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Physician Knowledge, Attitudes, and Behaviors Towards Registered Dietitian Nutritionists

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Abstract

Physician Knowledge, Attitudes, and Behaviors Towards Registered Dietitian Nutritionists

by

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MS, California State University, Long Beach, 2008

BS, California State University, Long Beach, 2006

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctorate in Clinical Nutrition

University of North Florida

Spring 2021

Abstract

Diet is increasingly linked with overall quality of life, and a healthy diet is now being considered one of the cornerstones of preventative care. Physicians rely on Registered Dietitian Nutritionists (RDNs) as most doctors lack the nutrition knowledge to properly treat their patients, especially during their residency. Little published information exists on the specific collaboration of RDNs and resident physicians. This study aimed to determine whether mentoring with an RDN increased physician nutrition knowledge, increased consults to RDNs, and whether physician attitudes improved regarding their understanding of the role of the RDN in healthcare. Knowledge or attitude alone are not strong predictors of behavior; rather, the relationship between all three must be examined. This study employed a mixed-methods approach. Paired samples *t*-tests were used to analyze the results of a multiple-choice quiz and the Nutrition In Patient care Survey, while a one-sample *t*-test was conducted to measure change in physician behavior through referrals or consults placed to the RDN. One-way ANOVA tests were run to compare mean test results between the different resident years. Participants in this study reported a lack of knowledge of the role of the RDN, though not a lack of respect for the RDN. These data suggested that working alongside an RDN as a member of the interprofessional team may lead to improved nutrition knowledge. Residency is a critical opportunity for RDNs to make an impression on resident physicians and help them better understand the value of the role of the RDN in interprofessional practice.

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Dedication

This dissertation is dedicated to my family, who always pushed me to aim higher than I thought I could. I had always hoped to be a doctor someday, and now that day is here. To my dad, I know you are smiling in Heaven and celebrating with me. To my mom, your support and prayers have kept me going all these years. To my husband Scott, thank you for believing in me and encouraging me through everything. You have been looking forward to calling me Dr. Jones – now you finally can. To my son Zane, thank you for visiting me in the “doctoral shack” while I was working, for snuggling up with me when I was doing homework, and for always being my biggest little cheerleader.

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I could not have gotten through the last four years - returning to school as a full-time wife, mom, and chief clinical dietitian - without a lot of backing from a lot of people in my life.

To Dr. Wright – thank you for always believing in me and for being such a positive influence in my academic life. Not only have you been my committee chair, but my advisor, instructor, and friend throughout all of this. I absolutely would not have been able to continue through without your encouragement. Thank you does not seem adequate – you helped my dreams of becoming a doctor in nutrition come true.

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Introduction

Nutrition is an ever-present topic in the news, online, and in life. Diet is increasingly linked with overall quality of life, and a healthy diet is now being considered one of the cornerstones of preventative care.¹ Unfortunately, oftentimes the sources of nutrition information are not knowledge-based. Physicians need to rely on Registered Dietitian Nutritionists (RDNs) as most doctors lack the nutrition knowledge to properly treat their patients. In teaching hospitals, RDNs may provide education to resident physicians at the beginning of their three-year residency, and/or throughout the duration of the working relationship. However, little published information exists on this specific collaboration.

This study is an important step in determining whether mentoring with an RDN increases physician nutrition knowledge, increases referrals or consults to RDNs, and whether physician attitudes improve regarding their understanding of the role of the RDN in healthcare are of interest.

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Chapter 1: Review of the Literature

Collaboration Between Physicians and Registered Dietitian Nutritionists

More than a century ago in 1903, Thomas Edison made a prescient prediction regarding the direction healthcare would take – “The doctor of the future will give no medicine, but will instruct his patient in the care of the human frame, in diet, and in the cause and prevention of disease”.¹ While medicines are still prescribed, diet has been increasingly linked to both the cause of as well as the prevention of disease.¹ However, physicians know or are trained more about prescribing medicines than about prescribing diets.

Resident physicians, who are in the midst of learning about all aspects of how to care for patients, are eager for knowledge. A study of physicians in 11 countries found that most were reportedly aware of associations existing between nutrition and a variety of disorders, however they lacked practical nutrition knowledge to address their concerns.² RDNs are the nutrition experts who can provide this knowledge to these physicians. The more knowledgeable physicians become regarding diet and its role in disease prevention and improving health, the better-equipped these physicians will be to treat patients wherever their careers may take them, even when an RDN may not be a part of their team.

In 2015, there were reported to be more than one million doctors of medicine throughout the United States.³ Of that figure, more than 825,000 were reported to be active (not retired).³ In comparison, in 2013 the Commission on Dietetic Registration reported a total of 89,300 RDNs.⁴ Thus, at that time, there were roughly 10% as many RDNs as doctors of medicine.

