1. Project Leads

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2. Why are you interested in participating in the Improvement Scholars Program?

We direct the UNC Hospital Adult Nutrition Support Team. Our 8-person multidisciplinary team manages all adult parenteral nutrition (PN) in the hospital. The goal of this project is to align PN use at UNC with other leading institutions and published society best practice documents. Participating in this program will allow us to systematically implement improvements in our hospital's PN practice which will directly improve care for patients, reduce costs, and fill a gap in physician trainees PN education.

3. Which UNC Health improvement priority will your project address?

Our proposed project will address the following UNC Health improvement priorities:

1) Prevent patient harm
2) Promote a positive patient experience
3) Create a safer transition of care home
4) Reduce hospital length of stay

4. What is the problem or gap in quality you seek to improve?

Nutrition support is a risk prone, lifesaving, and life preserving therapy for our most vulnerable patients.[1] PN provides nutrients intravenously and includes a combination of water, fats, dextrose, amino acids, electrolytes, vitamins, and trace minerals. PN is a life-sustaining option when intestinal failure prevents adequate oral or enteral nutrition. Considered a high-risk medication by the Institute for Safe Medication Practices, PN is a resource-heavy form of nutrition support with significant risk of morbidity and mortality if used incorrectly.[2] We propose to address the following critical gaps in the PN use process at UNC Chapel Hill:

Aim 1 – To **reduce** inappropriate initiation of PN. Our Nutrition Support Team has near complete autonomy in decisions related to PN order management including modifications to the PN prescription. However, the decision to start or not start PN is ultimately up to a patient's primary service. Appropriate indications for PN are well-described in published nutrition society (ASPEN) guidelines and consensus documents.[3-5] Appropriate use of PN has benefits, while inappropriate use introduces the potential for risks including death. Any clinical provider can order PN at UNC Hospital and PN is sometimes inappropriately ordered, used, and/or wasted.

Aim 2 – To **improve timing of PN initiation** in patients who have a clinical indication that is consistent with current guidelines to align with best practices. Appropriate timing for PN is well-described in published nutrition society (ASPEN) guidelines and consensus documents.[3-5] Among patients with an appropriate indication for PN, the timing of initiation is sometimes delayed due to a number of factors including delays in central venous access placement, failure of the primary team to recognize indications for PN, and failure to appreciate a patient's nutrition status and/or absorptive capacity. Conversely, some patients are initiated earlier than recommend by published guidelines. Both delays and pre-emptive initiation of PN is associated with worse patient outcomes compared to appropriate PN timing, including increased resource utilization, cost, and risk (e.g. central access placement, infection).

Aim 3 – To **implement a PN safety assessment and education** for those patients who will continue PN in the home setting. Infusing PN in the home setting is complicated and associated with significant risks if patients are not adequately trained and competent in IV catheter care, PN administration and elements, and the identification and management of complications, (e.g. volume overload, electrolyte abnormalities). Safe care transitions for patients receiving PN are well described.[6]

5. Describe the patient population affected, scope, and impact of the problem

a. **What is the specific patient population your project will impact?**
Aim 1 and 2, adult inpatients at UNC who are started on PN including patients on home PN who are admitted and continued on PN. Aim 3, adult inpatients at UNC who discharge home on PN.

b. **How many patients are in the population?**
There are 10-20 new PN starts every week at UNC and 20-25 adult patients on PN every day.

c. **How frequently does the problem occur?**
Aim 1, PN is inappropriately started in a patient every 1-2 weeks. These inappropriate initiations can lead to weeks of continuation of inappropriate therapy, not just a single dose/instance. Aim 2, PN initiation is delayed or too early in 1-2 patients per week. Aim 3, there is currently no formal PN safety assessment performed or education done before discharge by a member of our inpatient team.

d. **What is the impact of the problem?**
Inappropriate use of PN contributes to increased length of stay which translates into increased costs to the patient and the hospital by increased risk of morbidity (a central line and the associated complications, volume overload, electrolyte abnormalities, iatrogenic risks that come from an admission prolonged by PN use). Inappropriate use of PN is costly to the hospital system from resource utilization (clinician expertise of the PN team, pharmacy compounding, and medication (PN) cost). Delayed PN admission is associated with risks (infection, delayed wound healing, and prolonged admission).[7] Finally, UNC is an academic center with thousands of trainees who should understand appropriate use and timing for PN.

