophosphamide. Soon after, she developed progressive weakness, malaise, and pain in her lower back and jaw. Her temperature at home was 100.4 degrees Fahrenheit, and the patient was advised to present to the ED.

In the ED, the patient complained of fever, chills, diaphoresis, poor appetite, and pain over her right lower jaw. She denied any recent sick contacts or travel. She also denied experiencing any head and neck discomfort, cough, abdominal pain, dysuria, nausea, vomiting, or diarrhea. The patient had no known antecedent respiratory illness and had not started any new medications outside of her cancer treatment. She had no history of obstructive pulmonary disease and was a non-smoker who did not consume alcohol or use recreational drugs.

The patient's physical examination was notable for a temperature of 99.8 degrees Fahrenheit, blood pressure 125/70 mm Hg, heart rate 72 beats per minute, and oxygen saturation 97%. The patient's oral exam was notable for gingival erythema and swelling and fluctuance around a previous tooth implant. Laboratory assessment demonstrated a white blood cell count of 1.8 k/uL with an absolute neutrophil count (ANC) 0.04k/uL. The pa-

tient's chest radiograph showed no acute abnormalities. A viral panel using polymerase chain reaction was negative for Respiratory Syncytial Virus, Influenza A, Influenza B, and COVID-19. Urinalysis was negative for nitrites and leukocyte esterase. A CT scan of the face and mandible without intravenous contrast demonstrated no evidence of signs of periapical boney erosion or abscess. Two blood cultures were collected at time of arrival to the ED prior to antibiotic administration.

The patient was then empirically started on 0.15mh/kg dose of IV Vancomycin and 3.375mg dose of IV piperacillin-tazobactam. Given the hypovolemia noted on exam, she was also given intravenous saline 0.9% for volume expansion.

Hospital-at-Home Course

In the ED, the patient's Multinational Association for Supportive Care in Cancer (MASCC) risk index was 6, and she was subsequently referred for hospital admission. The patient was thought to be a potential candidate for HaH and was flagged for additional screening for HaH appropriateness. The patient lived within a 30-mile radius from the hospital in a safe neighborhood. Her home had functioning air conditioning and an internet connection to connect to the clinically integrated virtual command center (CIVC), which has been previously described. Nursing assessed the patient to ensure that there were no significant functional limitations as far as activities of daily living that would require around-the-clock assistance. The patient passed her geographic and clinical stability and social stability screens for HaH suitability and was approached for admission in the home.

After consenting to HaH admission, the patient was transported from the ED to her home utilizing Basic Life Support transport. The patient had intravenous access established and maintained prior to departure from the ED.

Once in the home, the patient was tethered to the CIVC via a "two-way" tablet for continuous communication. Biometric monitoring devices were delivered and placed on the patient. Redundant connections utilizing both Wi-Fi and mobile services were connected to a fail-safe router. The patient was then educated by the community paramedic and virtual nurse about the functionalities of the tablet and biometric monitoring system. The patient was started on cefepime and metronidazole upon arrival to home.

On day two of hospitalization, the patient reported increasing shortness of breath and chest discomfort. She denied cough or chills but endorsed anorexia. Remote biometrics transmitted to the CIVC demonstrated a HR 66 bpm, RR 14, oxygen saturation of 97% and blood pressure of 133/85 mmHg. An electrocardiogram (ECG), and chest x-ray were both performed within the home. The ECG demonstrated no evidence of myocardial ischemia, and her chest x-ray was notable for cardiomegaly without evidence of consolidation or air bronchograms to suggest pneumonia. Her ANC on day two was 319 cell/uL. Following a virtual consultation with her oncologist, the patient was started on Filgrastim 300 micrograms along with daily iron infusions. Her shortness of breath and chest pain improved.

On day three of hospitalization, the patient developed worsening diarrhea. Her vital signs were remarkable for an oral temperature of 100.1F. Diagnostic testing for Clostridium Difficile infection was negative. Blood cultures were negative. Her WBC was 42.67 k/uL, and her ANC was 35.85 k/uL. Her new-onset diarrhea was thought to be multifactorial in etiology, likely due to the adverse effects of chemotherapy, antibiotics, and Filgrastim. Her diet was slowly advanced on day four to good response and improvement in symptoms. She was transitioned to ciprofloxacin, and on day five she was discharged from her acute HaH stay to continue her recovery at home.

