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Utilization of a Standardized Discharge Checklist to Improve the Transition of Care for Patients Receiving Parenteral Nutrition

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Abstract

Background: Guidelines recommend using discharge checklists to discharge patients receiving parenteral nutrition (PN). Transition-of-care (TOC) tools have not been extensively studied in the PN population. The purpose of this study is to evaluate the impact of a standardized PN discharge checklist on TOC for PN patients. *Methods:* This is an Institutional Review Board–approved, retrospective quasi-experimental study of patients discharged receiving PN between January 1, 2014, and May 31, 2018. The primary end point was the completion of a PN discharge bundle (identification of a responsible provider to monitor PN after discharge, meeting daily caloric requirement of 20–35 kcal/kg/d, cycling PN prior to discharge). Secondary end points included documentation of PN discharge checklist components, hospital length of stay, frequency of 30-day hospital encounters, cause of hospital encounters, and time to readmission. *Results:* Fifty encounters were included in the pregroup and postgroup each ($n = 100$). There was a significant increase in completion of the TOC bundle in the postgroup (54% vs 76%, $P = .035$), driven by identification of a responsible provider for outpatient PN management (54% vs 82%, $P = .005$). Other PN discharge checklist components impacted included the following: case manager had the PN prescription for home infusion (50% vs 80%, $P = .003$), assessment for home glucometer (40% vs 90%, $P < .001$), and PN plan-of-care note documentation at discharge (18% vs 82%, $P < .001$). *Conclusions:* A standardized PN discharge checklist improved completion of discharge bundle. (*Nutr Clin Pract.* 2020;00:1–7)

Keywords

checklist; home parenteral nutrition; hospital readmission; length of stay; parenteral nutrition; patient discharge

Introduction

Transition of care (TOC) is the movement of a patient from one care setting to another.[1] Inadequate communication and insufficient care coordination during transitions can have negative effects on patient outcomes. Previous studies reviewing Medicare claims data show high readmission rates in discharged patients with a lack of outpatient follow-up in 50.2% of those readmitted within 30 days.[2] Several interventional studies in elderly and complex patients showed that targeting the discharge process and creating tools for improved TOC could lower readmission rates with potential cost savings.[3–8] The National Transitions of Care Coalition (NTOCC) provides guidance on key elements for measuring TOC. These include structure, processes, and outcomes.[9] Structure involves having an accountable provider or team at all points of transition, creating a proactive tool for plan of care, and utilizing health information technology to make TOC information available to patients and providers. Processes involve establishing a TOC workflow (eg, medication reconciliation, discharge planning, follow-up appointment tracking), timely transfer of accurate information between providers and care settings, and patient/family education and engagement. Outcomes describe potential quantitative and qualitative measures.

Discharging patients receiving parenteral nutrition (PN) from the inpatient setting can be a challenging process. A single study in the PN population reported that 31.6% of patients were readmitted within 30 days with 21.1% of readmissions related to a PN complication.[10] Recommendations published in the *Journal of Parenteral and Enteral Nutrition* suggest a multidisciplinary approach and the use

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Table 1. Standardized Discharge Checklist for PN Patients.

Checklist item	Description
Is the patient likely to require outpatient PN therapy?	Patient must have a documented disease state which requires PN (per Medicare guidelines).
Does patient meet test of permanence?	EMR documentation that patient requires at least 3 months of PN.
Has long term access been obtained?	Central line access is required for PN to be administered both in the hospital and at home. Access must be confirmed by imaging.
Is the case manager aware and have they been provided with a written PN prescription?	NSS gives case manager a written PN prescription. Case manager assesses insurance eligibility and patient/caregiver capability of performing PN home infusion.
Has the regimen and monitoring plan been optimized and PN cycled for home?	NSS assesses labs and nutrition requirements daily to optimize PN and advance to goal. Patient should meet daily requirement of 20–35 kcals/kg and be cycled prior to discharge.
Is there a plan in place for patient/caregiver education on their discharge home PN?	Plan must be in place for when and where patient/caregiver will be educated.
Does patient have a working glucometer, if necessary?	NSS notifies case management if patient needs a prescription for a new glucometer and testing supplies.
Has a responsible provider been identified and agreed to monitor the home PN?	The responsible provider must agree to monitor the PN after discharge. If the inpatient provider ordering the PN does not agree to this responsibility, he/she must find a provider willing to do so outpatient.
Was a NSS PN plan of care note documented in the medical record?	NSS places a PN discharge note that includes a final assessment and plan for the patient's PN. The note is placed prior to discharge.

