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Innovative Discharge Process for Families with Pediatric Short Bowel Syndrome: A Prospective Non-Randomized Trial

Bram P. Raphael, M.D.^{1,2}, Maria Jorina, Ph.D.³, Mary Gallotto, B.S.N., R.N., C.P.N.^{1,2}, Glendallis Grullon, M.S.N., C.P.N.P.^{1,2}, Meghan Dalton, M.S.N., C.P.N.P.^{1,2}, Melissa Takvorian-Bene, B.S.N., R.N., CPEN.^{1,2}, Christina Tascione, B.A.^{1,2}, Carolyn Rosa, C.P.N.P.^{1,2}, Jennifer McClelland, F.N.P.^{1,2}, Megan Gray, R.D.^{1,2}, Alexis K. Potemkin, R.N.⁵, Courtney Glavin, B.A.¹, Kathleen M. Gura, PharmD^{1,4}, Margaret K. Murphy, PharmD^{1,4}, Kierrah Leger, M.S., R.N.⁶, Judith Mahoney, M.S.N., R.N.⁶, Jessica Kerr, MPH⁷, Al Ozonoff, PhD, CPPS^{3,8}, and Christopher P. Duggan, M.D., M.P.H.²

¹Home Parenteral Nutrition Program, Boston Children's Hospital, Boston, MA 02115, USA

²Division of Gastroenterology, Hepatology and Nutrition, Boston Children's Hospital, Boston, MA 02115, USA

³Center for Applied Pediatric Quality Analytics, Boston Children's Hospital, Boston, MA 02115, USA

⁴Department of Pharmacy, Boston Children's Hospital, Boston, MA 02115, USA

⁵Department of Surgery, Boston Children's Hospital, Boston, MA 02115, USA

⁶Nursing patient services, Boston Children's Hospital, Boston, MA 02115, USA

⁷Division of General Pediatrics, Harvard Medical School, Boston, MA 02115, USA

⁸Department of Medicine Quality Program, Boston Children's Hospital, Boston, MA 02115, USA

Abstract

Background—Home parenteral nutrition (HPN) is a life-sustaining therapy for short bowel syndrome (SBS) and other severe digestive diseases, but complications are common. We aimed to evaluate an intensive pre-discharge HPN hands-on training course to reduce complications in children with SBS, including hospital readmissions.

Methods—We conducted a prospective, non-randomized controlled research study between April 1, 2014 and April 30, 2017. Eligible subjects were children age <18 years-old with SBS, and anticipated HPN dependence duration ≥ 6 months. Excluded subjects had previous history of discharge with a central venous catheter (CVC), HPN or intravenous fluids or strictly palliative goals of care. Intervention group practiced hands-on HPN care within hospital room for 24-hours

Corresponding Author: Bram P. Raphael, M.D., Division of Gastroenterology, Hepatology and Nutrition, 300 Longwood Avenue, Boston, MA 02115, USA, Phone: 617-355-6439, Fax: 617-730-4722, bram.raaphael@childrens.harvard.edu.

Updated Affiliations:

Glendallis Grullon, Department of Pediatric Hematology/Oncology, Dana-Farber/Boston Children's Cancer and Blood Disorders Center

Megan Dalton, Antepartum, Postpartum and Newborn Nursery Units, Beth Israel Deaconess Medical Center

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using study supplied infusion equipment. Control and intervention groups both received standard teaching (CVC care, home infusion pump operation, HPN preparation and administration).

Results—Nine children were assigned to the intervention group and 12 served as controls. Median age was 8.4 months and length of stay (LOS) was 82 days. All subjects experienced 1 event with a total of 47 issues related to HPN. There were no significant associations between group assignment and 30-day post-discharge events. Each additional week of initial LOS was associated with 11% increase in the odds of an ED visit (OR 1.11; 95% CI: 1.01, 1.26) and 16% increase in the odds of readmission (OR 1.16; 95% CI: 1.04, 1.37).

