Management of febrile neutropenia in an acute oncology service

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Summary

Background: Neutropenic fever in patients receiving chemotherapy is a medical emergency and should be treated promptly within 1 h with antibiotics as specified within the 2009 NCAG report on chemotherapy services.

Aim: To determine door-to-assessment, door-to-treatment and door-to-investigation intervals for patients with febrile neutropenia who presented to the inpatient Oncology Ward, the outpatient Oncology Day Unit and the Emergency Department in Addenbrooke’s Hospital, Cambridge.

Design: Retrospective observational audit.

Methods: Thirty-two patients on treatment for solid cancers who were admitted with febrile neutropenia between January and December 2010 were identified, and paper and electronic medical records were analysed to determine door to: assessment, treatment and investigation intervals.

Results and conclusions: Patients in this series were assessed quicker and received the first dose of antibiotics faster when they presented to an oncology ward rather than the emergency department. However, imaging was performed faster and blood results issued quicker if performed in the emergency department due to a better infrastructure that has been tailored to comply with national targets. Nonetheless, compliance with optimum standards of care was poor, with only 9% of sampled patients getting antibiotics within 1 h of presenting to hospital, and 53% within 1 h of being assessed by a clinician.

Introduction

The importance of broad-spectrum antibiotic treatment in chemotherapy-induced neutropenic fever has long been established. Indeed, this widely recognized complication of oncolytic chemotherapy has a mortality rate that is variably reported between 2% and 20% and consequently warrants early broad-spectrum antibiotic therapy irrespective of any manifestations of the systemic inflammatory response syndrome (SIRS, Table 1). Newer prognostication scoring systems, such as the Talcott4 and MASCC5 classifications, which use serious medical complications as endpoints for risk prediction, can be used to determine whether the oral or intravenous route should be used, however, neither preclude early antibiotic therapy.

Chemotherapy services both for solid and liquid malignancies have expanded markedly in the past 20 years, with the use of systemic chemotherapy increasing significantly secondary to the discovery and manufacture of new pharmaceutical agents and increasing indications for adjuvant and neo-adjuvant treatment. Undoubtedly, this has led to greater benefits to patients, with improved cure or long-term remission rates for some. The increasing
Two or more criteria are required for the diagnosis of SIRS. In the clinical setting, the presence of neutropenic fever and a delay of more than 1 h in antibiotic administration are not uncommon. A recent publication reported a 1 h door-to-needle compliance rate of only 26% in haematology patients. Indeed, there were several shortcomings identified in the management of common oncological complications, with chemotherapy-induced neutropenic fever identified as one of the areas that was often poorly managed. Unacceptable significant delays in administration of antibiotics as well as evidence of fragmented emergency care were highlighted.6

In 2009, as a response to this report, the National Chemotherapy Advisory Group (NCAG) published a comprehensive document with multiple recommendations in order to enhance the overall quality of care in patients receiving chemotherapeutic agents.7 These guidelines proposed that hospitals should have a well-defined policy on the treatment of neutropenic fever and aim for door-to-antibiotic times of no more than 1 h. Two years following the publication of this report, we still face deficiencies with the way we manage oncology patients presenting with neutropenic fever in both specialist cancer centres as well as peripheral units. Indeed, a recent publication reported a 1 h door-to-needle compliance rate of only 26% in haematology oncology patients presenting with febrile neutropenia, with delays of over 5 h till antibiotics were administered occurring uncommonly.8

At Addenbrooke’s Hospital, a university teaching hospital in Cambridge, patients are consented on the purpose, complications and overall risk/benefit of receiving cytotoxic therapies prior to receiving chemotherapy. Immunosuppression and subsequent increased susceptibility to acquiring infections are always discussed with particular emphasis on the importance of contacting the on call oncology registrar or senior house officer to report any febrile episodes of or above 38°C. We encourage patients to call the hospital directly, rather than asking for a referral through their general practitioner. Following a telephone consultation, patients are advised to come in to hospital for further assessment and probable admission. Routes of admission include: (i) the Oncology Day Unit, (ii) the Oncology ward and (iii) via the Emergency Department, if there are no available beds on the oncology ward and the oncology day unit is closed. The Oncology Day Unit provides an 8 a.m. to 6 p.m. service during weekdays, where outpatient investigations and day case treatments such as chemotherapy and support treatments, such as blood transfusions can be performed. In addition, the day unit also has an acute bed that allows for the assessment of any unwell patients.