PN; parenteral nutrition, EMR; electronic medical record, NSS; nutritional support services.

of a standardized discharge checklist.[11] This PN discharge checklist should include steps the care team can address early in the discharge process. Prior to discharge, providers should ensure patients are receiving PN regimens at goal caloric intake without adverse effects. Additionally, their PN should be cycled to transition from 24-hour continuous infusions to shorter durations with increased infusion rates that are more feasible in the outpatient setting. Many patients leaving receiving PN are new to such therapy.[12] These patients require additional scrutiny to ensure PN insurance coverage, establish PN follow-up with an outpatient provider, and coordinate home infusion services, including management of PN prescriptions, labs, and medication delivery. It is crucial for inpatient provider teams to have a systematic approach for discharge and plan-of-care documentation. However, there is a lack of evidence studying TOC specifically targeting the PN discharge process.

At our institution, the management of inpatient adult PN orders is delegated to nutrition support services (NSS), a multidisciplinary team within the inpatient pharmacy department composed of pharmacists and nurses. Healthcare team members involved in the PN discharge process include the physician ordering PN, NSS, and case managers. Historically, challenges in the PN discharge process at our institution included optimizing PN with a caloric requirement of 20–35 kcal/kg/d, ensuring PN is cycled in advance of the discharge date, and determining a provider for outpatient PN management prior to discharge.

To improve the TOC process for PN patients, the NSS team developed a standardized PN discharge checklist. In May 2017, the PN discharge checklist (Table 1) was developed using recommendations available in literature and internal opportunities identified to improve TOC for these patients.[11] This tool is utilized by the NSS team in their daily workflow and integrated into their discharge plan-of-care note. This note is available in the patient's electronic medical record (EMR) for all clinicians to view. The purpose of this study is to evaluate the impact of a standardized PN discharge checklist on TOC for PN patients.

Methods

Overview/Setting

This was a retrospective, cohort study comparing the discharge process and outcomes of patients discharged receiving PN before and after implementation of the standardized PN discharge checklist. The study was conducted after Institutional Review Board approval at an 800+-bed, tertiary care, level 1 trauma center.

Patient Population

Patient encounters were electronically identified if patients had an active inpatient order for PN within 24 hours of discharge between January 1, 2014, and May 31, 2018. The pregroup included encounters with discharge dates until

April 30, 2017, and the postgroup included encounters with discharge dates starting July 1, 2017. Encounters were included if the patient was at least 18 years of age and discharged receiving PN. Encounters were excluded if they were transferred to another acute care hospital or discharged against medical advice. Patient encounters were screened until study power was met.

Primary/Secondary End Points

The primary end point of this study was completion of a PN discharge bundle. This bundle consisted of identification of a responsible provider to manage PN after discharge, optimization of PN with a caloric requirement of 20–35 kcal/kg/d, and cycling of the PN prior to discharge. The secondary end points included documentation of all checklist components, frequency of hospital revisits and/or readmission within 30 days after discharge, cause of hospital revisit and/or readmission, and time to revisit and/or readmission.

Analysis

Data collected from the EMR included patient demographics, reason for initial hospitalization, reason for PN, PN order information, documentation of PN discharge checklist components, time to revisit/readmission, and reason for revisit/readmission if applicable. A 30-day event was defined as a return to the emergency department (ED) or an ED visit resulting in hospital readmission. A sample size of 42 encounters in each group was determined a priori with 80% power to show a 50% improvement in the primary end point. This power calculation was based on previous studies on TOC interventions and a preanalysis of the study population.[1] A P-value $<.05$ was considered statistically significant. The χ^2 tests were used for categorical data and Mann-Whitney U tests for continuous data. SPSS version 22 was used for statistical data analyses.

Results

Study Population

A total of 753 encounters had an active inpatient PN order 24 hours prior to discharge. After screening for inclusion and exclusion criteria, 50 encounters were included in the pregroup and postgroup each to meet study power (Figure 1). The pregroup encounters that met inclusion criteria occurred between December 2016 and April 2017, which represented 35 patients with multiple encounters. The postgroup encounters occurred between July and September 2017, representing 41 patients that had multiple encounters.