Conclusions—Post-discharge events remained widespread despite intensive HPN bedside interventions offered by this pilot intervention. With refinement of HPN discharge processes, quality benchmarks are needed.

Introduction

Reductions of readmissions and post-discharge complications are increasingly looked upon as a quality metrics for all healthcare centers. Nearly 30% of pediatric hospital readmissions are potentially preventable.¹ Pediatric 30-day readmissions are tracked in a variety of complex conditions including lower respiratory infections, sickle cell disease and appendicitis.^{2,3,4} Readmissions are commonly associated with complex therapies, not only conditions. Home parenteral nutrition (HPN) is a life-sustaining, complex therapy for children and adults with short bowel syndrome and other severe digestive diseases.⁵

Short bowel syndrome (SBS) results from intestinal malabsorption related to massive surgical bowel resection.⁶ HPN provides for daily nutritional requirements not met by enteral nutrition including hydration, electrolytes, protein, fat, vitamins and minerals. Even children with ultra-short bowel syndrome, defined as residual bowel length approximately 20 cm, can achieve good treatment outcomes.^{7,8,9} Increasingly, patients are receiving this therapy, because it is recognized as the best option over prolonged hospitalization for improving quality of life. Between 25,000 – 40,000 children and adults receive HPN in the United States.^{10,11} Patients discharged on HPN represent a particularly high-risk group for readmissions. Vallabh et al. reported that the 30-day unplanned readmission rate was 32% in an adult HPN cohort.¹²

Many healthcare resources are dedicated to preparing families for successful discharge on HPN. Caregivers receive extensive teaching on a variety of topics including maintaining safe medical environment, hand hygiene, central venous catheter (CVC) care, HPN preparation, infusion pump usage, infection control and troubleshooting common issues. In 2013, along with Dana-Farber/Boston Children's Cancer and Blood Disorders Center, we published a web-based video series to teach CVC care for caregivers and families, based upon family and staff feedback that bedside teaching was inadequate and inconsistent.¹³ HPN nurses, floor nursing, home infusion nursing, as well as visiting nursing provide hands-on teaching as well. There is limited literature on successful interventions to improve discharge transitions for pediatric HPN patients.

The objective of this pilot study was to examine the impact of a hands-on 24-hour HPN experience for families on 30-day readmissions, post-discharge events, as well as parent perceptions of readiness for discharge, the quality of discharge teaching, and coping ability.

Methods

Study subjects

Patients and families were eligible for the study if they were discharged home from the Boston Children's Hospital for the first time and followed by the our HPN Program between April 1, 2014 and April 30, 2017. Our interdisciplinary HPN program includes pediatric nurses, nurse practitioners, registered dietitians, clinical pharmacists and gastroenterologists, and is designed to provide care to all patients discharged from the hospital who require HPN or IV fluid support. Patients were included in the study if they met the following characteristics: SBS (as defined by intestinal resection for acquired or congenital gastrointestinal diseases, leading to clinically significant malabsorption and requiring specialized nutritional therapy);¹⁴ age less than eighteen years-old; parent or other adult caregiver identified to receive HPN teaching; anticipated discharge with standard HPN solution and infusion supplies; and anticipated duration of HPN therapy for at least 6 months. Patients were excluded from the study if they had previous history of discharge home with a CVC, HPN or IV fluids, or had strictly palliative goals of care. The hospital institutional review board approved the protocol (IRB-P00015165).

Study design

This pilot trial was a prospective, non-randomized controlled research study. Participants and medical teams in both cohorts were aware of their assignment. Figure 1 depicts the HPN discharge process including inpatient and outpatient steps. A convenience sample of total 20 subjects was chosen. During the study period, 67 patients were assessed for eligibility. Forty-six subjects were excluded, including 45 did not meet inclusion criteria and one family who declined participation (Consort diagram available in supplement). The remaining 21 subjects were allocated between the two arms of the study according to a pre-determined order. Study enrollment ceased when grant funding ended.