The current neutropenic fever policy at Addenbrooke’s Hospital suggests commencement of high dose intravenous piperacillin/tazobactam and gentamicin, with the addition of the glycopeptide antibiotic vancomycin if a central venous catheter is present, if there is a suspicion of neutropenia on presentation. The policy urges clinicians not to wait for the results of haematological investigations to be issued before prescribing antibiotics as per the neutropenic fever protocol. All febrile episodes post chemotherapy are assumed to be associated with neutropenia until proven otherwise.

In order to determine our current performance and ascertain compliance with the recommendations listed within the NCAG report, we conducted an audit of (i) door-to-clinician assessment interval, (ii) clinician-assessment-to-antibiotic-delivery interval, (iii) overall ‘door-to-needle’ interval and (iv) assessment-to-haematobiochemical-and-radiological-investigations intervals for admissions (a) directly to the hospital Oncology Ward and (b) through the Emergency Department (ED) in Addenbrooke’s Hospital. In addition, we also ascertained the clinician assessment-to-antibiotic delivery interval and assessment-to-investigation intervals for admissions to the outpatient oncology day unit. Specifically, we aimed to ascertain which of these three venues resulted in better quality of care, using time to obtain investigations and time to antibiotic therapy institution as endpoints.

### Methods

For the purposes of this study, and as established within the Addenbrooke’s Hospital oncology departmental policies, febrile neutropenia was defined

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Temperature</td>
<td>&gt;38°C or &lt;35°C</td>
</tr>
<tr>
<td>Heart rate</td>
<td>&gt;90 beats per minute</td>
</tr>
<tr>
<td>Respiratory rate</td>
<td>&gt;20 breaths per minute (or arterial PCO₂ &lt;4.3 kPa)</td>
</tr>
<tr>
<td>Leucocyte count</td>
<td>&gt;12 x 10⁹/l or &lt;4 x 10⁹/l or &gt;10% of immature forms</td>
</tr>
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Table 1 Characterization of the SIRS
as any oral or tympanic membrane temperature of 38°C or more maintained for 1 h, or 38.5°C or more on one occasion, associated with a neutrophil count of less than $1 \times 10^9$ neutrophils per litre at presentation.

Patients who presented and were subsequently admitted to Addenbrooke’s Hospital with febrile neutropenia during the time period January–December 2010 were identified and selected by querying the hospital admission database for patient events whose overall inpatient stay was coded with ICD 10 diagnoses D70 (neutropenia) and A41.9 (sepsis, unspecified). The following cohorts of patients were then excluded from the initial sampling process: (i) patients with liquid tumours who presented with febrile neutropenia and were under the care of the haemato-oncologists (as, at Addenbrooke’s Hospital, malignant haematological disorders are managed by haematologists, rather than oncologists); (ii) patients with solid tumours who presented with febrile neutropenia but had not received chemotherapeutic agents within 2 months of presentation, and therefore not suspected to be neutropenic on initial assessment; and (iii) oncology patients who were not neutropenic on presentation but subsequently developed febrile neutropenia during their inpatient stay.

