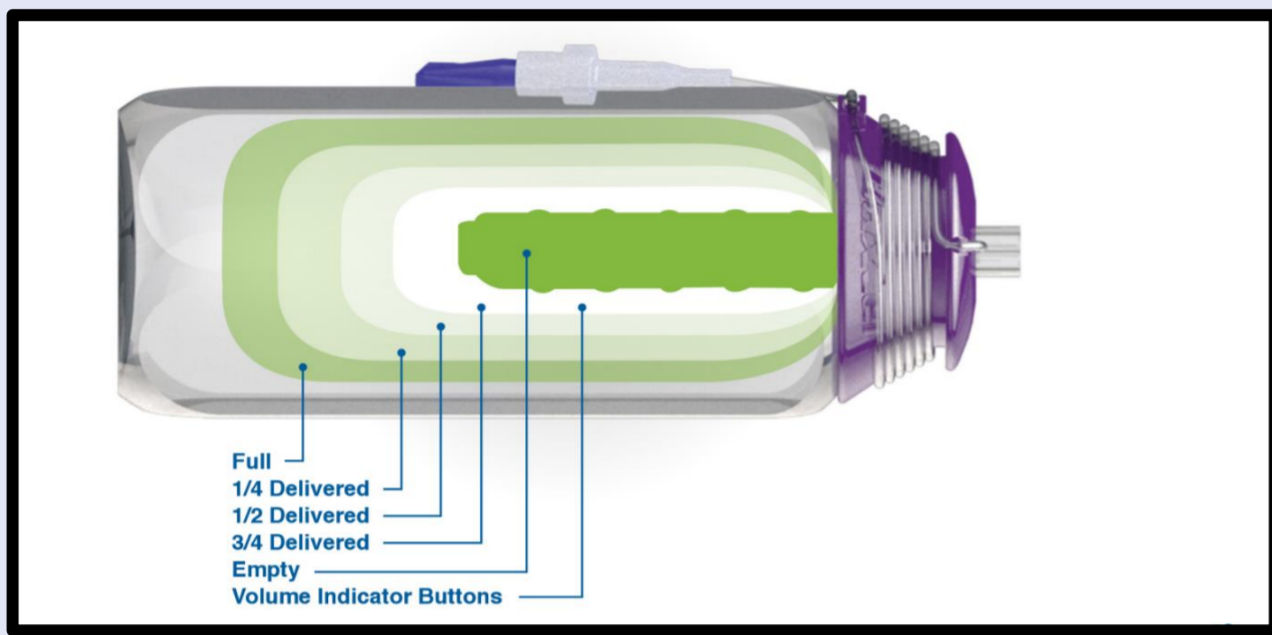


Factors affecting antibiotic delivery from a portable continuous infusion device in hospital outpatients

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Do elastomeric Infusors empty at different rates and why?



Prior to commencing this study, clinicians from the Hospital in the Home service (Central Coast Area Health, NSW) documented that Baxter Infusors® ('Infusors') emptied at varying rates.

This study aimed to:

1. Record Infusor-emptying rates whilst in use, and determine whether the variation in flow rates was common and within acceptable timeframes
2. Determine what factors contributed to slower and faster Infusor-emptying rates

Data collection form completed by patient and nurse/pharmacist

Data collection forms:
provided to every patient treated with an antibiotic Infusor between January and December 2015

Nurse recorded:

- time Infusor was attached and detached
- Whether Infusor was 'empty' or 'not empty' when removed and approximate volume remaining

Patient recorded:
The time the Infusor emptied (if it was before the nurse visit) and Infusor storage day and night

Pharmacist recorded:
Antibiotic type, date, day of treatment, indication

Infusors may empty at different rates

266 completed data collection forms were returned by 37 patients over a 12-month period (range 1-26 forms per patient; average 7 per patient).

The following definitions (24 hours +/-5%) were assigned for 111 (n=111/266) patients: 'Early' (empty before 22.8 hours), 'late' (not empty after 25.2 hours) or 'expected' (emptied between 22.8 and 25.2 hours).

The Infusor was 'not empty' when removed from the patient 64.7% (n=177/266) of the time, caused by late emptying Infusors or unevenly spaced nursing visits (see below).

Infusors emptied at varying rates: early (28%), late (35%) and expected (37%).

