Insights from Home TPN Infusion Data

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Background

Home infusion of Parenteral Nutrition (HPN) is increasingly prevalent in patients with chronic intestinal failure.
They are trained to self-infuse at home, using smart infusion pumps enabling independence, while maintaining an optimal nutritional status (1). HPN is improving quality of life and nutritional outcomes in many clinical conditions and can increase weight in cancer patients (2,3,4). With clinical resources often remote, patients are at risk of non-compliance. Caregiver visits for HPN infusion treatment plans can be infrequent with assessments of effectiveness based on lab results and subjective patient reports.
Objective delivery data from infusion pump reports have the potential to support lab results and subjective patient reports both remotely and at follow up visits, supporting treatment progress monitoring and medication planning.

Purpose

The aim of this study was to demonstrate the efficacy and accuracy of Eitan Insights digital health platform for home HPN use. We hypothesize that the data recorded by patients is consistent with the data recorded in the platform.

Study Design

Prospective, single-center observational study

Method

20 patients with a minimum of 3 weekly HPN infusions using the Sapphire Infusion Pump for at least 2 months were recruited over a year in 2022 (IRB approved). Weighing scales (ZTW weighing scales by T Scale) and manual forms were supplied to patients to record 3 days of infusions: the pre and post infusion HPN bag weight, the duration of infusion and the alarms. The weight of the administration set, and residual volume remaining was removed from the manually recorded bag weight. This is then converted to mL, deducted from the pre-infusion bag weight, and compared to the volume infused as recorded by the pump and Eitan Insights platform (a digital platform providing data driven insights from the pump recorded data). Manually recorded treatment duration were compared to the pump data, assessing the correlation between the data points for each patient's HPN infusions. Repeated Measures ANOVA procedure was used for statistical analysis.

Baseline Characteristics (20)	Mean (range)
Age, years	48 (20-71)
Sex, male (female)	12 (8)
Average HPN usage (years)	8 (1-20)
Average HPN infused (mL)	1,887 (1,250-2,000)
Average infusion time per treatment (hours)	10.4 (8-16)
Average infusion rate (mL/h)	181 (125-250)

Figure 1 Disease Demographics

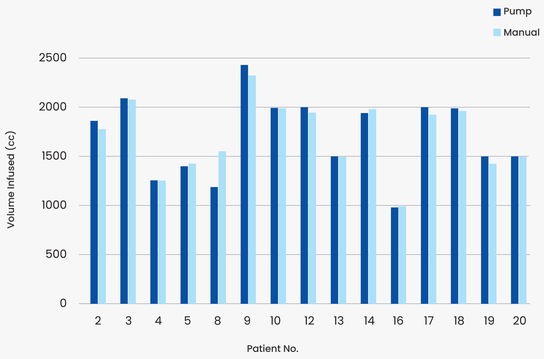

Figure 2 Volume Infused (day 1) Patients 1,6,7,11,15 withdrew (not included in results)

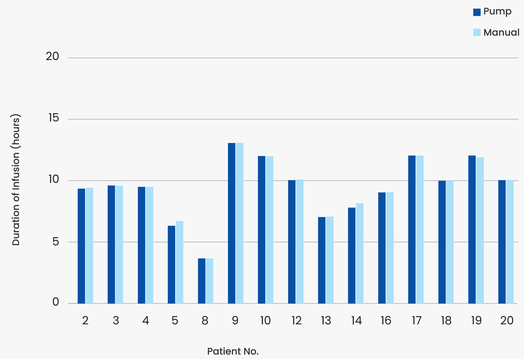

Figure 3 Duration of Infusion (day1) Patients 1,6,7,11,15 withdrew (not included in results)

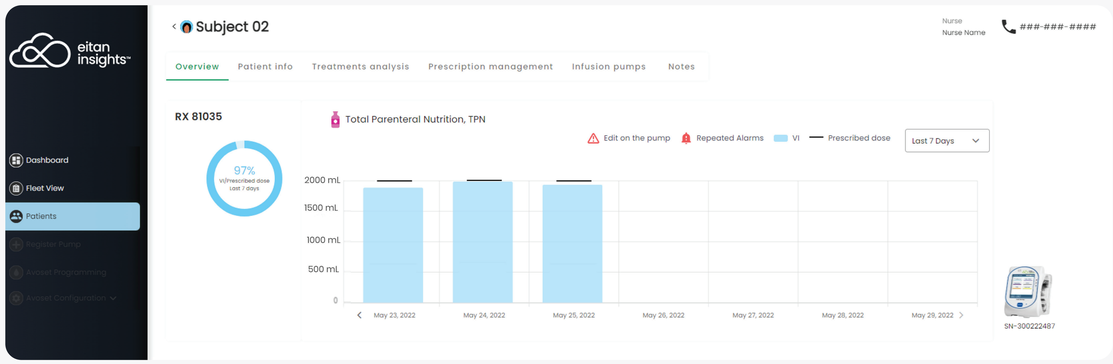

Figure 4 Insights Platform presenting subject 2" ; day 1 and day 3 infusion data shows minor non-compliance from prescribed dose

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Results

Attrition rate of 5/20, 45 data sets collected. No adverse events were noted during the study. Multiple comparisons for in-between subject factors and descriptive statistics found that there was no significant difference between manual vs pump recorded data sets for volume infused (Values of manual versus pump in mean 1707mL +/- 362mL and 1708mL +/- 405 P Value= 0.939) and infusion duration (Values of manual versus pump in mean 9:43 +/- 2.48 SD VS 9:45 +/- 2.41 SD P Value= 0.858) P value above 0.05 indicates no difference between the data sets. Figure 2 and 3 present data from the first day of treatment, showing a close correlation between manually recorded and pump data. Demographics of the sample group presented in Table 1 Demographics.
The demographics show a broad adult age range, pediatrics are not represented in the sample. Short Bowel Syndrome (SBS) was the most common cause for HPN (6 patients), followed by Chron's (5 patients).

Discussion

The data collected by the digital platform accurately reflects the patient's infusion data supporting the study's hypothesis. Patients with chronic disease have been shown to have challenges with compliance, one study showing the longer the HPN use, the poorer the compliance (5), yet patients that agreed to participate were characteristically compliant, introducing selection bias. Figure 4 presents how subject 2's data is presented on the Eitan Insights Platform; this was exactly aligned with the patient's self-report; less volume received than expected for days 1 and 3; these minor deviations from expected volume received reflecting the the patient's report that he was reliant on family caregivers on these days, ending infusion prematurely so family members could get to work. The accuracy of the data enables assessments of compliance without visiting the home.

The study was strengthened by the methodology design; weighing scale measurements were double checked and set weight and priming volume were removed from the bag weight calculation for increased accuracy and credibility to the data collection. Future research would assess the impact of treatment data, as presented on Eitan iInsights platform, on treatment outcomes.

Conclusion

The study showed data was accurately captured by the pump, providing insights on the digital health platform. These insights could be useful in studying correlations between treatment data and clinical outcomes as well as providing potential for cost savings in parenteral nutrition purchasing. Home-based therapies could benefit from remote treatment data visibility. This connected device has the potential to allow clinicians to be more informed, assess treatment trends and proactive resource planning through the infusion pump data insights.

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