Data for all patient events were captured from paper and electronic medical records. Specifically, the location at presentation and the times of: presentation to hospital, clinician assessment and time first dose of intravenous antibiotics delivered were extracted from the paper clinical records and drug charts. Basic observations on admission, including heart rate, blood pressure, respiratory rate, oxygen saturations and peripheral temperature were extracted for each patient, and used to calculate an early warning score (EWS) as shown in Table 2.9 The times at which haematobiochemistry results were issued by the laboratories and chest imaging performed were captured from the hospital pathology and radiology databases. In addition, the individual components of the septic screen that was sent off were analysed to determine overall compliance with blood and urine cultures.

All data were collated within an encrypted database and analysed using the R statistical package. The information governance department at Addenbrooke’s Hospital granted audit approval.

### Results

**Patient demographics and clinical details**

A total of 32 patient events were analysed: 20 patients were female and 12 male, with a median age of 52 years (range: 20–70). Mean neutrophil count at presentation was $0.35 \times 10^9$/litre (range: 0.0–0.99 $\times 10^9$/litre). Distribution of cases according to primary neoplastic site is outlined in Table 3, whilst distribution of co-morbidities is outlined in Table 4. As expected, few co-morbidities were present in this relatively young patient group.

Thirteen (40.6%) patients presented directly to the oncology ward, 10 (31.3%) patients presented to the ED and 9 (28.1%) patients presented to the outpatient oncology day unit. All admissions to the oncology ward were assessed by oncology core medical trainees (grades CMT1, CMT2), while admissions to the oncology day unit were assessed by oncology registrars (grades ST3+). Five of the patients presenting to the ED were seen by the on call oncology CMTs, three by the on call oncology registrars and two by the ED physicians.

Twenty-three (71.8%) patients exhibited features of SIRS (Table 1). Twelve (37.5%) patients fulfilled 2 of 4 criteria, 10 (31.3%) patients fulfilled 3 criteria and 1 (3%) patient fulfilled all 4 criteria. The overall median EWS score of patients on admission was 2. Median EWS scores for patients presenting to the oncology ward, ED and oncology day unit were 2,

### Table 2  Variation of physiological variables and correlation to EWS

<table>
<thead>
<tr>
<th>Score (3)</th>
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<tbody>
<tr>
<td>Pulse (bpm)</td>
<td>≤40</td>
<td>41–50</td>
<td>51–90</td>
<td>91–110</td>
<td>111–130</td>
<td>≥131</td>
<td>≥131</td>
</tr>
<tr>
<td>Breathing rate (bpm)</td>
<td>≤8</td>
<td>9–11</td>
<td>12–20</td>
<td>21–24</td>
<td>≥25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature (°C)</td>
<td>≤35.0</td>
<td>35.1–36.0</td>
<td>36.1–38.0</td>
<td>38.1–39.0</td>
<td>≥39.1</td>
<td>≥39.1</td>
<td>≥39.1</td>
</tr>
<tr>
<td>Systolic BP (mmHg)</td>
<td>≤90</td>
<td>91–100</td>
<td>101–110</td>
<td>111–249</td>
<td>≥250</td>
<td>≥250</td>
<td>≥250</td>
</tr>
<tr>
<td>SaO2 (%)</td>
<td>≤91</td>
<td>92–93</td>
<td>94–95</td>
<td>≥96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inspired O2</td>
<td>Air</td>
<td>Alert (A)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CNS (AVPU scale)</td>
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</table>

Any O2: Voice (V); Pain (P); Unresponsive (U)
1.5 and 1, respectively, with ranges of 1–6, 0–5 and 1–3.
Overall mortality for this series was 0% and all patients discharged with no appreciable change in performance status.

Overall door-to-antibiotic time interval

Median door-to-antibiotic interval for patients presenting directly to the ward (Figure 1) was 66 min (IQR 65–112, maximum delay 150). Two (15%) patients presenting to the oncology ward received antibiotics within 60 min, 8 (62%) within 90 min, and 11 (84%) patients within 2 h of presentation. Within the ED, median time to antibiotic delivery was 154 min (IQR 116–211, maximum delay 245). Three (30%) patients presenting to the ED received antibiotics within 2 h, six (60%) within 3 h and nine (90%) within 4 h.