Possible factors contributing to these variations in emptying rates are shown in figures 1-3

Season, overnight storage location, antibiotic type may cause a variation in Infusor emptying rates

Season

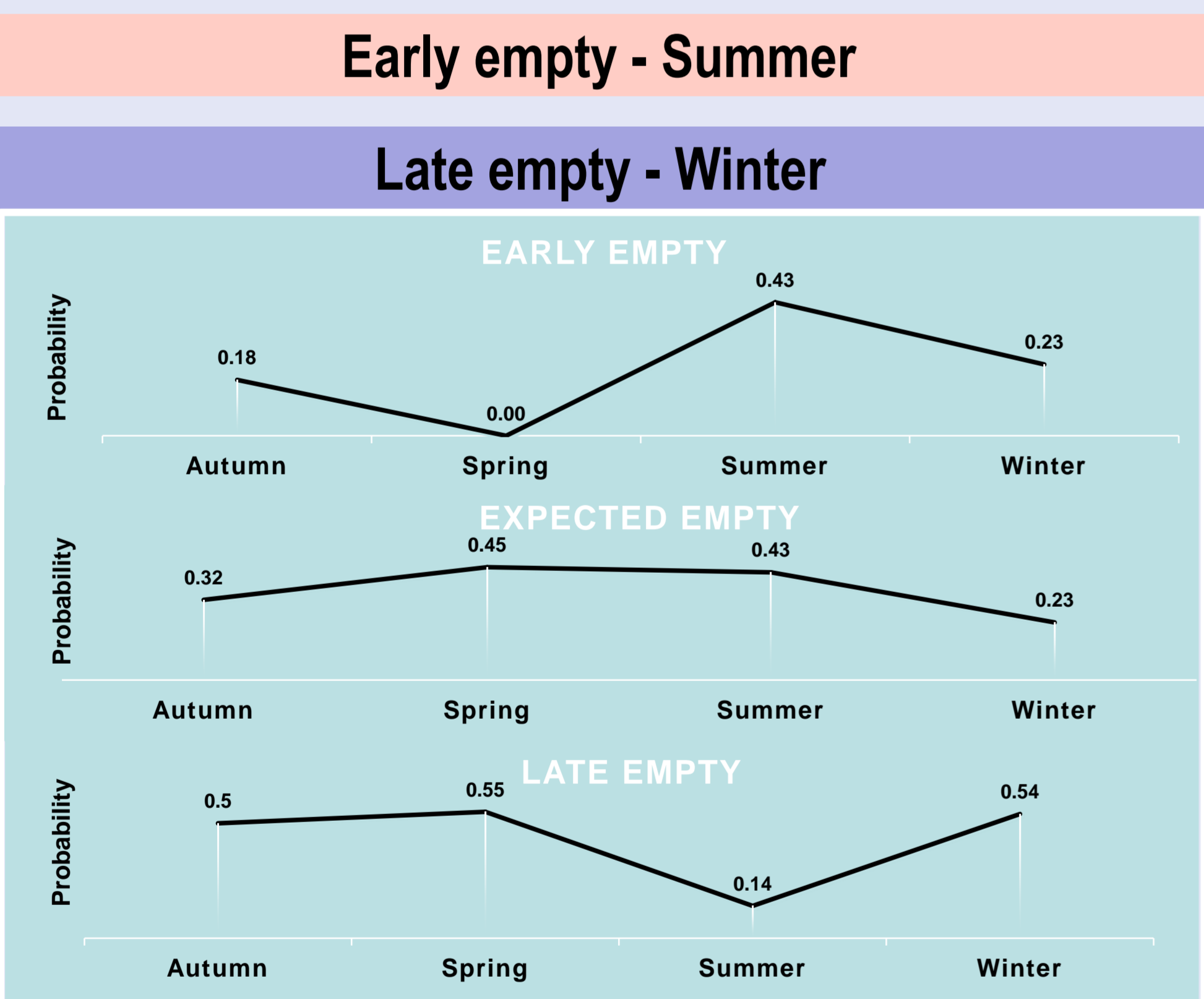


Figure 1 provides the predicted probabilities of 'Early' vs 'Expected' vs 'Late' emptying for each season. Summer was the most commonly recorded season (n=49; 44.14%). A chi-square test indicated a significant association (p=0.025) between the season and the 'Time to Empty'. During Autumn, Infusors were most likely to empty late (i.e. probability=0.50 approximately); in Spring, Infusors were also most likely to empty late (i.e. probability=0.55 approximately); during Summer, Infusors were most likely to empty early or as expected (i.e. probability=0.40 approximately); whilst in Winter, Infusors were most likely to empty late (i.e. probability=0.55 approximately).

