

PICC-ing the problem - optimizing antibiotic delivery via elastomeric infusors in paediatric cystic fibrosis patients

Nicolette Graham¹, Szu-Pei Lin¹, Shakira Wild², Gina Huang², Amy Leung²

¹ Pharmacy department, Lady Cilento Children's Hospital, ² School of Pharmacy, University of Queensland
 Presenter's e-mail: Nicolette.Graham@health.qld.gov.au

BACKGROUND

- To achieve optimal dosing to overcome pharmacokinetic and pharmacodynamic differences in drug handling in the Cystic fibrosis (CF) population, higher mg/kg dosing regimens are often required (1).
- Novel methods of antibiotic dosing and administration, such as extended and continuous Beta-Lactam infusions have been shown to improve time above Minimum Inhibitory Concentration (MIC) and bactericidal activity in the adult population, however paediatric data is sparse (2).
- Intermate® Elastomeric Infusors were introduced at Lady Cilento Children's hospital (LCCH) to allow continuous delivery of intravenous antibiotics for CF inpatient groups to improve efficacy of treatment and quality of life during long inpatient stays (Figure 1).
- Long term vessel health and reducing complications is a priority in these patients requiring Central Venous Access devices (CVAD) to receive life saving therapies. This includes the use of BioFlo® devices, a new generation Percutaneous Inserted Central Catheter (PICC).(3)
- The elastomeric delivery of intravenous antibiotics via a range of CVAD have not previously been studied in the paediatric patient population.

OBJECTIVES

To assess the amount of drug delivered to the patient via elastomeric infusors over the 24 hour period, and to identify any contributing factors that may hinder this process.

AIMS

- Assess the performance of elastomeric infusor devices (Intermate®) to deliver antibiotic therapy effectively
- Identify any factors that may contribute to poor infusor function
- Identify strategies that could be employed to improve infusor function and antibiotic delivery to this vulnerable patient group

FIGURE 1. Elastomeric infusor device (Baxter Intermate®) (4)



METHODS

- A retrospective audit of antibiotic delivery via an elastomeric infusors was conducted at the Lady Cilento Children's hospital for a 12 month period (August 2015 to July 2016).
- Chart reviews examined patient demographics, the type of antibiotic, dose, the type of intravenous access device, nursing infusor administration records, pharmacy infusor ordering records, and patients' medical records for any details of infusor malfunctions.
- Children < 18 years with Cystic fibrosis who were inpatients during the data collection period were included in the audit.

Outcomes measured:

- Percentage of antibiotic dose delivered via elastomeric infusor per 24 hour period for each day of the inpatient stay was calculated
- Infusor performance was compared by type of antibiotic, medication concentration and delivery via specific intravenous access device
- The infusor was considered full functioning if greater than 80% of the total daily dose was delivered over the 24 hour period.

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RESULTS

- A total of 70.8% (615/869 infusors) for 161 inpatient stays were analysed.
- 89.6% and 63.2% of Ceftazidime and Piperacillin-tazobactam infusor groups (respectively) met the criteria for optimal infusor function (>80% total dose delivered)
- For type of intravenous access device on infusor function, Port-a-cath and standard Cooke® PICC line (peripheral inserted central catheter) had the highest percentage of full functioning infusors.
- Sub-analysis showed piperacillin-tazobactam infusor function was reduced when given via peripheral intravenous cannulas (PIVC) and via Bioflo® PICC lines (Figure 2).

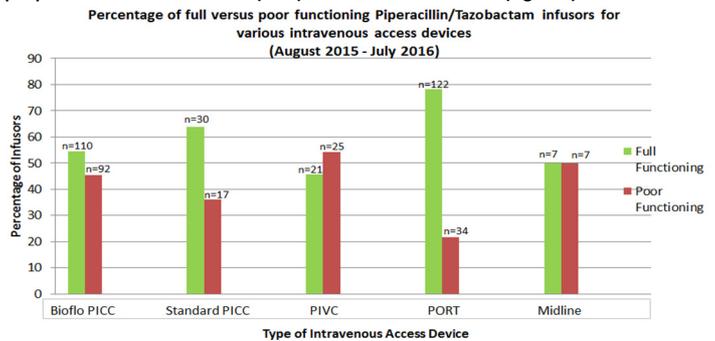


FIGURE 2. Impact of type of intravenous access device type on Infusor function (Figure 3)

- Piperacillin-tazobactam concentration exceeding 50mg/mL resulted in suboptimal infusor function (Figure 3).
- Other factors that may contribute to infusor malfunctioning included incorrect infusor administration, weighing technique and recording, and patient factors.

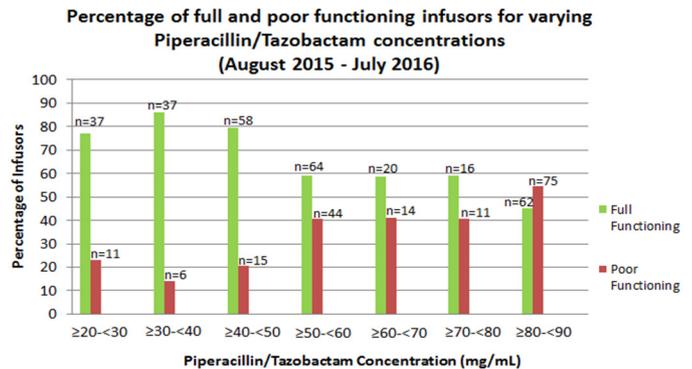


Figure 3. Infusor function versus Piperacillin/tazobactam concentration

CONCLUSION

Overall, the size and type of intravenous access device and drug concentration had a significant impact on piperacillin-tazobactam elastomeric infusor flow rate and function, impairing total drug delivery to the patient. Further research into the impact of these modifiable factors are required to ensure optimal antibiotic delivery via elastomeric infusor devices can be achieved.

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