Overall, 2 of 23 (9%) patients presenting to the ED and ward received antibiotics within 1 h of presentation (median delay 107 min). Since the time at presentation to the outpatient day unit was not recorded within the medical and nursing notes, the interval to assessment in patients presenting to this location could not be calculated.

Door-to-clinician-assessment interval

Median time to clinician assessment for patients presenting directly to the ward (Figure 1) was 30 min (IQR 15–50, maximum delay 112). Seven (54%) patients were assessed within 30 min and 12 (92%) within 1 h. Within the ED, median time to assessment was 71 min (IQR 54–86, maximum delay 177). Three (30%) were assessed within 1 h and 9 (90%) within 2 h of presentation to the ED reception.

Overall median time from presentation to clinician assessment in both ward and ED settings was 52 min. Since the time at presentation to the outpatient day unit was not recorded within the medical and nursing notes, the interval to assessment in patients presenting to this location could not be calculated.

Clinician-assessment-to-antibiotic-delivery interval

On the oncology ward, 9 (69%) patients received antibiotics within 1 h of prescription (median delay 33 min, IQR: 20–82, maximum delay 120). Within the ED, five (50%) patients received antibiotics 1-h post clinician assessment (median delay 65 min, IQR: 46–118, maximum delay 150). On the oncology day unit, 3 (33%) patients received antibiotics 1 h post prescription (median delay 80 min, IQR: 55–220, maximum delay 400).

Hence, overall, 17 (53.1%) patients received antibiotics within 1 h and 27 (84.4%) patients received antibiotics within 2 h of assessment. Overall median delay to antibiotic delivery post prescription was 58 min.

Choice of antibiotics

The antibiotic regimen prescribed in all cases was appropriate and as specified within the trust policy.

Length of stay

Median length of inpatient stay was 5 days (range 1–11 days). Patients were discharged when afebrile for more than 24 h provided that they were clinically stable. Plotting length of stay against the door-to-antibiotic interval (Figure 3) showed that there was a linear positive correlation between both variables ($R = 0.84$, $R^2 = 0.7$). Interestingly, patients admitted via the ED tended to have longer lengths of stays than those admitted directly to the ward. There was no correlation between age, co-morbidities,
chemotherapy regime used and presenting neutrophil count to length of stay. Longer lengths of stay were necessitated by continuing pyrexia eventually necessitating change of antibiotic regime as guided by local microbiological advice.

**Assessment-to-issue-of-blood-results interval**

Overall, 53% of all blood results were obtained within 1 h of assessment, with 90% of ED results being issued within 1 h (median 30 min, IQR 16–42, maximum time 104 min). Blood investigations taken from the ward took longer to be issued, with only 31% of the results being issued within 1 h of clerking (median 154 min, IQR 13–252, maximum time 7.3 h). On the oncology day unit, 44% of results were issued within an hour post assessment (median time 95 min, IQR 20–166, maximum time 13 h). All blood investigations sent from the oncology day unit and oncology ward were marked as ‘urgent’, while investigations sent from the emergency department were marked as ‘emergency’ in order to be given higher priority than blood investigations performed in other departments, as per hospital policy.
Figure 2. Multiple scatter plot with superimposed linear regression lines showing door-to-antibiotic intervals stratified by EWS in ED and Ward scenarios. The sicker the patient appeared (and hence the higher the EWS), the more promptly were antibiotics delivered. ($R_{\text{Ward}} = -0.83$, $R_{\text{ED}} = -0.75$ and $R^2_{\text{Ward}} = 0.69$, $R^2_{\text{ED}} = 0.57$).