Overnight storage

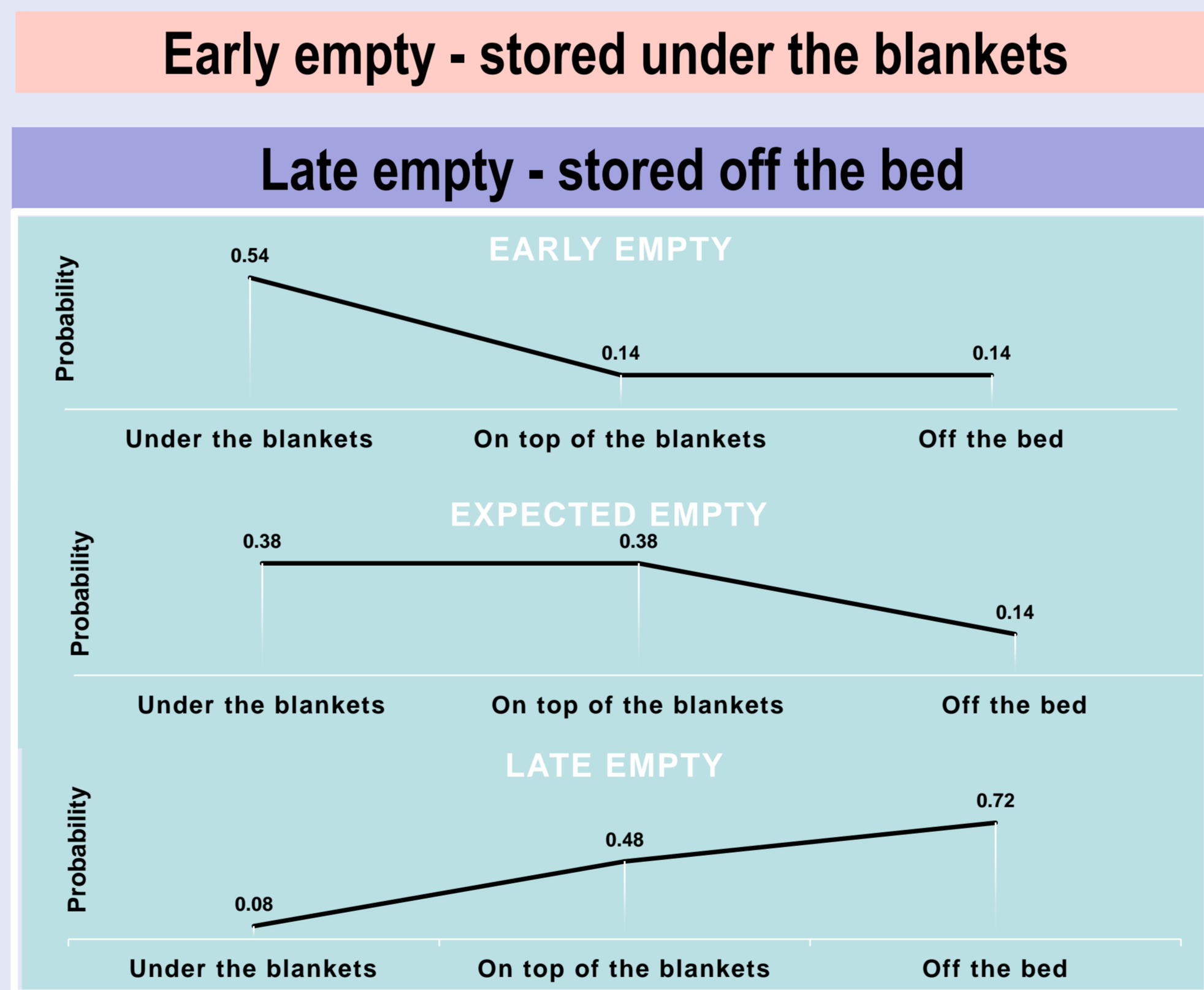


Figure 2 provides the predicted probabilities of 'Early' vs 'Expected' vs 'Late' emptying for the overnight storage location. 'On top of the blankets' was the most commonly recorded overnight storage location (n=63; 56.76%). A chi-square test indicated a significant association (p=0.001) between the 'Night storage' location and the 'Time to Empty'. Infusors stored 'under the blankets/pillow' were most likely to empty early. When stored 'on top of the blankets', Infusors were most likely to empty late. Infusors were also more likely to empty late if stored 'off the bed'.