6. What do you think are the underlying causes of the problem? Why do you think the problem is happening?

Aim 1 – Inappropriate initiation of PN is most often the result of a provider's knowledge gap regarding appropriate PN use or misconceived convenience/ease in obtaining a central line over a feeding (nasoenteric) tube. Other times providers will start PN "because the patient already had a line anyways. We can just use it". Inappropriate use is sometimes the result of delays in

securing enteral access (i.e. nasogastric tube or gastrostomy tube) or less often because the patient doesn't want enteral access or the provider is worried the patient will remove or has removed enteral access.[8]

UNC Hospital Case Examples:
An internal medicine team tried to start PN in a patient multiple times over a single admission despite being told by our team that she was not PN appropriate. In response, the internal medicine team asked the GI consult team for permission to start PN. PN was never started.

An ICU team tried to (re)start PN in a critically ill patient with bacteremia. PN in the setting of bacteremia is never appropriate.

A surgical team tried to start PN on an ICU patient two days in a row for a patient who our team (Nutrition Support) and the ICU team deemed appropriate for enteral nutrition. The primary surgical team wanted PN because the patient did not have enteral access distal to the surgical site. The GI luminal consult team was able to place an NJ tube endoscopically and the patient was started and advanced on tube feeds with success. PN was never started.

Aim 2 – Inappropriate timing (too soon or too late) of PN initiation for patients who meet criteria for PN is caused by one or a combination of the following: 1) ordering provider knowledge gap of appropriate timing of PN initiation, 2) antiquated perspective/ fear around PN use, 3) delay in central venous access placement, or 4) prolonged inadequate oral or enteral nutrition with poor documentation of nutrition status before admission or during the hospital course.

UNC Hospital Case Examples:
A surgical patient admitted with a small bowel obstruction was NPO for 8 days before initiation of PN. On day 8 still without bowel function and PN was initiated. Pt was started 3 days later than guidelines recommend.

Aim 3 – There is currently no formal PN safety assessment or education performed for those patients who will continue PN in the home setting. A PN safety assessment and education is the standard of care in many hospitals. UNC had "open-access PN" and the ordering inpatient provider was responsible for appropriate use and discharge. Given that most providers have a poor understanding of PN in general and no appreciation for home PN, moving to a formal and structured assessment and education by the PN team would be more in line with other leading institutions and would adhere with published best practices.[6]

UNC Hospital Case Examples:
During an IV multivitamin shortage, the UNC Home Infusion pharmacy made the decision that a home PN patient was appropriate for an enteral multivitamin. UNC Home Infusion Pharmacy is separate from UNC Pharmacy. They had stock of IV multivitamins but were rationing given the shortage. The patient effectively has no functioning GI tract and a venting gastrostomy tube that is almost always to drainage. The patient went without IV MVI for several weeks and developed Wernicke's encephalopathy. She has not recovered and has ongoing deficits. The patient's mother who is a nurse repeatedly asked the home infusion company to send IV MVI but was refused. The patient's mother did not know which provider was prescribing the PN or how to contact them. The preventable yet ongoing complications from the omission of an inexpensive vitamin

are costly. The patient is frequently readmitted with consequences caused by her new baseline agitation and intermittent delirium such as gtube and central line dislodgement and infection. Before the Wernicke's, the patient was alert, oriented, independent with most ADLs.

An internal medicine team discharged a patient home on PN with a plan for the VA to follow his PN. The patient did not know who was following his PN and presented to GI clinic for follow up reporting weight loss. The VA failed to follow his PN for >6 months and his home health infusion company sent the doctor the following email.

I noticed that you saw [MRN] in clinic on XXXX. We had previously spoken on the phone about his TPN a few months ago. Currently we have the VA following his TPN but they are not responding or cooperating in his TPN care. We also can't bill appropriately through his Medicare insurance without their singed orders. We will be forced to stop shipment of his TPN if we do not find another provider that is seeing him. I do all of the TPN management and changes to his prescription. We just need you to sign our orders. Is this something that you would be able to do for Mr. [MRN]?

