



Case Report

Virtual ward: The future in the management of neutropenic sepsis in the NHS

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Abstract

Virtual ward offers patients with neutropenic sepsis a unique opportunity to receive hospital level of care in the comfort of their home, especially for patients who would otherwise be admitted to hospital because of their acute treatment. On the virtual ward, patients can receive hospital level of care with a significant opportunity to mitigate any risk of hospital-acquired infection in this subset of patients who are already immunocompromised amongst other benefits. Additionally, hospital length of stay can be shortened leading to reduced admission pressure in hospitals, increasing hospital admission avoidance, and encouraging safe discharge from hospital while still providing the best care for the patients. We report a case of a 76-year-old cancer patient who presented with neutropenic sepsis and was successfully managed on the virtual ward in a district hospital. This case highlights the importance of virtual wards an evolving innovation that can define the future management of cancer patients in NHS. It is safe and reduces the cost of inpatient care in healthcare.

Introduction

Neutropenic sepsis is a life-threatening complication arising mostly from chemotherapy and other anticancer treatments [1-3]. It remains a medical emergency where time is paramount in preventing mortality. Reports indicate that mortality could range between 2% to 21% and judicious use of intravenous antibiotics and Granulocyte colony-stimulating factor have reduced admission to the intensive unit and decreased mortality rate [1,4].

Patients who undergo chemotherapy are at high risk of neutropenic sepsis, because of the harmful side effects of the anticancer treatment on healthy cells as well as on cancerous cells [5]. Chemotherapy may cause bone marrow suppression, which in turn affects the blood-producing stem cells thereby inhibiting their production and response to infection. This tends to affect the overall neutrophil count thereby predisposing patients to severe sepsis. Prompt diagnosis and response are essential to avert complications [1]. Managing

these patients in the hospital can be challenging due to the high risk of hospital-acquired infections [6,7]. We report a case of an elderly male who was successfully managed on a virtual ward after presenting with neutropenic sepsis shortly after chemotherapy. The informed consent was obtained before publication.

Case report

A 76-year-old male with a background of non-Hodgkin's lymphoma on chemotherapy presented to the emergency department with ten (10) days history of fever, malaise, and feeling generally following a recent chemotherapy session. He had no other associated systemic symptoms. He had a similar presentation following his first cycle of chemotherapy a few months earlier. He was normally independent and mobile. He also had adequate family support at home. On examination, he was febrile with a temperature of thirty-eight (38) degrees and tachycardic with a peripheral pulse rate of a hundred and seven (107). Other systemic examinations were unremarkable.



Routine laboratory blood results on presentation showed a raised C-reactive protein (CRP) of 157 (reference range 0.3 to 1.0 mg/L) white blood cell (WBC) was 1.2 (reference range 4.5 to $11.0 \times 10^9/L$), Neutrophil count was 0.5 (reference range $1.8 - 7.5 \times 10^9/L$) and Serum sodium level was 128 (reference range 136–148 mmol/L). Chest X-ray, urine, and blood cultures were unremarkable.

He was immediately commenced on intravenous antibiotics and granulocyte colony-stimulating factor. After 24 hours he was transferred to the virtual ward where he had his intravenous antibiotics continued via an accufuser elastomeric infusion pump and vital signs monitored in real-time using a remote monitoring system from the comfort of his home. He had daily clinical reviews by the in-hospital team through virtual ward rounds. In addition, he had daily blood investigations to monitor his neutrophil count and had additional review from the virtual ward team who visited daily to set up intravenous medications. By the fifth day, he had made significant clinical improvement with the resolution of temperature spikes, and his laboratory parameters also had made some improvement with a neutrophil count of 5.9 (reference range $1.8 - 7.5 \times 10^9/L$) and a CRP of 102 (reference range 0.3 to 1.0 mg/L). He was switched to oral antibiotics and monitored for an additional four days before being successfully discharged back to his GP and primary team.

Discussion

Neutropenia is defined as absolute neutrophil count (ANC) < 1000 cells/microL ($< 1.0 \times 10^9/L$), and severe neutropenia is ANC < 500 cells/microL ($< 0.5 \times 10^9/L$). The risk of infection increases and mortality rises as the neutrophil level falls below 500 cells/microL [8,9].

Sepsis is the penetration of micro-organisms into the body system leading to alteration in the normal body system arising from systemic inflammatory response [10]. Neutropenic sepsis becomes evident when there is a fever of $38.3^\circ C$ sustained for more than an hour in a patient with an absolute neutrophil count of $0.5 \times 10^9/L$ or less post-chemotherapy. Patients could present with other constitutional symptoms and signs consistent with sepsis. Diagnosis is confirmed by a temperature of more than $38^\circ C$ and a neutrophil count of $0.5 \times 10^9/L$ or less [11].

Prompt clinical evaluation of patients with neutropenic sepsis is essential in management to reduce the risk of mortality. The initiation of empirical antibiotics such as intravenous piperacillin with tazobactam is recommended according to NICE guidelines. Patients with a low risk of septic complications can continue antibiotics outside of the hospital setting [12]. The virtual ward can play a crucial role in ensuring that all discharged patients are offered the same level of hospital care at their convenience at home without compromising their treatment while also putting into consideration their social needs and overall circumstances. The use of electronic monitoring devices and systems has made the options for monitoring and follow-up more flexible [13]. The index case

was monitored using a remote monitoring system known as Current Health which takes vital signs reading at intervals. Monitoring depends on the clinical state of the patient and could be set to monitor every 30 minutes, 1 hour, 2 hours, or 4 hours. Daily virtual clinical reviews and physical visits by the virtual ward team can offer further support and opportunities to escalate any concerns or patient deterioration. Evidence shows virtual wards are safe and with technology can be an option for monitoring and treating patients from the comfort of their homes [14]. Considering the risk of nosocomial infection post-hospital admission, a virtual ward can potentially be a viable option in managing neutropenic sepsis patients as this can significantly decrease the risk of exposure and overall mortality risk. Also, the quality of care provided can be the right support required by neutropenic sepsis patients with no risk of deterioration to make a good clinical recovery.

Conclusion

In conclusion, virtual wards have increasingly earned recognition in the NHS and have been efficiently used in providing hospital-level care at home for patients who meet the criteria for admission and are also comfortable using technology to monitor their illnesses away from the hospital. Neutropenic sepsis with a low risk of clinical deterioration can benefit from the supportive services provided on a virtual ward while at the same time decreasing the risk of any exposure to nosocomial infections following in-hospital admissions. Developing a standard pathway and admission criteria for the management of neutropenic sepsis on the virtual ward can be beneficial in many ways.

Safe monitoring is key, and this makes virtual wards a vital part of NHS systems and the future of healthcare service delivery. Healthcare professionals should take the initiative to enroll or refer patients with neutropenic sepsis, deemed suitable with low risk to the virtual ward. This will promote hospital avoidance, and early discharge, reduce the risk of nosocomial infections, free hospital beds for more acutely unwell patients, and minimize NHS pressure on NHS frontline staff as well as cost [15].

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