Figure 3. Multiple scatter plot with superimposed linear regression line showing length of inpatient stay (LOS) plotted against door-to-antibiotic interval. EWS for each datapoint is also represented. It appears that the longer the door-to-needle interval, the longer the inpatient LOS ($R = 0.84$, $R^2 = 0.7$).
Assessment-to-chest-imaging interval

Nine (90%) patients who presented to the ED were imaged: median time to acquiring a radiograph was 39 min from assessment (IQR 23–72 min). Nine (69%) patients who presented directly to the ward had a chest radiograph done: median time to image acquisition was 8.7 h (IQR 51.5–12.6 h). Eight (89%) patients who presented to the day unit had a chest radiograph done, median time to image acquisition was 4.2 h (IQR 1.4–7.7 h). The presence (or absence) of radiological signs suggestive of a lower respiratory tract infection did not alter the initial antibiotic regime used.

Septic screen components

Overall, 25 (78%) patients had plain chest imaging performed, 31 (97%) patients had blood cultures done and 23 (72%) had urine sampled and sent off to the microbiology lab for culturing. All sets of blood cultures were taken before antimicrobial therapy was initiated.

Discussion

Chemotherapy-induced neutropenic fever is a medical emergency that requires urgent assessment and treatment with antibiotics. Low baseline neutrophil counts that fail to increment following an infective or inflammatory stimulus in such patients may result in florid septicaemia and death. The ‘golden hour’ model that has been a standard for many years in the Advanced Trauma Life Support protocols has now been incorporated in various sepsis protocols10 and indeed the NCAG have also recommended that antibiotics should be administered within the first hour of presentation to hospital.7

At Addenbrooke’s Hospital, we are currently developing an acute oncology service that brings together expertise from emergency medicine, general medicine and oncology in a service that allows for rapid, 24-h assessment of oncology patients presenting to hospital with chemotherapy-related adverse events or as a direct consequence of their neoplasm. The department has its own policy on chemotherapy-induced febrile neutropenia, which has been formulated to ensure compliance with NCAG recommendations and is widely distributed throughout the hospital.

Compliance with 1-h door-to-needle target

This service evaluation demonstrates that patients were assessed much faster and received the first dose of intravenous antibiotics quicker on presentation to the oncology ward, rather than the ED (Figure 1 and Table 5). Median time to assessment by a doctor on the oncology ward was 30 min, with 54% of patients assessed by a core medical trainee within 30 min of presentation. Following medical assessment, 46% of patients received antibiotics within 30 min of prescription and 69% within an hour. Resident staff on the ward are aware that febrile neutropenia is an oncological emergency and has a significant mortality rate unless treatment is started promptly and are thus quick to assess and manage such patients.

The results obtained for the specialist ward contrast sharply with those from the ED. This department, by its nature, is often much busier than the ward, with a very high turnover of patients. Unlike the specialist oncology ward, the ED sees a broader spectrum of patients, so understandably there is a certain element of prioritization where unstable patients are always dealt with more promptly and given higher priority over others with lower warning scores. Subsequently, patients were assessed by a clinician after a longer time interval, with median time to assessment being 71 min. In addition, there was a considerable delay until the first doses of antibiotics were delivered, with only 50% of patients receiving antibiotics 1 h post clinician assessment and prescription.

It has long been postulated that neutropenic sepsis is not a single entity, but rather represents a spectrum of severity ranging from septic shock to isolated fever with otherwise normal clinical examination.5,11–12 Approximately 70% of all episodes of febrile neutropenia are classified as low risk in accordance with the MASCC score.13 Often exigency in treatment depends on how ‘unwell’ such patients look and it would be very worrying if delays in treatment were to be identified in unstable patients. A plot of EWS against the door-to-antibiotics interval (Figure 2) shows that patients with higher EWS received antibiotics faster than those with lower warning scores. Indeed, as the EWS decreased, the door-to-needle interval increased, with significant adjusted correlation coefficients. The sicker the patients appeared, the faster they were attended to: all patients with scores of 4 or higher received antibiotics within 70 min. Patients with lower EWS were given lower priority, especially within the ED, and were thus triaged and assigned to a cubicle for assessment by oncology physicians after longer intervals. Urgent antibiotic therapy, although desirable, is not always possible especially since unstable patients tend to take priority over more stable patients (with EWS being a discriminatory factor that determines the urgency of assessment). The regression lines in Figure 2
also show the rightward shift in interval to antibiotic delivery between the ED and ward, where institution of antibiotic therapy in patients with any EWS occurs quicker on the specialist ward than the ED.