7. What is the history of improvement or attempted improvement at UNC Health? What work will your proposed improvement build on?

In 2020, Emily Coscia the lead dietitian on the PN team advocated to UNC hospital administration to recruit a nutrition support physician to join the PN team. Emily Coscia is a Certified Nutrition Support Clinician and was part of a multi-disciplinary PN team at Dartmouth before coming to UNC. In 2021, Dr. Anne Peery joined the team as our Nutrition Support Attending, immediately serving as our physician champion, elevating the success of our team, and also serving as our voice within the medical center. Dr. Peery is always accessible to support NST members with patient challenges and frequently communicates with providers when practice changes are warranted (for example an inappropriate PN request). She has established the foundation for safe and appropriate PN awareness and is continually advocating for our consult service (NST) to be held to the same practice standards and autonomy as all consult services within the institution. Emily and Anne made a number of improvements in PN practice including routing all new PN consult notes to Dr. Peery for review and signature, bedside patient care rounds, escalating PN safety concerns to Dr. Peery, modifying the PN orders, and developing a nutrition support elective for the Gastroenterology fellows. Furthermore, they continued team journal club discussions and mentoring new team members while they studied for the certified nutrition support certificate. In 2023, Emily and Anne recruited Sara Bliss. Sara is a board-certified nutrition support pharmacist. and a recognized clinician, educator, scholar, and author expert in nutrition. Together, the team has modified the PN orders at UNC to discourage inappropriate PN orders. Sara has completely revised the pharmacy resident PN curriculum. The pharmacy residents are responsible for PN orders over most weekends. All three team members frequently give educational lectures to trainees to improve understanding of appropriate PN use.

8. Please complete the Measures Table.

Measure Name	Measure Type	Measure Calculation	Measure Exclusion	Data Source	Baseline	Goal	Collection Frequency
% of inappropriate PN starts (including attempts)	**Outcome**	Numerator: Number of patients with inappropriate PN order over 6-month period. Denominator: Number patients started on PN over 6-month period	Any consult for advice on whether PN is appropriate.	Prospective data collection during PN rounds	3-7%	1%	Twice a week
% of delayed PN starts	**Outcome**	Numerator: Number of patients with delayed PN start ≥48 hours over 6-month period. Denominator: Number patients started on PN over 6-month period	None	Prospective data collection during PN rounds	5%	1%	Twice a week
% of early PN starts	**Outcome**	Numerator: Number of patients with early PN start ≥48 hours over 6-month period. Denominator: Number patients started on PN over 6-month period	None	Prospective data collection during PN rounds	2-5%	1%	Twice a week
% of patients who receive a home PN safety assessment before discharge	**Balancing**	Numerator: Number patients discharged on PN who receive PN safety assessment over 6-month period Denominator: Number patients discharged on PN over 6-month period	None	Prospective data collection during PN rounds	0%	60%	Twice a week
% of patients who receive home PN education before discharge	**Process**	Numerator: Number patients discharged on PN who receive PN targeted education over 6-month period Denominator: Number patients discharged on PN over 6-month period	None	Prospective data collection during PN rounds	0%	60%	Twice a week

9. What ideas do you have for changes that will result in improvement?

Aim 1 – To reduce inappropriate initiation of PN.
Primary Driver #1: Provider Knowledge Gap
Change Ideas:

1. Revise our team communication with primary team to include structured review for appropriateness at time order is placed (either over the phone or in-person conversation) and immediate feedback on appropriateness and timing.
2. Revise our PN consult note to include brief educational statement on appropriate PN use and timing for providers to reference.
3. Revise PN order to include brief educational statement on appropriate PN use and timing.
4. Document in the chart all PN consults that are declined and the rationale.
5. Invite experts in nutrition support from other institutions to speak at Medicine Grand Rounds, GI Medicine/Surgery Grand Rounds, Surgery Grand Rounds, and Gynecology Oncology Grand Rounds. This would create the opportunity for institutional knowledge growth by bringing in specialists from outside institutions with expertise in nutrition support and PN.
6. Expand existing 1-hour nutrition support lecture from GI fellows to include other trainees (Medicine, Surgery, Gynecology Oncology).
7. Encourage PN consults when "unsure" for guidance on how to secure appropriate nutrition to meet the patient's calorie/protein needs.