Baseline characteristics based on the initial encounter were similar; however, there was a significant difference in body mass index (Table 2). The PN indications had no significant differences between the pregroup and postgroup (Table 3). The most common indications for PN were enterocutaneous fistulas and short-bowel syndrome. There were 29 (58%) pregroup encounters and 22 (44%) postgroup encounters reviewed that were patients already receiving home PN prior to the hospital admission. There were no significant differences in non-PN causes of the hospital admission with 46 due to non–PN–related causes in the pregroup and 44 in the postgroup (Table 4). Many of the patients had admissions related to gastrointestinal complications, pain, and infection/wound. For those admitted for a PN-related cause, line infections were the most common causes of initial admission in both the pregroup and postgroup. There was no significant difference in discharge disposition between the 2 groups, with 62% in the pregroup and 54% in the postgroup discharging home, 10% and 20% discharging to a long-term acute care facility (LTAC), 8% and 0% discharging to a nursing home, and 20% and 34% discharging to subacute rehabilitation (SAR).

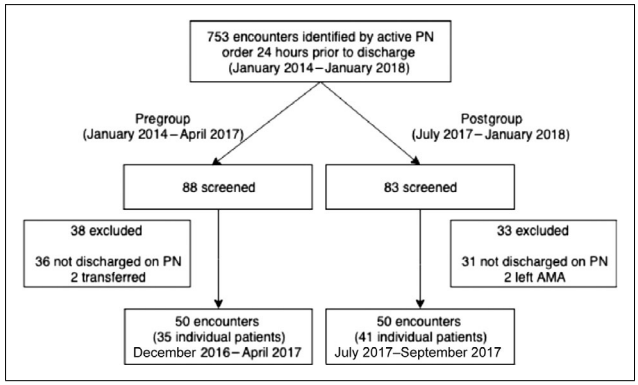

Figure 1. Encounter selection. AMA, against medical advice; PN, parenteral nutrition.

Outcomes

There was a statistically significant increase in completion of the TOC bundle after implementation of the PN discharge checklist (54% vs 76%, $P = .035$). Of the 3 components of the TOC bundle, there was no significant difference in cycling of PN or meeting the caloric goal prior to discharge (Figure 2). However, there was a statistically significant increase in identifying a responsible outpatient physician for outpatient PN management from 54% to 82% ($P = .005$).

Other PN discharge checklist components with statistically significant changes included whether the case manager was aware and had the final PN prescription for home infusion (50% vs 80%, $P = .003$), patient's need for a working glucometer was assessed (40% vs 90%, $P < .001$), and the PN discharge checklist was documented in the plan-of-care note (18% vs 82%, $P < .001$) (Table 5).

Table 2. Baseline Characteristics per Patient.

Variable	Pregroup (N = 35)	Postgroup (N = 41)	
Age, y	60.0 ± 24.0	63.0 ± 24.0	NS
Female sex, N (%)	30 (86%)	27 (66%)	NS
Body mass index, kg/m^2	25.0 ± 10.2	23.2 ± 6.7	0.027
Actual body weight, kg	65.4 ± 33.2	62.5 ± 20.6	NS
Ideal body weight, kg	54.0 ± 11.3	54.5 ± 13.7	NS
Serum albumin level, g/dL	2.8 ± 0.8	2.7 ± 0.8	NS
Prealbumin level, mg/dL	11.0 ± 20.0	6.0 ± 16.5	NS
Insurance, N (%)			
Public	19 (54.3%)	26 (63.4%)	NS
Private	16 (45.7%)	14 (34.1%)	NS
None	0 (0%)	1 (2.4%)	NS
Diabetes, N (%)	7 (20%)	13 (31.7%)	NS
Hepatic, N (%)	2 (5.7%)	1 (2.4%)	NS
Renal, N (%)			
No dialysis	4 (11.4%)	3 (7.3%)	NS
Intermittent hemodialysis	1 (2.9%)	3 (7.3%)	NS
Peritoneal dialysis	0 (0%)	1 (2.4%)	NS
Cardiac, N (%)			
Heart failure	2 (5.7%)	5 (12.2%)	NS
History of MI	3 (8.6%)	5 (12.2%)	NS
Other cardiac	6 (17.1%)	13 (31.7%)	NS
Pulmonary, N (%)	12 (34.3%)	9 (22%)	NS
Neurologic, N (%)			
Stroke	1 (2.9%)	4 (9.8%)	NS
Other	1 (2.9%)	4 (9.8%)	NS
VTE, N (%)	7 (20%)	13 (31.7%)	0.026
Transplant, N (%)			NS
Pancreas transplant	1 (2.9%)	2 (4.9%)	NS
Intestinal transplant	1 (2.9%)	3 (7.3%)	NS
Lung transplant	0	1 (2.4%)	NS
Kidney transplant	0	1 (2.4%)	NS
Liver transplant	0	1 (2.4%)	NS