Unfortunately, there was no time at presentation documented within the nursing notes for patients presenting to the outpatient oncology day unit. However, analysis of the clinician-assessment-to-antibiotic-delivery intervals showed that there is an occasional significant delay in administering antibiotics when patients present to outpatient units. Indeed, only 33% of patients received antibiotics 1 h post prescription, with a median delay of 80 min. The outpatient environment is not geared towards managing acute patients and is thus not a suitable place for the assessment and management of such patients, since all staffs are often very busy with administrative and clinical work. In one case, antibiotics were administered 6 h post prescription as the latter were not delivered on the day unit, as per usual protocol, but on the admitting ward. The delay might have occurred as the patient appeared stable with no evidence of SIRS.

Overall, there is considerable room for improvement. Only 9% of the patient events analysed received antibiotics within 1 h of presentation (15.4% on ward, 0% in ED). However, most of these had low EWS, and those with higher scores were dealt with more promptly. Indeed, to circumvent this delay, one might suggest the development of an infrastructure that would allow for immediate cannulation and delivery of antibiotics according to local protocols if the 1-h target is to be attained. This might be carried out on an oncology ward or the ED, where the resident nurses/nurse practitioners deliver a single dose of antibiotics according to a stringent hospital protocol for any patient reporting a history of fever post chemotherapy. Treatment in patients with extensive drug allergies/intolerances might be deferred until clinician assessment. This strategy will ensure immediate antibiotic delivery, without waiting for clinical assessment, and might prove to be valuable especially if the on-call oncology team is busy attending to another, more pressing emergency. Further treatment should be guided according to the MASCC score, results of blood investigations and clinical progress.

### Delay to obtaining investigation results

Whereas patients were assessed quicker on specialist wards, there was a delay in obtaining investigations on the ward when compared to the ED. The reason for this may not be immediately obvious. In 2001, the infrastructures of many EDs throughout the country were redesigned following the publication of guidelines by the Department of Health that set out standards for care and treatment in emergency services. Most notably, the document stressed that by 2004 no one was to wait more than 4 h from arrival to the ED to admission or discharge. Fines would be issued to trusts who did not comply with this governmental target. Understandably, the infrastructures of EDs were then tailored to comply with such targets, primarily by training and employing more ED physicians,

### Table 5 Comparison of assessment venues in an acute oncology service

<table>
<thead>
<tr>
<th>Oncology Ward</th>
<th>Emergency Department</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In favour of assessment</strong></td>
<td>Availability of a dedicated resuscitation area—beneficial for management of floridly septic and unstable patients</td>
</tr>
<tr>
<td>Specialist area with all members of staff well trained in management of oncological emergencies</td>
<td>Faster acquisition of chest imaging</td>
</tr>
<tr>
<td>Lower workload:staff ratios compared to ED</td>
<td>Faster acquisition of blood investigations</td>
</tr>
<tr>
<td>Restricted spectrum of patients admitted</td>
<td></td>
</tr>
<tr>
<td>Patients assessed faster by clinician</td>
<td></td>
</tr>
<tr>
<td>Shorter clinician-assessment-to-needle interval</td>
<td></td>
</tr>
<tr>
<td>Possible resultant shorter length of stays</td>
<td></td>
</tr>
<tr>
<td><strong>In disfavour of assessment</strong></td>
<td>Higher workload:staff ratios compared to ward</td>
</tr>
<tr>
<td>Longer door-to-investigation times</td>
<td>Broader spectrum of patients seen: prioritization of more unstable patients essential</td>
</tr>
<tr>
<td>No dedicated resuscitation area available</td>
<td>Longer door-to-clinician-assessment interval</td>
</tr>
<tr>
<td></td>
<td>Longer clinician-assessment-to-antibiotics interval</td>
</tr>
<tr>
<td></td>
<td>Possible resultant longer length of stays in hospital</td>
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</tbody>
</table>
recruiting more nursing staff and providing better in-house diagnostic services that would allow for rapid assessment and diagnosis.

