Evaluating the Use of a Drip Rate Reader for Administration of Intravenous Fluid

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BACKGROUND

Hospital bed scarcity accelerates interest in Hospital@Home models in Singapore and globally [1]. However, there are challenges in caring for patients requiring medical care in their own homes. One such challenge is the lack of infusion pumps in patient homes. Without infusion pumps, IV drips are often adjusted by eye. Manual gravity-fed infusions are error-prone [2]. Incorrect infusion rates are one of the leading causes of serious medication errors worldwide. Hence, a device that can monitor IV infusion accurately is needed (Figure 1).

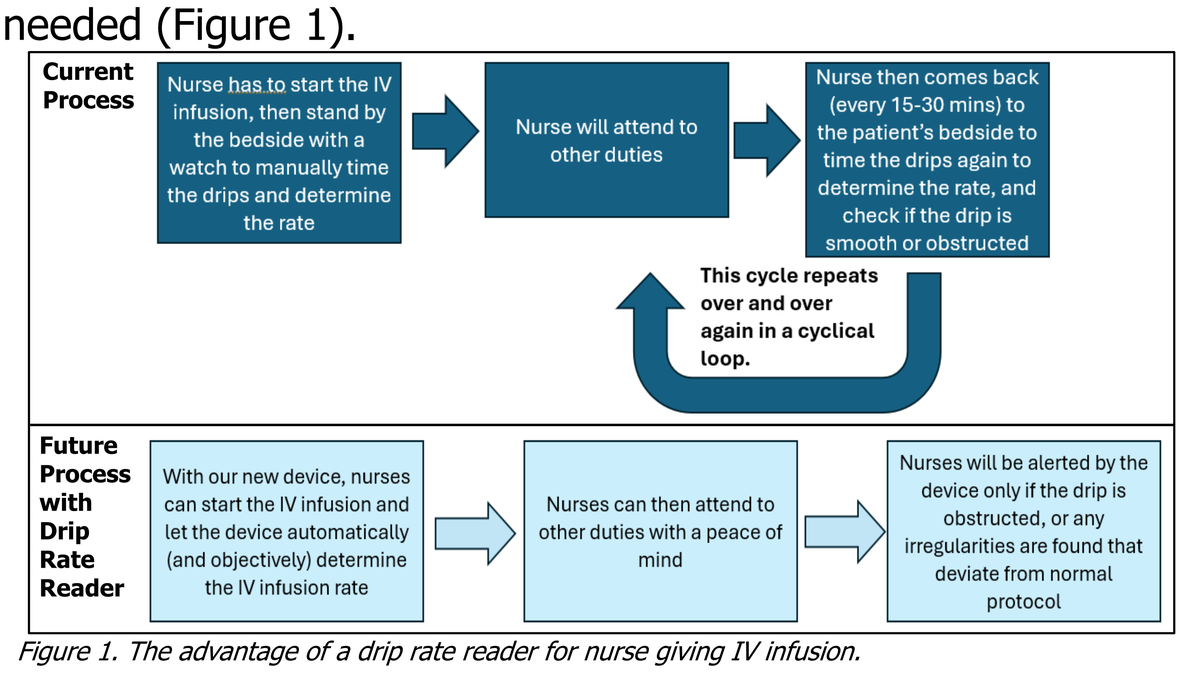


Figure 1. The advantage of a drip rate reader for nurse giving IV infusion.

OBJECTIVES

1. To develop and refine a portable, battery-operated drip rate reader, *Driplogy* that provides real-time monitoring of intravenous (IV) drip rate.
2. To evaluate the accuracy, feasibility, usability and durability of a drip rate reader for administration of intravenous fluids in clinical settings.

METHODOLOGY

Prototype Refinement

- Engineering improvement of the hardware to enhance portability, durability and usability.
- Drop detection algorithm optimization for higher precision.

Accuracy testing

- *Driplogy* readings were compared against infusion pump rates (41.67mL/hr, 83.33mL/hr, 100mL/hr, 200mL/hr, 500mL/hr), using a predefined ±5% deviation target.
- Ten units were manufactured and underwent the same accuracy testing.

Clinical Evaluation and User Feedback

- Tested 10 times by nurses in wards and homes were done for each unit.
- Nurses provided feedback on ease of operation, functionality, device impact, durability and satisfaction in infusion.