MI, myocardial infarction; NS, not significant; VTE, venous thromboembolism.

In the 30 days following discharge receiving PN, there was no statistically significant difference in 30-day events (62% vs 48%, $P = .159$). There were 10 ED revisits and 21 hospital readmissions in the pregroup and 8 ED revisits and 16 hospital readmissions in the postgroup. The time to 30-day event was similar between the 2 groups (11 days ± 13 vs 10 days ± 10). The causes of 30-day events were primarily non–PN–related causes. Only 4 of 31 events in the pregroup and 5 of 24 events in the postgroup were associated with PN causes. The most common PN-related complication leading to an event was line infection. The most common non-PN causes were gastrointestinal, infection/wound, and pain related.

Discussion

The use of a standardized PN discharge checklist improved completion of the PN discharge bundle in this study. The

Table 3. Indications for Parenteral Nutrition per Encounter.

Indication	Pregroup ($n = 50$)	Postgroup ($n = 50$)
Enterocutaneous fistula	19	10
Short-bowel syndrome	9	12
Obstructive carcinomatosis	6	4
Significantly malnourished and severe fat malabsorption	5	1
Bowel rest for at least 3 months and is receiving 20–35 kcal/kg/d	0	5
Massive small-bowel resection	0	1
Complete mechanical small-bowel obstruction in which surgery is not an option	2	2
Significantly malnourished and has severe motility disturbance	1	3
Documented 10% weight loss over 3 months or less, serum albumin level ≤3.4, and a clinical that has not responded to standard medical management	0	1
Small-bowel transplant rejection	1	4
Severe graft vs host disease	2	0
Other	5	12

Patients may have had multiple parenteral nutrition indications.

Table 4. Causes of Admission per Encounter.

Variable	Pregroup ($N = 50$)	Postgroup ($N = 50$)
PN-related	7	9
Line infection	6	7
Malnutrition	1	2
Non–PN-related	46	44
GI		
Fistula	10	7
Small-bowel obstruction	6	6
Inflammatory bowel disease	3	2
**Short-bowel syndrome	0	6
Pancreatitis	0	1
Trauma-related loss of enteral nutrition	1	3
Other GI	9	9
Renal	0	1
Cardiac	2	0
Pulmonary	2	1
Neurologic	0	1
Endocrine	0	1
Infection/wound	9	13
Transplant	3	2
Depression/psychological	2	0
Pain	17	11
Cancer	6	6

Patients may have had multiple causes of admission.
GI, gastrointestinal; PN, parenteral nutrition.
** $P < .05$.