Discussion

To the best of our knowledge, this is the first case report describing a high-risk adult patient with febrile neutropenia being hospitalized within their home instead of a brick-and-mortar setting. The risks related to hospitalization in an institutional setting for patients with neutropenia are well known; brick-and-mortar hospitalization places patients at higher risk for the development of hospital-acquired complications [7], as rates of overall nosocomial infections in neutropenic patients are high [8]. In this patient population, hospitalization within the home may decrease the risk of nosocomial infections and subsequent complications. Additionally, patients with malignancy are frequently under significant stress, which hospitalization in an unfamiliar environment may exacerbate; HaH holds the appeal of meeting a patients' acute needs in a familiar and comfortable home environment. When considering clinical endpoints in relation to neutropenic fever, we noted the duration of neutropenia was two days and days to defervescence was two days as well in our patient.

This case report describes the presentation of an older individual with breast cancer who developed neutropenic fever following marrow suppressive therapy and illustrates several important points. First, this case describes a patient with neutropenic fever and low MASCC scores that was safely hospitalized in the home, acknowledging the importance of the patient meeting clinical and social stability criteria for HaH appropriateness. Second, this case suggests that the complexities of hospital care for this patient population are not beyond the scope of in-home hospital care. Finally, the successful team-based approach to navigating her complex care plan among key stakeholders that resulted in the patient's clinical improvement over the course of her admission supports recent reports suggesting that multidisciplinary care with a patient's oncologist, inpatient nursing, and hospital medicine team can effectively be coordinated within the home via a virtual command center.5 In addition to the potential clinical benefits to the patient of avoiding nosocomial infection, HAH is an alternative to brick-and-mortar hospitalization that has the potential to lower the overall costs of care. Febrile neutropenia accounts for nearly 10% of all annual cancer-related hospital expenditures, exceeding $2.5 billion a year. The cost of an adult hospitalization for febrile neutropenia ranges from $20,000 to up to $40,000 per hospitalization [3,4].

We are hopeful that this report will alert clinicians to the possibility of an alternative home-based acute care environment for patients with neutropenic fever requiring hospitalization. While more research is needed to further explore outcomes for this patient population in a HaH model, this case report highlights the potential benefit for patients who are appropriately screened and the positive mental and clinical impact it may have on this pa-

tient population.

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Conflict of Interest

Dr Rothman provides physician advisory services to the Medically Home Group. Dr. Maniaci serves as an unpaid observer on the Medically Home Board of Directors on behalf of Mayo Clinic. The manuscript conforms to the International Committee of Medical Journals Editors regarding authorship. It has not been published, nor is it currently under consideration for publication in any other journal. The manuscript has been seen and approved by all named authors. There are no conflicts of interest or relationship with industry to disclose, relevant to the manuscripts this work.

References

1. Durani U, Go RS. In-Hospital Outcomes of Neutropenic Fever: A Study Using the National Inpatient Sample, Years 2009-2013. Blood. 2016;128(22):4762-4762. DOI: 10.1182/blood.V128.22.4762.4762.
2. Baugh CW, Faridi MK, Mueller EL, Camargo CA, Jr., Pallin DJ. Near-universal hospitalization of US emergency department patients with cancer and febrile neutropenia. PLoS One. 2019;14(5):e0216835. (In eng). DOI: 10.1371/journal.pone.0216835.
3. Tai E, Guy GP, Dunbar A, Richardson LC. Cost of Cancer-Related Neutropenia or Fever Hospitalizations, United States, 2012. Journal of Oncology Practice. 2017;13(6):e552-e561. DOI: 10.1200/jop.2016.019588.
4. Boccia R, Glaspy J, Crawford J, Aapro M. Chemotherapy-Induced Neutropenia and Febrile Neutropenia in the US: A Beast of Burden That Needs to Be Tamed? Oncologist. 2022;27(8):625-636. (In eng). DOI: 10.1093/oncolo/oyac074.
5. Paulson MR, Torres-Guzman RA, Avila FR, et al. Telemedicine allows for effective communication between a medically complex cancer patient and his virtual hospital medical team. Clin Case Rep. 2022;10(10):e6456. DOI: 10.1002/ccr3.6456.
6. Rothman RD, Hohman J, Heaton MB, Delaney CP. Early Experience and Lessons Following the Implementation of a Hospitalist Led Hospital-at-Home Program Journal of Hospital Medicine. 2024.
7. Chang BP. Can hospitalization be hazardous to your health? A nosocomial based stress model for hospitalization. Gen Hosp Psychiatry. 2019;60:83-89. (In eng). DOI: 10.1016/j.genhosppsych.2019.07.014.
8. Carlisle PS, Gucalp R, Wiernik PH. Nosocomial infections in neutropenic cancer patients. Infect Control Hosp Epidemiol. 1993;14(6):320-4. (In eng). DOI: 10.1086/646750.

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