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Time to antibiotics (TTA) in paediatric patients with fever in the setting of neutropenia

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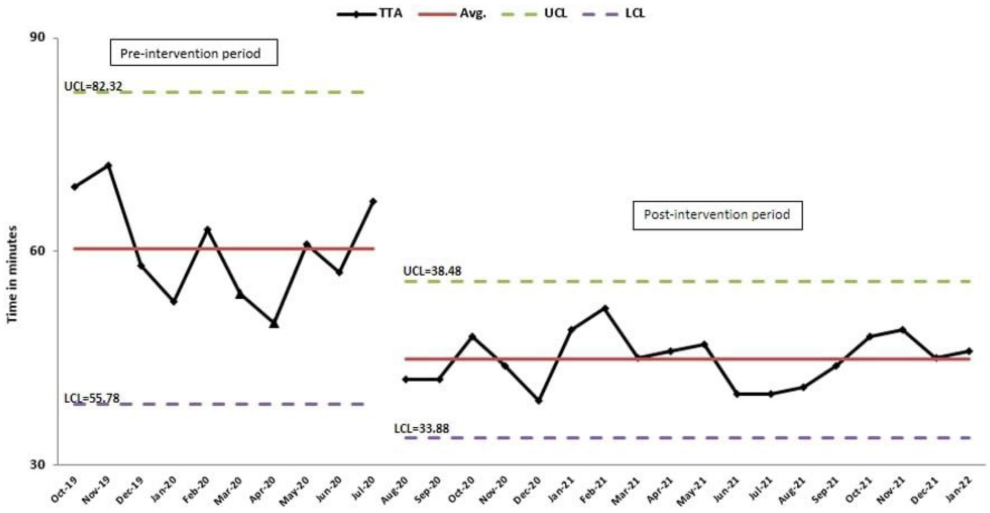

Fig 1. Average time to antibiotics in paediatric patients with febrile neutropenia from October 2019 until January 2022.

Introduction

Immunocompromised cancer patients are at elevated risk of infections.[1] The major contributing factors that predispose cancer patients to immunodeficiency include the underlying disease and related management.[2] Febrile neutropenia is a common and life-threatening complication in paediatric cancer patients on chemotherapy.[3,4] It is characterised by fever (temperature ≥38.3°C (101°F) or ≥38°C (100.4°F) for at least 1 hour).[2] Bacterial infection facilitated by immunosuppression is the vital cause of mortality and morbidity in cancer patients.[5] Morbidity and mortality correlated with this situation can be minimised if the clinicians initiate antibiotic treatment expeditiously.[3] It has been established that the administration of antibiotics in patients presenting with febrile neutropenia in <60 minutes of arrival in the emergency room (EAR) can significantly reduce mortality and morbidity.[6] This study aimed to ensure timely administration of antibiotics (in <60 minutes) in paediatric oncology patients presenting to the EAR with fever following chemotherapy.[7]

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Materials and methods

Baseline data from October 2019 to July 2020 were reviewed. Patients who had a delay of >60 minutes in antibiotic administration were chosen to understand the causes of process variation. The data reviewed revealed non-compliance with the benchmark, ie average time <60 minutes. A team with multidisciplinary expertise analysed the preliminary data and initiated a quality improvement project. A four-stage approach, the plan, do, check, act (PDCA) cycle, was undertaken to improve the service and resolve the issues faced.[8] The PDCA was aimed to mitigate the identified reasons of process variation, ie delays in patient assessment, delays in antibiotic prescription, delays in dispensing, transportation of prepared medicine and delays in administration. The team proposed multiple strategies to reduce the process variation, including but not limited to the amendment of hospital electronic system (HIS) medication module, defined timelines for each service, dose banding, and educating the relevant staff members to ensure timely communication. Statistical analysis, interrupted time series (ITS) analysis, was performed on two cohorts (pre-intervention and post-intervention phases) to study the effectiveness of interventions. R-software was used to conduct the analyses. All tests were two-sided, and a statistical significance level of 5% was used.

Results and discussion

The statistical process control chart suggested that the variation of the processes reduced significantly in the post-intervention period. The results showed that initially, the average time to antibiotic was 64.6 minutes/month (Fig 1). In the pre-intervention period, there was no significant change in antibiotic administration. The administration time decreased significantly by 12.9 minutes/month in the post-intervention period. However, no significant month-to-month change was observed in the average antibiotic administration time (p-value for the time after the intervention was 0.1839). The Durbin–Watson statistic for the model was 1.744 ($p=0.2$), indicating no autocorrelation.

Conclusion

This study highlights the benefits of using the PDCA cycle for improving the quality of care in a healthcare setting. The changes such as amendment of the HIS module, defined timelines for each service, dose banding, and relevant staff member education helped improve and sustain timely administration of antibiotics in the emergency room setting. ■

References

1 Steele RW. Managing infection in cancer patients and other immunocompromised children. *Ochsner J* 2012;12:202–10.
2 Punnapuzha S, Edemobi PK, Elmoheen A. Febrile neutropenia. *StatPearls* 2021.
3 Burns B, Hartenstein M, Lin A *et al.* Optimizing time to antibiotic administration in children with possible febrile neutropenia through quality improvement methodologies. *Pediatr Qual Saf* 2019;4:e236.
4 Haeusler GM, Sung L, Ammann RA, Phillips B. Management of fever and neutropenia in paediatric cancer patients: room for improvement? *Curr Opin Infect Dis* 2015;28:532–8.
5 Viscoli C. Management of infection in cancer patients: studies of the EORTC International Antimicrobial Therapy Group (IATG). *Eur J Cancer* 2002;38 Suppl 4:S82–7.
6 Balay E, Louie J, Krause L *et al.* Febrile neutropenia in the emergency department: improving timely antibiotic administration – a quality improvement initiative. *Pediatrics* 2019;144 (2_MeetingAbstract):123.
7 Monroe K, Cohen CT, Whelan K *et al.* Quality initiative to improve time to antibiotics for febrile pediatric patients with potential neutropenia. *Pediatr Qual Saf* 2018;3:e095.
8 Soković M, Jovanović J, Krivokapić Z, Vujović A. Basic quality tools in continuous improvement process. *J Mech Eng* 2009;55:1–9.