The observation and intervention groups received the same standardized HPN discharge didactic teaching. All families regardless of study arm received hands-on training in hospital on operating a home infusion pump. All families regardless of study arm discharged with enteral nutrition received standardized teaching from nursing and nutrition. All families allocated to the intervention group also participated in a hands-on HPN care within hospital room for 24-hours using study-supplied home equipment. Supplies provided to the intervention group to use included: Curlin PN infusion pump (ZEVEX, Salt Lake City, UT), infusion tubing and supplies, plastic organizer bin, alcohol-based hand sanitizer, liquid soap, paper towels, as well as aluminum cookie sheet as clean work surface for preparing HPN. A home infusion company nurse supported the family at the patient's bedside until the HPN infusion was fully set-up in order to fully simulate a home experience. The home infusion company nurse was not present during the entire cycled PN infusion, which is standard of care for the community. Intervention families received instructions to act independently with

CVC care as they would upon discharge, without nursing care from the floor nurses. Families were expected to prepare the HPN bag (add IV multi-vitamins and spike the HPN bag with IV tubing) and to administer HPN overnight. Families monitored the patient for issues with infusions and would attempt to troubleshoot if needed. At the end of the HPN infusion, families were asked to disconnect the tubing and provide proper CVC care. In contrast, control subjects used actual home HPN equipment for first time only following discharge, not in the hospital prior to discharge, per standard practice. Control subjects received standard bedside nursing care up until hospital discharge. Within a week after each participant's intervention, we collected anonymous feedback from all participating staff using online survey via SurveyMonkey.¹⁵ The study team incorporated the feedback into rapid-cycle design improvements, such as pre-discharge briefings, updating standard HPN supplies lists, revising staff manuals, and situation background assessment recommendation communications to on-call staff.

One family member was asked to complete four validated surveys using Likert-type questionnaires at designated time periods in both groups. The readiness for hospital discharge survey (RHDS) is a 29-item tool used to assess parents' perception of readiness for discharge, which was completed within 24-hours prior to discharge.¹⁶ The quality of discharge teaching scale (QDTS) measures teaching content, such as care of child at home, information about medical care, knowledge about when/how to call provider, parent's feelings as well as delivery, such as skill of nurses in providing education to parent.¹⁷ The post-discharge coping difficulty scale (PDCDS) is an 18-item tool used to measure the degree of parental difficulty in coping with stress, recovery, family self- management, support, confidence, and child's adjustment after hospital discharge.¹⁷ The QDTS and PDCDS were completed at their outpatient HPN follow-up visit, which was typically 1–4 weeks post-discharge. At 30-days post-discharge, families completed an anonymous open-ended single question online survey via REDCap.¹⁸ For 30-days post-discharge, events were collected via review of electronic medical record review, including emergency department (ED) visit, all-cause readmission, central-line-associated bloodstream infection (CLABSI), as well as HPN and non-HPN related events.

We conducted a medical chart review to record parent and child characteristics: parent age, patient age at discharge, gender, gestational age, stoma presence, residual small bowel length, previous hospital-acquired CLABSI, ethnicity, distance between the hospital and home, insurance type, presence of home nursing care, diagnosis, hospital unit, number of HPN teaching sessions, and length of stay (LOS).

Analysis approach

Descriptive statistics were used to compare demographic characteristics between intervention and control groups. Frequencies and percentages were calculated for count variables, medians and interquartile range for continuous variables. To account for a small sample size, we used Fischer's exact test to compare demographic characteristics between the intervention and control groups. Mann-Whitney U-test was used to compare non-normally distributed variables between the two groups.

Univariate logistic and linear regressions were used to analyze relationships between the outcomes of interest (ED visits, readmission, and scores from RHDS, QDTS, and PDCDS) and the demographic characteristics Table 4. Univariate relationships significant at $p < 0.10$ were considered collectively in multivariate models Table 5. The chi-squared test was used to compare the proportion of new HPN patients who experienced readmissions before versus after interventions. All tests of significance were two-sided, and comparisons at $p < 0.05$ were considered statistically significant. Statistical analyses were performed using STATA SE14 (StataCorp. 2015. *Stata Statistical Software: Release 14*. College Station, TX: StataCorp LP).

