Are Prescribed Infusions Running as Intended?

Quantitative analysis of data log files from infusion pumps used in a large acute NHS hospital

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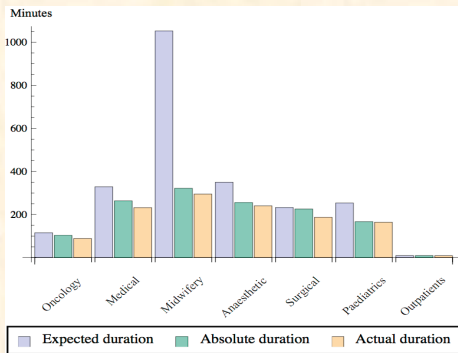
Figure 1. The absolute infusion duration (duration between the beginning and end of an infusion), the expected infusion duration and the actual infusion duration.
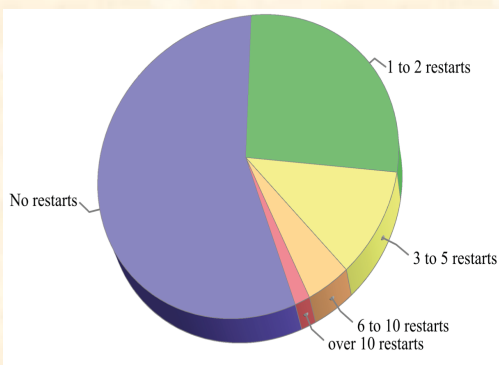

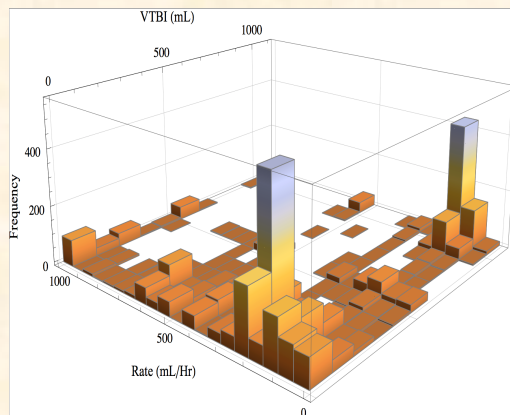Figure. 2. Infusions analysis and restarts.

Figure 3. 3D Histogram showing the frequency of each combination of VTBI and rate for all infusions.

Introduction

Infusion pumps have remained practically the same since the 1980s due to the simplicity of the task in hand — *administer a prescribed medication to time*. Nowadays, computerised interactive infusion pumps are used in many areas but this study has shown that only 56% of intended infusions were delivered without interruption, resulting in some infusions finishing many hours behind time.

Background

The importance of effective, timely management of IV medication has been highlighted within the '5 rights' of medication safety and more recently focused on the delivery at the 'right time' (Barber & Taxis 2004; NPSA, 2007 & 2010; Westbrook *et al*, 2011). Recovering from interruptions to IV therapy (e.g., dealing with alarms and errors) can take significant time to re-establish prescribed infusions and this impacts on patient care (Lee *et al*, 2012).

Results

Between January 2008 and March 2011 data logs from 128 volumetric infusion pumps were downloaded and the intended infusion duration (Fig. 1) and number of interrupts were analysed (Fig. 2). The results showed:

- 3,706 separate infusions
- 9,067 hours of infusions
- Only 56% of infusions were administered without interruption
- 44% (N=1645) were interrupted at least once
- 9 cases of over 20 restarts
- One pump was restarted 48 times during a 5 hour infusion
- Occlusion was number one cause for stopping pumps.

A number of common regimens were identified (Fig. 3) but each of these had to be set up manually, resulting in wide variations. STAT doses, Volume to be Infused (VTBI) settings, and prescribed rates varied significantly for the same prescriptions.

Conclusions

Alarms and interruptions to infusion pumps affect the timely delivery of prescribed medications. 44% (n=1,645) of all infusions were not administered as intended, resulting in large variations in time to complete and total volume infused. Using logs to understand how infusion devices are used in clinical practice can benefit:

1. **Pharmacy departments** by helping to improve drug delivery systems, reducing variations and ensuring timely infusion therapy;
2. **Procurement teams** who may require detailed analysis of user logs to ensure safer devices for the future with better programmes and interfaces;
3. **Equipment management teams** who will be able to analyse logs and user interactions and highlight user issues and device deficiencies;
4. **IV Therapy teams** who would be able to identify procedural errors, set up errors and give better insights into how infusion pumps are used.

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