Primary Driver #2: Unable or unwilling to get enteral access
Change Ideas:

1. Education described above will include importance of using the GI tract for nutrition support when feasible and tips on how to obtain enteral access.
2. Engage the GI consult team to see any request for enteral access in a timely manner.
3. Advocate to pharmacy to make IV erythromycin available again at UNC.[9] Erythromycin is a motility medication that can be used to help obtain post pyloric access which some patients require for safe enteral tube feeds.

Aim 2 – To improve timing of PN initiation in patients who have a clinical indication.
Primary Driver #1: Provider Knowledge Gap
Change Ideas:

1. The targeted education under Aim 1 will also address appropriate PN timing.
2. Encourage PN consults when "unsure" for guidance.

Primary Driver #2 Delay in central venous access placement
Change Ideas:

1. The targeted education under Aim 1 will address the need for and timing of central line placement.

Primary Driver #3 Prolonged inadequate oral or enteral nutrition with poor documentation of nutrition status before admission or during the hospital course.
Change Ideas:

1. All education detailed above will include the importance of assessing a patient's nutrition status at baseline and tracking over the course of an admission in the daily progress notes.
2. Educate floor dietitians to when nutrition support (enteral and parenteral nutrition) is appropriate and encourage the floor dietitians to consult our team (nutrition support)

if there is any concern that a patient's calorie and protein needs are not being met.[10] Dietitians who are not on the Nutrition Support Team do not necessarily know appropriate use and timing PN. The education detailed in Aim 1 will also encourage greater collaboration between clinicians and hospital dietitians.

Aim 3 – To implement a PN safety assessment and education for those patients who will continue PN in the home setting.

Primary Driver #1: No formal PN safety assessment exists at UNC

Change Ideas:

1. Our team will develop a PN safety assessment. Templates already exist. The PN safety assessment will include substance use, housing (refrigerator for 1 week supply of PN, scale for weights, thermometer, space for PN set up), and a caregiver/back-up caregiver plan.
2. Our team will implement the PN safety assessment and document with a note in Epic.

Primary Driver #2: No formal PN education exists at UNC

Change Ideas:

1. Our team will develop a protocol for home PN education which will include information on emergency contacts and when to seek health care. The PN safety assessment will include a discussion of risks of home PN, including infection, line thrombosis, liver dysfunction, hypo- and hyperglycemia, dehydration, and volume overload. The teach will review the risks of missed infusions and missed additives.
2. Our team will implement the PN education including in-person teaching and a binder with important contact information and resources.

10. How has this problem has been addressed successfully elsewhere?

At other academic institutions, PN is started when appropriate by the Nutrition Support Team. At those institutions, a consult for PN is placed and PN is started if deemed appropriate by the Nutrition Support Team. Our eventual goal is to transition from "open-access" PN to a fully staffed multidisciplinary and multispecialty Nutrition Support Team that starts PN when appropriate. For now, we will continue to engage and educate the primary teams on appropriateness and timing of PN. Select academic centers have a formal safety assessment and PN education prior to discharge home.

11. How will Carolina Quality tools (Just Culture, SAFE reporting, team communication and teaming skills, huddles, and visual management boards) be used to support the work?

Our team has adopted the practice of letting teams know when PN is inappropriate or when PN is being started too early/too late. Concerns are escalated to Dr. Peery when necessary. We would like to formalize this practice. We also submit SAFE reports when errors in PN use occur. We are open to considering advice on how we can improve our communication with primary teams.

12. Please describe how your project addresses one or more of the following 5 elements:

Improved health and enhance patient experience. Inappropriate use of PN is associated with an increased risk of morbidity (a central line and the associated complications, volume overload, electrolyte abnormalities, iatrogenic risks that come from an admission prolonged by PN use).

Delayed PN admission is also associated with risks (infection, delayed wound healing, and prolonged admission).

Enhanced clinician and staff experience. Trainees would benefit from a better understanding of PN use. The nutrition support team experiences greater job satisfaction when PN is used appropriately and when patients are discharged safely home.