Results

Figure 2 shows research study enrollment. We enrolled a total of 21 subjects with SBS who were initially discharged on HPN, including 9 subjects in the intervention group. Participant demographics are listed in Table 1. The gestational age at birth was 33 (29–35) weeks. The residual small bowel length was 37 (27–55) cm with 4/21 (19%) having ultra-short bowel syndrome and 9 (43%) having a stoma at discharge. Nine (43%) have a previous hospital-acquired CLABSI. The intervention and control groups were similar in all characteristics, except for the number of teaching sessions.

All families in the intervention group independently performed CVC care and administered HPN overnight. Table 2 shows a comparison of the two groups according to the three discharge surveys. There were no significant differences between the two groups in terms of the RHDS or QDTS. There was a non-statistically different trend towards higher PDCDS score in the intervention group compared to the control group.

Post-discharge events are described in Table 3. Readmission rates were similar in both groups. There were 3 hospitalizations affecting 3 patients in the control group, and 7 hospitalizations affecting 5 patients in the intervention group. Also, there were a similar number of outpatient visits with nearly all patients completing a follow-up visit. All subjects experienced at least 1 complication related to HPN. There were a similar number of ED visits in both groups. In the control group, there were 5 ED visits affecting 4 patients, while in the intervention group there were 8 ED visits affecting 6 patients. There was 1 CLABSI in the intervention group, and none in the control group. All of the subjects regardless of group participation experienced vomiting and diarrhea requiring medical attention. None of the subjects discontinued HPN during the study period.

There was no association observed between any of the three surveys mean scores and odds of ED visit, readmissions, and CLABSI. Each additional week of initial LOS was associated with an 11% increase in the odds of an ED visit (OR 1.11; 95% CI: 1.01, 1.26) and a 16% increase in the odds of readmission (OR 1.16; 95% CI: 1.04, 1.37). Mean RHDS score in whites was 1.16 points lower than in non-whites (95% CI: -2.12, -0.20, $p=0.02$). Compared to patients with necrotizing enterocolitis, mean RHDS score was 2.12 points lower in patients with intestinal atresia (95% CI: -3.52, -0.71, $p=0.007$), 1.87 points lower in patients with Hirschsprung's disease (95% CI: -3.19, -0.38, $p=0.02$), and 3.55 points lower in patients with omphalocele (95% CI: -5.37, -1.73, $p=0.001$). When adjusted for

insurance, differences in mean RHDS score among diagnoses and ethnic groups were not significant.

Figure 2 depicts the program-wide percentage of patients readmitted within 30-days after initial discharge on HPN from October 2012 to June 2017. Following publication of the web-based video series “Caring for a Central Line at Home,” there was a statistically significant decrease in readmissions from 60% to 28% ($p=0.004$). There was a non-significant rise in readmissions following launch of the hands-on intervention compared with the previous period ($p=0.55$).

Discussion

This was a prospective controlled study involving children with short bowel syndrome initially discharged on HPN. As we demonstrated in this study, our program reduced readmissions program-wide by standardizing CVC teaching with the development of a web-based video series, “Caring for a Central line at Home.” We were interested in studying whether an effort to standardize the HPN discharge process might reduce readmissions. In the present study, we found that all 21 patients in our sample experienced at least one adverse event within 30-days of discharge with 47 issues related to HPN.

In this cohort, approximately 30% of patients were readmitted, which is similar to what has been reported in adults.¹² Despite similar stress of caring for a family member with a severe digestive disorder, discharge outcomes might be expected to be worse for children compared to adults. CVC care in children can be particularly challenging due to small physical size and poor patient cooperation.

