Use of ambulatory infusion pump data to objectively measure adherence to home parenteral nutrition prescriptions

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Background

Objective data measuring home parenteral nutrition (HPN) adherence are not published in the literature, although nonadherence is considered an issue among HPN clinicians.[1,2] Prior to determining treatment plans to improve nonadherence, objective information on adherence would be a valuable tool for clinicians.[3]

Purpose/Objective

The purpose of this study was to measure adherence to HPN prescriptions using pump data to better understand the prevalence of adherence and characteristics associated with adherence in the HPN setting.

Methods

Inclusion criteria

Pumps assigned to adult patients receiving daily HPN in which pumps were routinely collected for one of the following:

- Change in HPN prescription
- End HPN therapy
- Routine pump maintenance

Pumps were returned to the distributor and a report was emailed to the primary investigator; the most recent seven days of pump data were entered into a de-identified dataset and analyzed.

Primary outcome measure

- Prevalence of adherence to the HPN prescription
  - Defined as infusion of ≥80% of the prescribed volume

Secondary outcome measures

- Association between adherence and the prescribed HPN characteristics:
  - Prescribed length of infusion (<18 hrs. vs. ≥18 hrs.) and adherence
  - Duration of time on HPN (<30 days vs. ≥30 days) and adherence

Results

- A total of 13 eligible pumps were collected between June 2020 and August 2021, reflecting 86 total infusion days
- Prevalence of adherence to the HPN prescription was 91.9% (n=79)
- There were no significant associations between the length of the prescribed infusion and adherence (*P*=0.06) and duration of time on HPN and adherence (*P*=0.09)
- There was no significant difference between the prescribed volume and actual infused volume (*P*=0.58)
  - However, the actual length of infusion was significantly longer than the prescribed length of infusion (12.7 hrs. vs. 12 hrs., *P*<0.0001)

Table 1. Clinical and demographic characteristics of patients associated with pumps (N=13)

	Median (IQR)	Range
Age (yr)	62 (11)	30-75
Weight (kg)	52.7 (15)	40.4-89.5
BMI (kg/m2)	20.0 (4.5)	14.4-35.0
Duration of time on HPN (d)	16 (56)	1-765
	n	**%**
Female	9	69.2
Male	4	30.8
Indication for HPN		
Short bowel syndrome	3	23.1
Dysmotility	1	7.7
Bowel obstruction	1	7.7
Fistula	2	15.4
Other[a]	6	46.1
Reason for pump collection		
Change in HPN prescription	10	76.9
End of HPN therapy	3	23.1
Receiving other IV therapies		
Yes	5	38.5
No	8	61.5

Key: **BMI**, body mass index; **HPN**, home parenteral nutrition; **IV**, intravenous.
[a] Inflammatory bowel disease, malnutrition, gastric cancer, Dysphagia (refusal of enteral nutrition), lymphatic cancer in duodenal mucosa.

Table 2. Results of pump data extraction (N=86[a])

Day of Infusion, n (%)						
Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
13 (15.1)	13 (15.1)	12 (14.0)	12 (14.0)	10 (11.6)	13 (15.1)	13 (15.1)
Pump alarms (≥1 alarm per infusion period), n (%)						
Yes	43 (50.0)					
No	43 (50.0)					

[a] 7 days of data were not available for all pumps.

Table 3. Prescribed versus infused HPN characteristics

	Prescribed	Infused
Length (hr)	12 (3)	12.7 (5.8)[a]
Volume (mL)	2160 (900)	2150 (964.8)[b]
Dextrose (g)	210 (55)	200 (60.1)
Amino acids (g)	75 (10)	75 (5.0)
Lipids (g)[c]	50 (15)	50 (25)
Total kcal	1501 (280)	1483.9 (318.7)

Key: **HPN**, home parenteral nutrition; **kcal**, kilocalorie.
Median values reported with interquartile range.
[a] No significant difference between prescribed volume of infusion (P=0.58; Wilcoxon rank sum test).
[b] Significantly longer than prescribed length of infusion (P<0.0001; Wilcoxon rank sum test); n=85 (infusion start time missing on one report).
[c] Lipids provided within total nutrient admixture.

Figure 1. Adherence to HPN prescription (N=86)

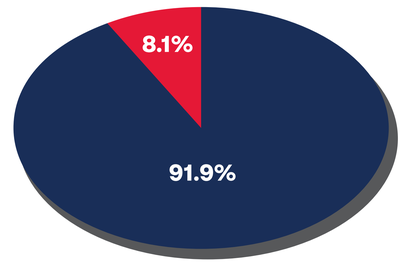


Figure 2. Prescribed versus actual volume infused (N=86)

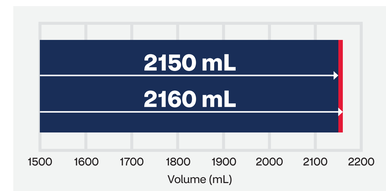
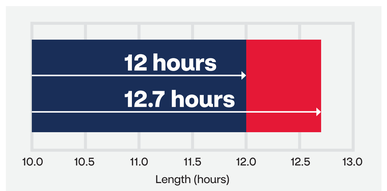


Figure 3. Prescribed versus actual length of infusion (N=86)



Conclusion

- Adherence to the HPN prescription was noted in the majority of infusion days
- Significantly longer length of infusion compared to the prescription may be attributed to the high frequency of pump alarms and need to intermittently stop the infusion
- Further analysis of a larger sample size may reveal new information regarding patient and prescription characteristics associated with adherence
- Further studies are needed to examine the clinical effect of nonadherence and methods to improve adherence

Acknowledgements

The study authors thank Christina Paniccia MS, RDN, CNSC and Laryssa Grguric MS, RD, LDN, CNSC for their study assistance and Migan Orton Lightfoot RN, BSN from Moog Medical for her instruction of interpreting pump reports.

References

1. Kirby DF, Mitchell R, Hendrickson E. Noncompliance/Nonadherence With Home Nutrition Support: An Underrecognized Clinical Dilemma. *Nutr Clin Pract*. 2017;32(6):777-781.
2. Kumpf VJ. Challenges and Obstacles of Long-Term Home Parenteral Nutrition. *Nutr Clin Pract*. 2019;34(2):196-203.
3. Burkhart PV, Sabaté E. Adherence to long-term therapies: evidence for action. *J Nurs Scholarsh*. 2003;35(3):207.