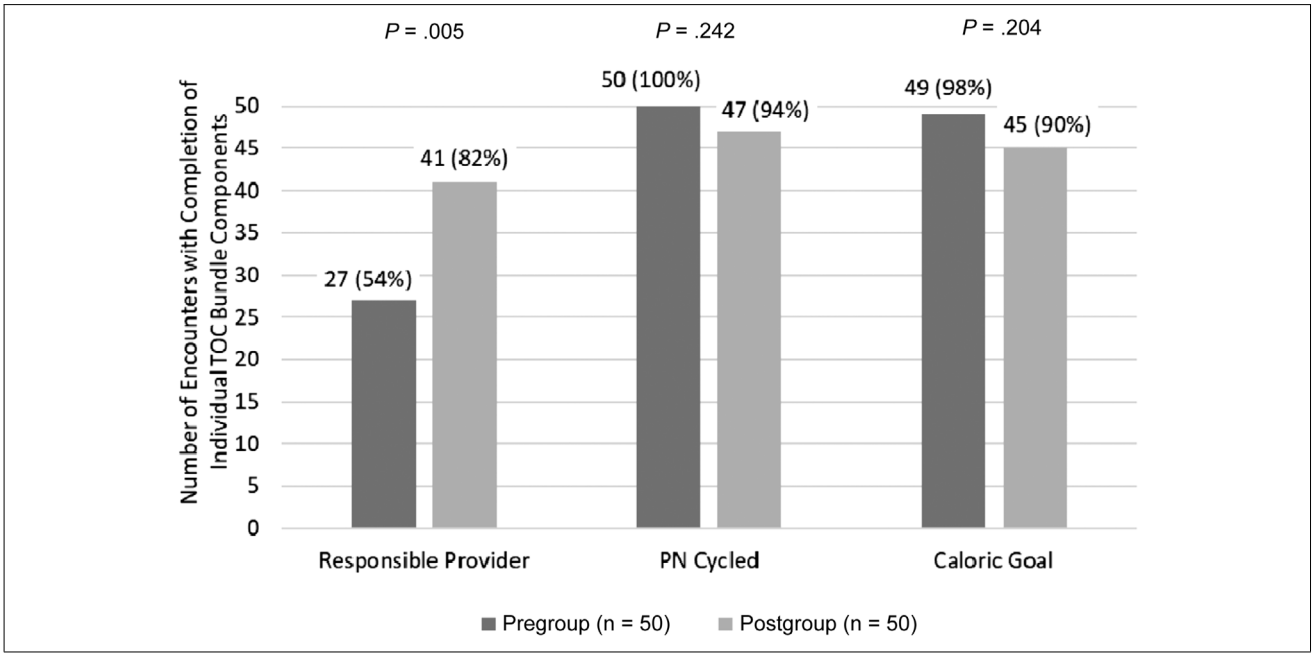

Figure 2. Encounters with completion of individual transition-of-care (TOC) bundle components. PN, parenteral nutrition.

Table 5. Documentation of PN Discharge Checklist Components.

Checklist component	Pregroup ($n = 50$), N (%)	Postgroup ($n = 50$), N (%)	*P*-value
Is the patient likely to require outpatient PN therapy?	42 (84%)	48 (96%)	NS
Does patient meet test of permanence?	40 (80%)	42 (84%)	NS
Has long-term access been obtained?	49 (98%)	50 (100%)	NS
Is the case manager aware and have they been provided with a written PN prescription?	25 (50%)	40 (80%)	.003
Is there a plan in place for patient/caregiver education on their discharge PN?	11 (22%)	6 (12%)	NS
Assessed if patient has a working glucometer, if necessary?	20 (40%)	45 (90%)	<.001
Was an NSS PN plan-of-care note documented in the medical record?	9 (18%)	41 (82%)	<.001

NS, not significant; NSS, nutrition support service; PN, parenteral nutrition.

3 components in this PN discharge bundle were elements recommended as a standard of care for all patients being discharged receiving PN.[11] Although all checklist items are significant, these 3 components were selected because they are directly managed by NSS, recommended by PN discharge guidelines, and serve as essential PN therapy and TOC benchmarks before discharge. A previous study of Medicare patients showed that about one-half of those readmitted within 30 days had no follow-up provider interaction in the interim.[2] PN cycling prior to discharge improves the quality of life of patients receiving home PN and ensures that patients are metabolically stable prior to discharge.[11,13,14] The completion of this PN discharge bundle was primarily driven by an increase in identification of a provider to manage PN after discharge between the pregroup and postgroup. Use of a standardized PN discharge checklist in this study confirms that identification of a provider to manage PN therapy after discharge is a key component in discharge planning.