Children receiving HPN have higher readmission rates than many of the most complex pediatric conditions, such as acute leukemia and organ transplant.¹⁹ By comparison, the average rate of unplanned readmissions for all pediatric admissions is 6.5% at tertiary children’s hospitals in the United States and at our institution.¹⁹ The present pilot study was not powered to impact program-wide readmission rates. Compared with the web-video series, further study is needed to support this standardized HPN discharge process for reducing hospital readmissions.

Parent and staff feedback informed our project design. Upon discharge, families are expected to rapidly develop into expert healthcare providers. The majority of subjects in our study had home nursing in place upon discharge, which can provide a critical support. Families typically are the key caregivers responsible for CVC care, and must maintain highest care standards. We anticipated that the intervention would improve the familiarity of families with using home equipment and supplies. Families are often expected to provide other complex care at home like enteral nutrition care, which can also be burdensome.

Parents in both groups reported a high degree of readiness for discharge, which were similar to what has been reported in bone marrow transplant parents.²⁰ The decision by the primary inpatient service to discharge imminently may heighten a family’s perceptions on their readiness. In this cohort we did not observe a correlation between readiness scores and post-discharge outcomes. The readiness variability among families with differing SBS diagnoses

may reflect differences in discharge needs outside the purview of HPN, including other morbidities of SBS, such as associated congenital anomalies, small bowel bacterial overgrowth, and enteral tubes. Parents in both groups reported high scores for quality of discharge teaching, making it challenging to demonstrate improvement in satisfaction. Families were pleased with both the content and delivery of HPN teaching provided. For this population, there may be a steep learning curve faced when applying skills at home. High-fidelity simulation might better improve competence in CVC care and decrease complications, as has been seen with nurses in oncology and intensive care units.^{21,22}

As the average LOS for this cohort was just over 80 days, there would seem to be ample time for discharge teaching. However, the HPN team is necessarily involved throughout the entire course of the hospitalization. We only collected the number of formal HPN teaching sessions, not the time course of teaching. A notable finding of this study was that there was a 16% increase odds of readmission for each additional week of hospitalization associated with HPN discharge. Prolonged LOS is presumably a surrogate for medical and social complexity that was not apparent with collected variables. Future studies should build models to risk-adjustment for HPN populations. Variation in readiness scores by ethnicity concurs with literature showing racial disparities in outcomes in this population.^{23,24} Future studies should evaluate whether outcome differences are due to implicit bias or other factors.

There were limitations to the present study. Firstly, it is impossible to control completely for variation of clinical care at home. It is difficult to evaluate how teaching parents prior to discharge affects healthcare behaviors of the entire household outside the hospital. For example, home care nurses rarely receive formal instruction at the hospital. In the present study, the vast majority of families received home nursing, but we unfortunately did not collect information on what type of care home nurses was performed. Future studies might evaluate the role home nursing plays in post-discharge outcomes. Another limitation was that our team instituted multiple interventions simultaneously over this three-year study. For example, our team offered all families a pre-discharge briefing based upon work done by the Agency for Healthcare Research and Quality.²⁵ Another limitation to generalizability was that many patients used an investigational lipid emulsion Omegaven (Fresenius Kabi AG, Bad Homburg vdh, Germany). Omegaven requires specific administration techniques as it is dispensed in 100 ml bottles and is not available as a total nutrient admixture, thus requiring the use of an additional infusion pump and a different administration set with a vented spike.²⁶ A final limitation is that it is difficult to control for all non-HPN factors that contribute to post-discharge adverse events like readmission.

A strength of this study was the fairly homogenous study HPN population, including only SBS patients, reducing variability from the other HPN indications such as motility disorders, congenital diarrhea, or graft-versus-host disease. The subjects' residual bowel length also closely matched what has been reported by the Pediatric Intestinal Failure Consortium.²⁷ Another strength was having a well-defined standardized discharge process and single expert HPN team responsible for discharge teaching. We also tracked discharge outcomes in a well-defined fashion. Future studies should study quality benchmarks across HPN programs, including family satisfaction scores and readmissions rates.

