Comparison of Ambulatory Pump vs. Elastomeric Use for Continuous Nafcillin and Oxacillin from 2019-2021

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Kristine Nguyen, PharmD; Maria Giannakos, PharmD, MBA, BCPS, BCSCP; Jay Winters, PharmD; Alexandros Pitsakis, PharmD, MBA
Option Care Health - Audubon, PA

Background

Time dependent pharmacodynamics of beta-lactams should be optimized for efficacy. This can be accomplished through increasing dosing frequency or the use of continuous administration. Nafcillin and oxacillin were previously administered primarily via ambulatory pumps as they allow for intermittent dosing or continuous infusion.

A previous study by this organization compared compliance and costs for various methods of administration of intravenous antibiotics in home infusion, which demonstrated that patients prefer elastomeric pumps compared to other methods.[1] This study also showed elastomeric pumps had the lowest number of missed doses, were more cost effective, and required shorter nurse teaching visits.

Elastomerics can provide continuous administration of nafcillin and oxacillin, which provides greater flexibility to the patient as well as cost avoidance related to ambulatory pump management. To achieve improved standardization, updates were made to the prescription templates for these medications.

Purpose

This project compared the use of ambulatory versus elastomeric pumps for nafcillin and oxacillin before and after implementation of standardized templates. Clinical outcomes, such as therapeutic failure, of both methods were also assessed.

Methods

This is a descriptive study. Data was collected from this organization's electronic records for all patients treated with either nafcillin or oxacillin administered via an ambulatory or elastomeric pump from quarters one and two of 2019, 2020 and 2021. Fifty patients from four groups, based on administration method and medication, were randomly selected to determine efficacy.

Treatment success was determined by pharmacist documentation indicating completion of therapy. Treatment failure was defined as a change in antibiotic, readmission to the hospital, or death. Medication errors reported were also collected from an electronic database and categorized using the NCC MERP Index.[2]

Results

A total of 2,805 patients were included in the study. Elastomeric administration was the primary method after implementation of the templates *(Chart 1)*. Treatment success was similar for both administration methods, as well as adverse effects.

The most common reason for switching or discontinuing therapy was allergic reactions including rash, itch and anaphylaxis. Most common reason for ER visits and hospitalization was rash, gastrointestinal issues, and lab abnormalities including hypokalemia. There was a total of 32 medication errors reported; however there was only one requiring additional monitoring *(Table 1)*.

Chart 1: Ambulatory vs Elastomeric Use from 2019-2021

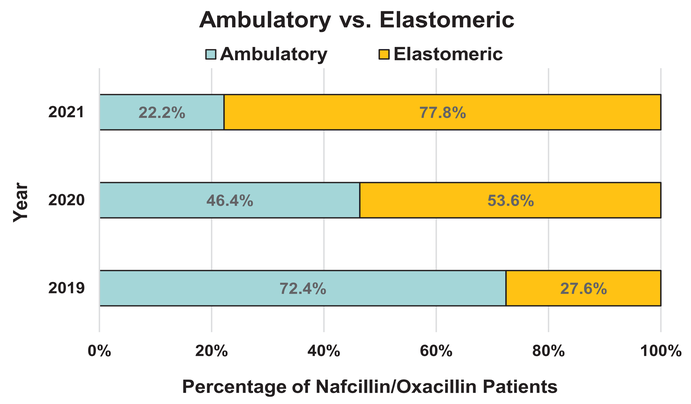

Table 1: Categorization of Medication Errors Reported Using the NCC MERP Index

	Nafcillin Ambulatory	Nafcillin Elastomeric	Oxacillin Ambulatory	Oxacillin Elastomeric
Category A	4	2	0	4
Category B	0	1	2	1
Category C	4	8	2	3
Category D	0	0	0	1
Total Events	8	11	4	9
Total Patients	858	778	462	707

Note: Category A: circumstances or events that have the capacity to cause error; Category B: An error occurred but the error did not reach the patients; Category C: An error occurred that reached the patient but did not cause patient harm; Category D: An error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient and/or required intervention to preclude harm.

Discussion

The switch to elastomerics did not negatively impact treatment success or increase adverse events reported. It is important to note that common medication errors for elastomerics included incorrect elastomeric product chosen and patient/nurse not aware that the infusion was continuous. A similar medication error was reported for ambulatory pumps where bags were completed early.

There were more incidences of medication errors and adverse reactions for nafcillin; however, there were more patients receiving nafcillin than oxacillin. One limitation of the study was reliance upon accurate documentation of therapy completion, a switch of therapy, and adverse reactions. It was also dependent on patient self-reporting of adverse reactions.

Conclusion

The switch to elastomerics has been previously shown to increase patient compliance and decrease costs. The creation of standardized templates assisted in driving the change away from ambulatory pumps to elastomeric pumps for continuous infusion administration of oxacillin and nafcillin. Additional education may be warranted for elastomeric pumps to reduce medication errors.

References

[1]Wurdemann J. et al. Comparison of Compliance and Comprehensive Cost for Various Methods of Administration of Intravenous Antibiotics in a Home Infusion Setting. Poster presented at NHIA Annual Meeting. 2019
[2]National Coordinating Council for Medication Error Reporting and Prevention. https://www.nccmerp.org/vision-and-mission (Accessed 2022 Jan 26).

Disclosures

Authors of this presentation have the following to disclose concerning possible financial or personal relationshipswith commercial entities that may have a direct or indirect interest in the subject matter of this presentation: Kristine Nguyen; Maria Giannakos; Jay Winters; Alexandros Pitsakis. Nothing to disclose.

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