Antibiotic Type

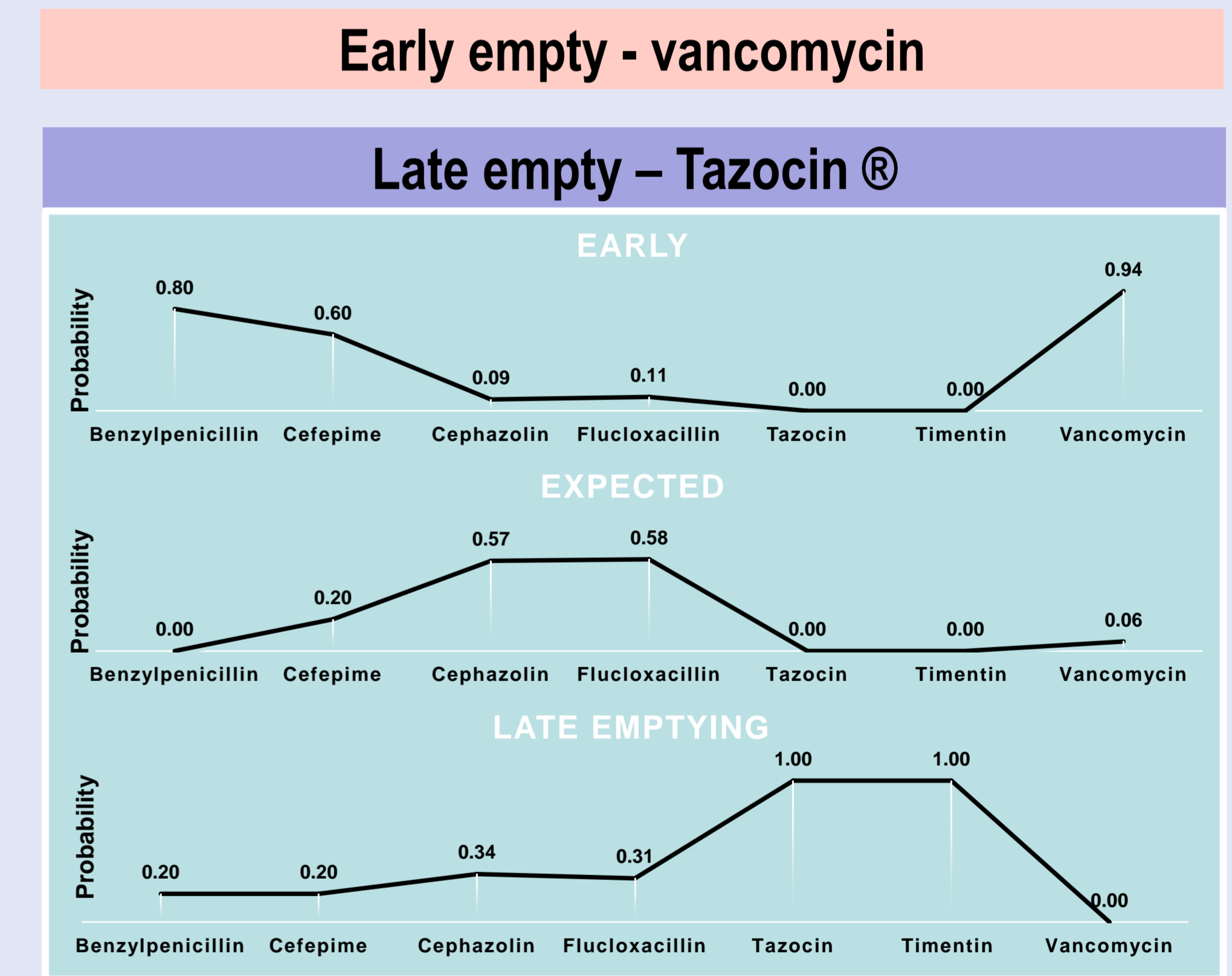


Figure 3 provides the predicted probabilities of 'Early' vs 'Expected' vs 'Late' emptying for each drug. Flucloxacillin was the most commonly recorded (n=45; 40.54%). A chi-square test indicated a significant association (p=0.027) between the 'Drug' and the 'Time to Empty'. Infusors were most likely to empty early if the drug was benzyloxyphenoxymethyl penicillin or vancomycin (i.e. 0.80+ probability). However, Infusors were most likely to empty late if the drug was either Tazocin® or Timentin® (i.e. probabilities being close to 1). Cephazolin or flucloxacillin were most likely to empty as specified (i.e. probability=0.60 approximately).