Conclusion

In this cohort with pediatric SBS, 30-day post-discharge readmission on HPN was more common than the most complex pediatric conditions despite extensive discharge teaching currently in place. Prolonged hospitalization was associated with higher rates of readmissions and ED visits. With refinement of HPN discharge process interventions, quality benchmarks are needed to compare outcomes across centers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Abbreviation Key

ED	Emergency department
SBS	Short bowel syndrome
CLABSI	Central line-associated bloodstream infection
CVC	Central venous catheter
HPN	Home parenteral nutrition
IV	Intravenous
QDTS	Quality of discharge teaching scale
LOS	Length of stay
PDCDS	Post-discharge coping difficulty scale
RHDS	Readiness for hospital discharge survey

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Clinical Relevancy Statement

Systematically evaluating discharge preparation with pediatric home parenteral nutrition is the first step to reduce preventable complications. The high incidence of adverse events identified in this study was an important finding. Another important finding was that prolonged length of stay was associated with increased risk of readmission and emergency department visits. These findings are clinically relevant for clinicians responsible for training families on HPN and the various stakeholders tackling issues of surrounding healthcare resource utilization for this population.

Horizontal lanes highlight the main participants' role. An oval identifies starting and stopping steps. Diamond shapes indicate decision points, while irregular quadrangle shapes indicate manual processes. Black coloring represents items added during intervention period.

Figure 2. Program-Wide Percentage of Patients Readmitted within 30-Days After Initial Discharge on Home Parenteral Nutrition (all indications)

The gray bar in October 2013 represents first intervention, web-based videos “Caring for a Central Line at Home.” The second gray bar in July 2015 represents in launch of “Equipped for Home (PN).” Dot represents outlier.

Table 1

Demographic characteristics of 21 pediatric home parenteral nutrition patients with short bowel syndrome. Continuous data are reported as Median (Q1, Q3) and categorical data as N (%).

	Control group (N=12)	Intervention group (N=9)	P
Patient age (months)	7.4 (5.7, 8.7)	10.0 (6.1, 15.3)	0.28
Parent age (years)	31.5 (28.5, 37.5)	32 (31.0, 39.0)	1.00
Female sex	5 (42)	4 (44)	0.62
Single parent household	2 (17)	1 (11)	1.00
Caregivers' type of residence			0.16
<i>Single family or shared</i>	11 (92)	6 (67)	
<i>Shelter or other</i>	0	2 (22)	
Non-white ethnicity	4 (33)	5 (56)	0.40
Distance from hospital (miles)	88.5 (27.1, 182.2)	9.3 (4.6, 227.9)	0.39
Home nursing in place	5 (42)	6 (67)	0.27
Public insurance status	9 (75)	6 (67)	1.00
Diagnosis *			0.71
<i>Necrotizing enterocolitis</i>	3 (25)	5 (56)	
<i>Gastroschisis</i>	0	1 (11)	
<i>Intestinal atresia</i>	1 (8)	3 (33)	
<i>Hirschsprung's disease</i>	2 (17)	2 (22)	
<i>Malrotation or midgut volvulus</i>	3 (25)	4 (44)	
<i>Omphalocele</i>	1 (8)	1 (11)	
<i>Liver failure</i>	1 (8)	0	
<i>Feeding tube placement complication</i>	1 (8)	0	
<i>MMIHS</i>	0	1 (11)	
<i>Intestinal resection for kidney tumor</i>	0	1 (11)	
Central line type			0.43
<i>PICC</i>	0	1 (11)	
<i>Broviac/Hickman</i>	12 (100)	8 (89)	
Number of teaching sessions	6 (4.5, 7)	5 (4,5)	0.03
Length of stay (days)	89.5 (39.5, 135.5)	92 (67.0, 205.0)	1.00

* Subjects may have >1 diagnosis

MMIHS, Megacystis microcolon intestinal hypoperistalsis syndrome

Table 2

Mean (standard deviation) discharge survey results in 21 new home parenteral nutrition patients with pediatric short bowel syndrome.