RESULTS

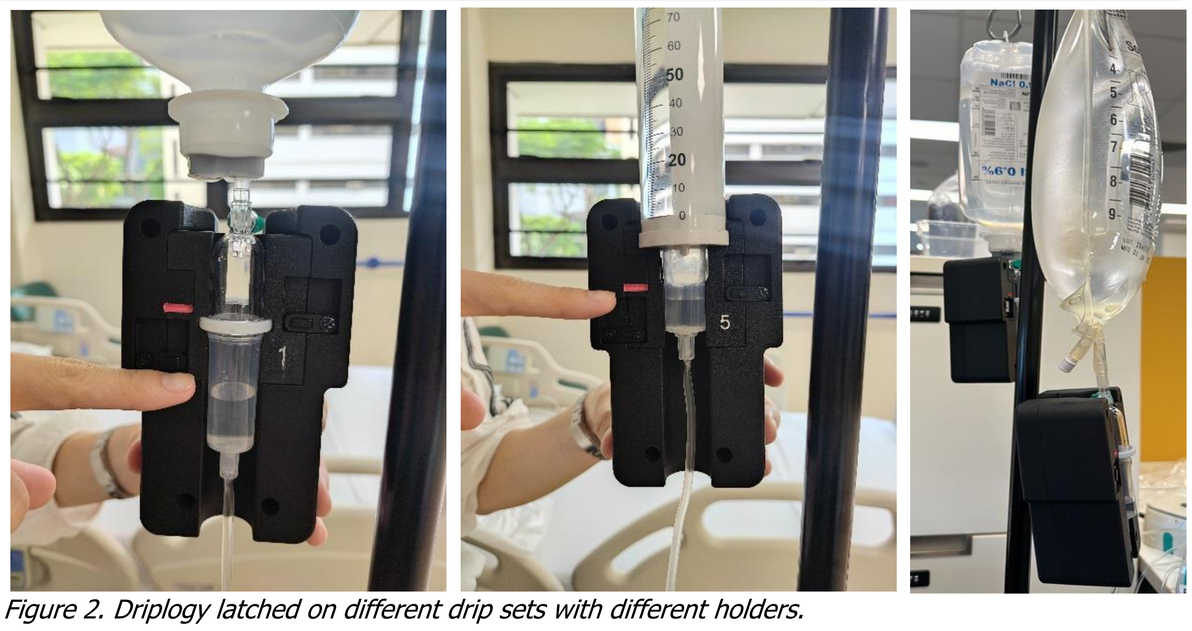


Figure 2. Driplogy latched on different drip sets with different holders.

Accuracy Testing

- All 10 units achieved less than 5% deviation from the pump in 96% of measurements across all target flow rates, indicating *somewhat* reliable drop-sensing performance.

	Question Total, N= 97	Yes N (%)	No N (%)
Ease of Use & Setup	Did you find the *Driplogy* easy to use right away?	88 (90.7%)	9 (9.3%)
	Was it easy to latch the DRIPLOGY PDR on the burette or drip set?	85 (87.6%)	12 (12.4%)
Functionality	Is the display of Total Volume Useful?	89 (91.8%)	8 (8.2%)
	Is the display of Drop Count Useful?	76 (78.4%)	21 (21.6%)
Device impact	Did using the *Driplogy* improve your confidence in patient safety during infusions?	71 (73.2%)	26 (26.8%)
Battery Life	Did the battery last throughout the infusion duration?	97 (100%)	0 (0%)

Table 1. Total 97 responses from community and ward nurses after evaluation of 10 units Driplogy.

Durability and Satisfaction

- 6 of 10 units failed after 1 to 7 months of use (5 screen faults, 1 detached charging port), durability will be improved.
- Overall satisfaction was high, with 31 responses selecting "strongly satisfied" and 32 selecting "satisfied".

Qualitative Feedback

- Nurses values the alarm function for providing alerts when infusion stops.
- A common concern was the device being bulky and heavy, with a preference for a more compact design.

CONCLUSION

Driplogy shows promising accuracy and usability as a practical alternative for gravity-fed IV infusions in Hospital@Home settings, though further refinement is needed to improve hardware, accuracy and long-term durability.

ACKNOWLEDGEMENT

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