Although this target has been heavily criticized, it has arguably made the ED a more efficient workplace. Indeed, this explains why patients who presented to the ED had investigations done more promptly. The ED at Addenbrooke’s Hospital contains an in-house radiology department, which allows for quick acquisition of chest radiographs, together with a dedicated team of skilled physician assistants who bleed patients on arrival. In addition, the department makes use of a chute system that directly transports blood vials to the laboratories, eliminating any delays that could be introduced by human portering services. Finally, laboratories give higher priority to samples taken within the ED, which are processed before ward samples. Overall, this means that any blood dyscrasias are identified and acted upon much quicker, improving quality of care that the patients receive. A significant delay in the issuing of blood results when taken from the ward and within the oncology day unit was introduced whenever porting staff were asked to deliver blood vials to the lab. In such cases, ward staff should be expected to deliver the investigations directly to the lab, though this might not always be possible especially in the face of staff shortages and increasing workloads on the ward. An alternative to this would be the installation of haematology point-of-care analysers: such machines can analyse whole blood and issue red cell counts, haemoglobin concentration and neutrophil counts within minutes. Setting up such a machine within dedicated oncology assessment areas will not only improve the quality of care patients with neutropenic fever receive, but would also enable treatment decisions to be made quickly, especially in chemotherapy administration settings where delays in the processing of haematology samples may result in delay in the initiation of chemotherapy.

Is there a difference in length of stay?

Figure 3 shows a linear relationship between the time to antibiotic delivery and length of stay: there is a remarkably tight correlation between the two. While this does not imply causation, especially in view of the small sample size, the tight correlation between the two makes one wonder whether a delay in antibiotic delivery does increase length of stay. Factoring in EWS shows that the EWS at presentation did not influence length of stay. Indeed, patients with higher EWS received antibiotics faster and got better sooner as opposed to those with lower EWS, who received antibiotics after a prolonged time interval and were subsequently discharged after a longer time interval. Interestingly, the graph also shows that patients who presented to the ED and then admitted to the oncology ward were discharged after longer time periods than those admitted directly to the ward.

Conclusions

Clearly, in an ideal scenario, patients presenting with presumed neutropenic fever should be assessed rapidly and receive the first dose of antibiotics promptly. Although a small sample size was utilized in this study, the results obtained are similar to those demonstrated in other studies, reinforcing the idea that although neutropenic fever is generally recognized quite promptly, there are still deficiencies in the way we are treating it. Sick patients are treated promptly and received antibiotics well within an hour; however, those with lower warning scores tend to receive them much later, causing a positive skew in the representation of door-to-antibiotic curves. As has been argued before, neutropenic sepsis comprises a spectrum of severity; however, we believe that despite this, treatment should be commenced as soon as possible, within the limits allowed by the current system, particularly if time to discharge correlates with time to first antibiotic dose irrespective of EWS. The policies that have been implemented need to become more rigid and ways have to be found in order to decrease the door to needle time, including the introduction of a stringent protocol that allows for immediate cannulation and antibiotic delivery by healthcare professionals and improved education in all grades of staff. In addition, dedicated ‘acute oncology assessment areas’ with point-of-care haematology analysers may be set up within trusts, which would allow for immediate management of any patients presenting with complications both of their underlying neoplasm and the treatment they are receiving for it.
We look forward to the publications of guidelines on neutropenic fever by NICE that will provide a much-needed standardized care protocol for use throughout the UK.

Conflict of interest: None declared.

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