	Control	Intervention	P- value
Readiness for hospital discharge survey (0–10)	8.0 (1.20)	8.1 (1.04)	0.83
Quality of discharge teaching scale (0–10)	8.2 (1.04)	7.9 (1.14)	0.59
Post-discharge coping difficulty scale (0–10)	2.9 (1.76)	3.7 (1.60)	0.35

Table 3

Thirty-day post-discharge events occurring in 21 new home parenteral nutrition patients with pediatric short bowel syndrome. Categorical data are reported as median (Q1, Q3) per family or N (%) of patients.

Event type	Control Group (N=12)	Intervention Group (N=9)	P-value
Number of telephone communications	1 (1,5)	3 (1,5)	0.67
Utilization of healthcare resources			
<i>Number of HPN ambulatory visits *</i>	21 (100)	19 (100)	0.19
<i>1 Emergency department visits</i>	4 (33)	6 (67)	0.40
<i>1 Hospitalization</i>	3 (25)	5 (55)	0.17
Absolute number of complications			
<i>Fever</i>	2 (17)	1 (11)	1.00
<i>Central line associated bloodstream infection</i>	1 (8)	0	1.00
<i>Catheter breakage</i>	0	3 (22)	0.17
<i>Other medical issue related to HPN</i>	23 (100)	24 (100)	0.13
<i>Vomiting and/or diarrhea</i>	0	1 (11)	0.43
<i>Other medical issue unrelated to HPN</i>	3 (25)	5 (44)	0.47

* Scheduled and urgent appointments

HPN, home parenteral nutrition

Table 4

Univariate analysis of outcomes and caregiver survey scores in 21 new home parenteral nutrition patients with pediatric short bowel syndrome.

Outcome	Odds Ratio, 95% CI	P-value
Emergency department visit		
<i>Age</i>	0.47 (0.09, 1.50)	0.19
<i>Unit</i>	0.90 (0.15, 5.12)	1.00
<i>Sex (Female)</i>	3.72 (0.48, 37.15)	0.28
<i>Ethnicity (Whites vs. non-Whites)</i>	0.27 (0.03, 2.10)	0.28
<i>Distance (Miles)</i>	0.99 (0.99, 1.00)	0.71
<i>Home nursing (Yes or No)</i>	1.18 (0.01, 109.70)	1.00
<i>Insurance (Public vs. Private)</i>	6.81 (0.56, 393.20)	0.19
<i>Diagnosis (Necrotizing enterocolitis)</i>	0.90 (0.66, 1.20)	0.51
<i>Number of teaching sessions</i>	1.74 (0.92, 3.95)	0.10
<i>Length of stay (Weeks)</i>	1.11 (1.01, 1.26)	0.02
Hospitalization		
<i>Age</i>	0.56 (0.11, 1.78)	0.28
<i>Unit</i>	0.57(0.08, 3.37)	0.74
<i>Sex (Female)</i>	1.56 (0.19, 13.28)	0.94
<i>Ethnicity (Whites vs. non-Whites)</i>	0.64 (0.08, 5.23)	0.94
<i>Distance (Miles)</i>	0.99 (0.98, 1.00)	0.37
<i>Home nursing (Yes or No)</i>	2.31 (0.16, +inf)	0.54
<i>Insurance (Public vs. Private)</i>	4.1 (0.33, 235.94)	0.44
<i>Diagnosis (Necrotizing enterocolitis)</i>	0.96 (0.70, 1.29)	0.84
<i>Number of teaching sessions</i>	1.65 (0.88, 3.57)	0.13
<i>Length of stay (Weeks)</i>	1.16 (1.04, 1.37)	0.003
	Coefficient, 95% CI	P-value
Readiness for hospital discharge survey		
<i>Age</i>	−0.32 (−0.92, 0.27)	0.27
<i>Unit</i>	−0.35 (−1.31, 0.61)	0.45
<i>Sex (Female)</i>	0.31 (−0.81, 1.44)	0.56
<i>Ethnicity (Whites vs. non-Whites)</i>	−1.16 (−2.12, −0.20)	0.02
<i>Distance (Miles)</i>	−0.0005 (−0.002, 0.0006)	0.34
<i>Home nursing (Yes or No)</i>	−0.07 (−1.80, 1.66)	0.93
<i>Insurance (Public vs. Private)</i>	1.02 (−0.06, 2.09)	0.06
<i>Diagnosis (Necrotizing enterocolitis)</i>	−0.17 (−0.33, −0.009)	0.04
<i>Number of teaching sessions</i>	0.08 (−0.25, 0.40)	0.61
<i>Length of stay (Days)</i>	0.0007 (−0.005, 0.007)	0.80
Quality of discharge teaching scale		
<i>Age</i>	0.35 (−0.21, 0.91)	0.20