Variations in nursing visits

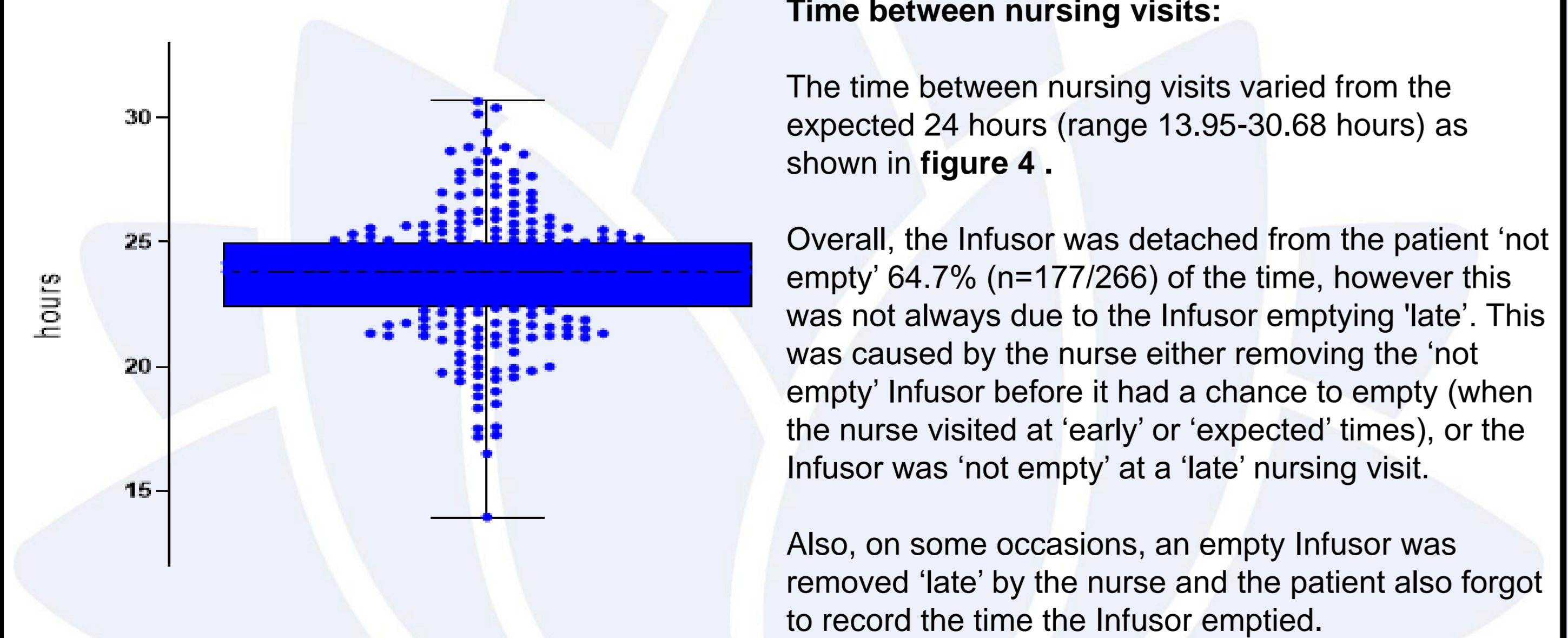


Figure 4: Box & whisker plot showing number of hours (median, IQR and range) between daily visits by nursing staff to change Infusor device

Time between nursing visits:

The time between nursing visits varied from the expected 24 hours (range 13.95-30.68 hours) as shown in figure 4.

Overall, the Infusor was detached from the patient 'not empty' 64.7% (n=177/266) of the time, however this was not always due to the Infusor emptying 'late'. This was caused by the nurse either removing the 'not empty' Infusor before it had a chance to empty (when the nurse visited at 'early' or 'expected' times), or the Infusor was 'not empty' at a 'late' nursing visit.

Also, on some occasions, an empty Infusor was removed 'late' by the nurse and the patient also forgot to record the time the Infusor emptied.

Infusor emptying times could therefore not always be established as a result of these variations in nursing visit times.

Effect on practice

When using elastomeric devices in practice, HITH clinicians should be aware that Infusor emptying rates may vary, and the possible contributing factors (especially for Infusors that consistently empty early or late, patients responding slowly to treatment and when interpreting vancomycin levels). Consistent nursing-visit times is also important to ensure optimal service delivery and positive patient outcomes. Whilst there were no obvious treatment failures in the CCLHD HITH service during this study, HITH nurses now document remaining volumes in Infusors when detaching from patients as standard practice, to monitor ongoing antibiotic treatment.



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