Reduced costs. Inappropriate use of PN is costly to the hospital system from resource utilization (prolonged admissions, clinician expertise of the PN team, pharmacy compounding, and medication (PN) cost).

13. Please describe the support and engagement you have from leadership for the work you are proposing. Please indicate leaders with whom you have consulted about this proposal.

Dr. Peery attended an Acute Bed Advisory Council meeting on January 4, 2024 with Drs. Falk, Colford, Corbin, Dellicarri, Greenberg, Zvara, Zak, Campbell, Downs, Harden-Jacobs, Soloway (PM - Throughput Strike Team), Buckio (ACA Surgery), and Sipkes (Pharmacy) to discuss nutrition support at UNC. There is interest in growing the nutrition support team in the hospital and to also offering outpatient support to patients with parenteral and enteral nutrition needs. There is an Express Workout meeting scheduled for February 29th 1-5PM to discuss how to expand and improve nutrition support at UNC.

14. Who will comprise the project team?

Nutrition support with parenteral nutrition is a specialized practice that requires expertise to manage safely. All of our dietitians practice at the top of their licenses. All are Certified Nutrition Support Clinicians (CNSC), the most widely accepted, visible nutrition support certification.

<u>Nutrition support team</u>
1. Emily Coscia, RD, CNSC
2. Alyssa Collins, RD, CNSC
3. Mary McBreaty, RD, CNSC
4. Ellen McDermott, RD, CNSC
5. Ann Scherrer, RD, CNSC
6. Colton Schille, RD, CNSC
7. Sara Bliss, PharmD
8. Anne F. Peery, MD

9. How will you ensure sufficient time to dedicate to the project over the scholar year?

There are no barriers to the time requirement for this project. We each have dedicated time every week to improving our team's care. Each of us (Emily, Sara, Anne) will commit 1-5 hours per week to this project. We have included letters from our supervisors assuring that we have the time necessary to complete the tasks outlined in this application.

10. What factors do you anticipate will foster and hinder improvement?

The greatest barrier to improvement will be convincing some clinicians to change their PN practice. We hope that by inviting outside experts in nutrition support to speak at UNC that

clinicians will modify their practice. We expect that when presented with the most current evidence from specialty specific experts that change will happen.

11. What ideas do you have for sustaining the improvement at the end of the Improvement Scholars Program?

Our team is eager to improve as demonstrated by our numerous QI projects over the last few years. With support from the hospital, we expect to expand our team to add other specialties and potentially a nurse practitioner or physician assistant. This is an ideal time for us to participate in a formal quality improvement project. We expect to adopt a new workflow for how PN consults are managed including how we communicate with teams. We expect to improve upon the PN order set and our documentation in Epic and that all of these changes will remain in place. We hope that the lectures on nutrition support are recognized as fundamental education and that they remain in the curriculum across specialties. We will develop a safety assessment and education for patients and their caregivers before discharge home with PN. We intend to retain and implement this assessment and education in our workflow.

12. Implementation Timeline

	Month 1	Months 2-3	Months 4-11	Month 12
Aims 1 & 2				
Modify PN order set	x			
Modify PN consult note	x			
Educate hospital dietitians (not part of the Nutrition Support Team) to indications and timing of PN				
Implement new order set, consult note, and communication		x	x	x
Grand rounds lectures	x	x	x	
Trainee lectures	x	x	x	
Collect data on PN use		x	x	
Finalize project				x
Aim 3				
Meet with other institutions to learn about their PN discharge practices	x			
Develop safety assessment		x		
Develop education for safe discharge home		x		
Implement safety assessment and education			x	
Finalize project				x

13. References

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10. Quartarolo J, Dolopo A, Richard B. Multidisciplinary effort to improve the diagnosis of malnutrition in hospitalized patients. Nutr Clin Pract 2021;36:1068-1071.