Outcome	Odds Ratio, 95% CI	P-value
<i>Unit</i>	−0.04 (−0.92, 0.84)	0.92
<i>Sex (Female)</i>	−0.66 (−1.65, 0.33)	0.18
<i>Ethnicity (Whites vs. non-Whites)</i>	0.30 (−0.74, 1.33)	0.56
<i>Distance (Miles)</i>	0.0009 (−0.0001, 0.002)	0.07
<i>Home nursing (Yes or No)</i>	−1.13 (−3.05, 0.79)	0.22
<i>Insurance (Public vs. Private)</i>	0.09 (−1.03, 1.21)	0.87
<i>Diagnosis (Necrotizing enterocolitis)</i>	−0.07 (−0.24, 0.10)	0.39
<i>Number of teaching sessions</i>	0.14 (−0.18, 0.46)	0.37
<i>Length of stay (Weeks)</i>	−0.003 (−0.009, 0.002)	0.20
Post-discharge coping difficulty scale		
<i>Age</i>	−0.30 (−1.22, 0.62)	0.50
<i>Unit</i>	−0.09 (−1.50, 1.31)	0.89
<i>Sex (Female)</i>	1.46 (−0.05, 2.97)	0.06
<i>Ethnicity (Whites vs. non-Whites)</i>	0.21 (−1.46, 1.88)	0.80
<i>Distance (Miles)</i>	−0.001 (−0.002, 0.001)	0.36
<i>Home nursing (Yes or No)</i>	0.15 (−2.05, 2.34)	0.88
<i>Insurance (Public vs. Private)</i>	−0.19 (−1.98, 1.59)	0.82
<i>Diagnosis (Necrotizing enterocolitis)</i>	−0.06 (−0.33, 0.22)	0.66
<i>Number of teaching sessions</i>	0.03 (−0.56, 0.50)	0.91
<i>Length of stay (Weeks)</i>	0.005 (−0.004, 0.01)	0.25

Table 5

Multivariate analysis of readiness for hospital discharge survey in 21 new home parenteral nutrition patients with pediatric short bowel syndrome.

Outcome	Coefficient (95% CI)	P-value
Readiness for hospital discharge survey		
<i>Ethnicity (Whites vs. non-Whites)</i>	−0.83 (−2.02, 0.36)	0.16
<i>Diagnosis (Necrotizing enterocolitis)</i>	−0.09 (−0.28, 0.10)	0.32
Readiness for hospital discharge survey*		
<i>Gastroschisis</i>	−0.66 (−2.48, 1.16)	0.44
<i>Intestinal atresia</i>	−2.12 (−3.52, −0.71)	0.007
<i>Hirschsprung's disease</i>	−1.78 (−3.19, −0.38)	0.02
<i>Malrotation or midgut volvulus</i>	−0.95 (−2.19, 0.29)	0.12
<i>Omphalocele</i>	−3.55 (−5.37, −1.73)	0.001
<i>Other</i>	−1.50 (−2.59, −0.41)	0.01

* Necrotizing enterocolitis reference group