Increased documentation of the PN discharge checklist components in this study suggests an improved evaluation of TOC needs for PN patients. The PN discharge checklist improved the practice of delivering the final PN prescription to the discharging team as determined by documentation in the EMR plan-of-care note. A workflow for timely transfer of information to prevent errors or delays in discharge is a key element to TOC process measures.[9,11]

Documentation of the final patient evaluation and discharge recommendations also improved by 64%. Prior to the discharge plan-of-care note, documentation for the

discharge PN information (eg, PN formula, outpatient PN physician, etc) was not a standard expectation. PN information should be easily retrievable in the EMR to providers and for outpatient insurance requirements. The latter is a common barrier, especially for patients with Medicare, which mandates specific documentation requirements of an appropriate indication with objective testing for outpatient PN (eg, reason for long-term PN, objective laboratory values).[15] Previous studies have reported that 42% of records reviewed after discharge for Medicare PN coverage did not include required documentation for reimbursement.[16] NSS designed the PN discharge checklist to reflect common discharge barriers at Henry Ford Hospital (HFH). Other institutions should design discharge PN checklists to reflect discharge criteria that are difficult to complete at their institution. Nevertheless, there are ongoing challenges standardizing TOC processes when institutions are faced with variations of insurance policies with fluctuating coverage criteria. Future exploration of patient insurance demographics, causes of authorization delays, and healthcare-associated costs incurred because of inefficiencies may be valuable to refining our discharge checklist.

Although this study was not powered to adequately assess hospital revisits, there were few initial admissions and 30-day events after discharge related to PN complications, with line infections being the most common cause. The overall PN-related complication rate of 16.2% in this study was lower than in other studies in which PN complications were related to 21.1% of readmissions within the long-term PN population with catheter related blood stream infection (CRBSI) and dehydration being the most common causes.[10] There was also an increase in discharge disposition to an LTAC, SAR, or nursing in the pregroup (38%) compared with the postgroup (46%). This may have impacted the decrease in PN education documentation from 22% in the pregroup to 12% in the postgroup because patient education is not usually completed if medications will be managed by the facility. The documentation of PN education rates were higher in the encounters discharged home with 35% ($n = 31$) and 19% ($n = 25$) in the postgroup. Another explanation for such low rates of PN education documentation at discharge may be that the standardized EMR discharge note does not have an entry for documenting completion of or a plan for discharge education. Nevertheless, reassessing the PN education workflow at our institution is a potential area for further investigation and improvement.

The results of this study must be taken into context with its potential limitations. The retrospective nature of this study relies on documentation in the EMR. Additional limitations include lack of randomization, difficulty in controlling for confounding variables, and regression to the mean. This study included patients who were already receiving PN prior to admission and those who recently started to receive PN, which is an important difference to note in baseline characteristics for the patient population. Additionally, our bundle that we studied may not represent the entire impact of the checklist but only components we felt were necessary for our institution.

Institutions should assess their discharge processes for PN patients to identify opportunities that may be improved with a PN discharge checklist. Key elements have been identified in this study and by previous ASPEN literature that can apply at any institution discharging patients receiving PN.[11] This standardized checklist incorporated American Society for Parenteral and Enteral Nutrition (ASPEN) recommendations and hospital-specific elements that are necessary for effective coordination for discharge. By documenting these TOC elements in the EMR, the multidisciplinary team could view the team's progress in preparing the patient for a successful discharge. Because the PN discharge checklist elements are not unique to our patients, other institutions could use this PN discharge checklist to prepare their PN patients for discharge as well, or they could use our checklist to ensure there is a member of the multidisciplinary team accountable for each key element necessary for discharge. This process can continue to be optimized by incorporation of the checklist into the EMR. This would allow any clinician to view outstanding TOC elements needed for discharge.

Conclusion

This study provides evidence for the use of a standardized PN discharge checklist to improve TOC of PN patients. It also provides a list of comprehensive TOC elements necessary for patients discharged receiving PN. Future studies should further evaluate the impact of a PN discharge checklist and other TOC efforts such as optimizing PN education workflows on patient outcomes and potential cost savings.

Statement of Authorship

J. Doh, L. Hencken, L. Mlynarek, and N. MacDonald equally contributed to the conception and design of the research; J. Doh, L. Hencken, L. Mlynarek, and N MacDonald contributed to the design of the research; J. Doh contributed to the acquisition and analysis of the data; L. Hencken, L. Mlynarek, and N. MacDonald contributed to the interpretation of the data; and J. Doh drafted the article. All authors critically revised the article, agree to be fully accountable for ensuring the integrity and accuracy of the work, and read and approved the final article.

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