UNC HEALTH
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January 30, 2024

Dear UNC Institute for Healthcare Quality Improvement team,

I am writing to lend my enthusiastic support as project sponsor to Dr. Peery and the Nutrition Support Teams Improvement Scholars Program Application. The goal of this project is to improve the quality of adult parenteral nutrition use in the hospital. The specific aims are to 1) reduce inappropriate initiation of parenteral nutrition, 2) improve appropriate timing of parenteral nutrition starts, and 3) implement a parenteral nutrition safety assessment and education before discharge. The team has developed a feasible and sustainable project with the potential to improve the care we provide and trainee education. Dr. Peery and her team will perform all aspects of the project and we will meet quarterly to review progress. I am committed to improving parenteral nutrition care at UNC Health and will advocate for the team as needed.

Please reach out if you have questions. Thank you for your strongest consideration of this important and high priority quality improvement project.

Sincerely,

Udobi Campbell, PharmD, MBA
Vice President of Operations
UNC Hospitals

January 25, 2024

Dr. Darren DeWalt, MD, MPH

Matt Huemmer, MBA, MHA, CLSSGB

UNC Institute for Healthcare Quality Improvement

Dear friends and colleagues,

I am writing to lend my strongest support to Emily Coscia and her team's application to the UNC IHQI Improvement Scholars Program (Oct 1, 2024 – Sep 30, 2025). The goal of this project is to improve gaps in the quality of parenteral nutrition management at UNC Medical Center. Prioritizing appropriate nutrition therapy will prevent and correct malnutrition. Therefore, the work from this project will likely result in sustainable improvement in clinical care and will have a direct impact on patient and hospital associated outcomes (reductions in hospital length of stay, mortality, and associated costs). As the sole Adult Nutrition Support Specialist, Emily will be provided the time needed to conduct the proposed improvement project, to attend IHQI meetings, and to complete just-in-time training. She and her team have already accomplished significant improvements in parenteral nutrition care in the last few years at UNC. I expect this project will be highly successful.

Please do not hesitate to contact me if you have questions. Thank you for taking the time to consider the Nutrition Support Team's application.

Sincerely,

Jessica McGee MS, RD

Director of Clinical Nutrition

University of North Carolina Medical Center

101 Manning Drive

Chapel Hill, North Carolina 27514

February 1st, 2024

Dr. Darren DeWalt, MD, MPH
Matt Huemmer, MBA, MHA, CLSSGB
UNC Institute for Healthcare Quality Improvement

Dear friends and colleagues,

I am writing to lend my strongest possible support to Sara's participation in the UNC IHQI Improvement Scholars Program (Oct 1, 2024 – Sep 30, 2025) alongside the other leaders of the nutrition support team, Dr. Anne Peery and Emily Coscia, RD. The goal of this project is to promote evidence-based use of parenteral nutrition (PN), decrease inappropriate use, educate clinicians, and to affect overall through put of patients who require PN at discharge. As a board-certified nutrition support pharmacist, Sara is uniquely qualified to assist in this project and has already positively impacted our PN use process with other improvement projects related directly the PN ordering process. Our pharmacists have dedicated time each afternoon to work on special projects such as this one, and she will be able to easily dedicate a few hours per week to participate and ensure the success of this project. She has the time needed to conduct the proposed improvement project, to attend IHQI meetings, and to complete just-in-time training. I expect this project will be highly successful.

Please do not hesitate to contact me if you have questions. Thank you for taking the time to consider the Nutrition Support Teams application.

Sincerely,

L. Sipkes

Laura Sipkes, PharmD
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Dr. Darren DeWalt, MD, MPH
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UNC Institute for Healthcare Quality Improvement

Dear Darren and Matt,

I am writing to lend my strongest possible support to Dr. Anne Peery and her team's application to the UNC IHQI Improvement Scholars Program (Oct 1, 2024 – Sep 30, 2025). The goal of this project is to move UNC Hospital's parenteral nutrition use forward to be more evidence-based and in-line with standards of care. As Medical Director of the Nutrition Support Team, Dr. Peery has 20% salary support from the hospital dedicated to inpatient parenteral nutrition. She has the time needed to conduct the proposed improvement project, to attend IHQI meetings, and to complete just-in-time training.

Please do not hesitate to contact me if you have questions. Thank you for taking the time to consider the Nutrition Support Teams application.

Sincerely,

Nicholas J. Shaheen, M.D., M.P.H.
Bozymski-Heizer Distinguished Professor of Medicine
Chief, Division of Gastroenterology & Hepatology