Limited information has been published on the interactions between dietetics and medicine in interprofessional education (IPE).^{5,6} An initiative funded by the Robert Wood Johnson Foundation and co-sponsored by the Alliance for a Healthier Organization, the

American College of Sports Medicine, and the Bipartisan Policy Center, called for training in nutrition and physical activity to be provided to medical students as well as physicians in order to combat the growing obesity problem facing America.⁷ Working closely with physicians, RDNs can implement intervention strategies including educating physicians about malnutrition, which is highly prevalent in hospitalized patients.⁷ Additionally, RDNs are considered to be the most qualified health professionals to provide current, evidence-based references for physicians to refer to regarding dietary guidelines.^{6,8} Collaboration between physicians and RDNs sets the stage for how to make the best improvements to both lifestyle and diet in order to optimize health.⁹

Nearly two-thirds (64%) of physicians surveyed by the Nutrition and Lifestyle Working Group of the American College of Cardiology's Cardiovascular Disease Prevention Section replied that they would refer to a dietitian when it comes to nutritional counseling of patients.¹⁰ While the survey was aimed primarily at cardiovascular specialists, in Europe and the Americas, more than 70% of physicians felt that detailed nutrition counseling was an essential part of their practice.¹⁰ Yet more than two-thirds (67%) of those surveyed read about nutrition less than once every 3 months.¹⁰ This explains why more than half of physicians surveyed felt they lacked expertise on nutrition.¹⁰ The American College of Cardiology even has a statement on core competencies that acknowledges the importance of nutrition, recommending that trainees be knowledgeable in the principles of nutrition as well as in the assessment and management of obesity, and that they should acquire the necessary skills in order to competently prescribe lifestyle approaches for preventing and treating diabetes mellitus as well as obesity, though no specific nutrition knowledge or competencies are listed.¹¹ Collaboration between physicians and RDNs would help to meet these core competencies, as well as to develop ongoing

interprofessional relationships and to improve the perceived value between two important disciplines regarding patient care.

The RDN holds discipline-specific knowledge regarding evidence for safe effective health care.¹² Energy and protein needs are calculated, the need for specific nutrient additions or restrictions is considered, and a nutrition treatment plan is formulated by the RDN who has been trained in these areas. It would be outside of the RDN scope of practice to diagnose a patient with congestive heart failure – that is up to a physician. Yet, physicians do not regularly acknowledge that RDNs are the experts at diagnosing nutrition-related problems.

The term “clinical nutrition” is defined by the European Society for Clinical Nutrition and Metabolism as “the prevention, diagnosis and management of nutritional and metabolic changes related to acute and chronic conditions caused by lack of or excess of energy and nutrients”.¹³ Due to the broadness of this definition, nutrition is considered relevant to a variety of conditions as well as being a key domain for physicians.¹³ However, physicians are typically not expected to have more than basic nutrition knowledge, with some considering this to be “unrealistic”.¹³ Thus, knowing when to refer to an RDN is important, as is knowing where to find evidence-based nutrition information for themselves.

Collaboration between physicians and RDNs is essential. Physicians need to advocate for RDNs and respect and value the role that the RDN fills in patient care.¹³ Simultaneously, RDNs must be aware of the challenges facing physicians not only at the individual level, but also at the policy level in regards to implementing sustainable nutrition advice within the medical practice.^{6,13} When RDNs and physicians work together as part of an interprofessional team, they can approach the patient from different perspectives and backgrounds while still providing a united front. Who better than the RDN, the expert in nutrition, to answer questions and mentor

physicians, regardless of their years of experience, in how to effectively address nutrition in the healthcare setting?

The Perception and Value of RDNs as Members of the Healthcare Team

If the ultimate goal of healthcare is to meet each individual patient's needs, then it should not matter what discipline an individual represents – each discipline should be valued as much as the next.¹⁴ As RDNs are considered experts in food and nutrition as well as leaders within the field of dietetics, inclusion of the RDN on the interprofessional team is vital.¹⁵ This acknowledges the value that RDNs bring to the table. Unfortunately, misinformation or lack of understanding regarding the role and value of the RDN often exist among other health professions, even at the student level.¹⁶ IPE research as a whole lacks inclusion of the RDN and the dietetic profession.¹⁶ One of the core competencies of the Interprofessional Education Collaborative (IPEC) for interprofessional collaborative practice is to fully understand the roles and responsibilities each profession brings to the team.¹⁶ However, gaps in knowledge and understanding exist in how the RDN is perceived and valued by other professions.^{16,17} This is an area that is recommended for further research to explore opportunities wherein other professions can recognize and understand the many responsibilities and roles of the RDN.¹⁶ A recent study found that including dietetic students into graduate-level IPE may positively impact how other healthcare professions perceive the role of the RDN.¹⁶ Improved perception of the value of the RDN may lead to better understanding of the RDN's role as a member of the interprofessional team.¹⁸

The Role of the RDN

Nearly 40 years ago, a study surveying physician chiefs of staff found that 55% did not believe that dietitians should be a part of decision making within a healthcare team.¹⁹ Another

study a few years later found that agreement had progressed to where dietitians should be contributors to the healthcare team, though consensus lacked on what exactly their role was.¹⁹ Later studies found that physicians slowly became more supportive of dietitians involvement, though still with differing understanding by physicians of exactly what responsibilities and role the dietitian should play.¹⁹

The schooling and internship that RDNs are required to undertake before sitting for the registration exam provides the background knowledge and training to qualify the RDN to assume a variety of roles.²⁰ These include providing comprehensive and coordinated care for patients, participating in continuous quality improvement efforts, and being an important member of the healthcare team.¹⁴ Perhaps most importantly, RDNs are able to take the science that nutrition is based upon and translate that into real-world solutions while providing evidence-based, individualized information.¹⁵

This expertise affords many opportunities for RDNs, whether in education as professors, in the community as public health nutritionists, in the media as spokespersons, or in the acute care setting, to name a few. As a member of the interprofessional healthcare team, an RDN may be responsible for diet recommendations in metabolic clinics; for working alongside (or functioning as) a certified diabetes educator; as a member of a neonatal intensive care unit (NICU) or intensive care unit (ICU) team addressing critically ill patients' nutritional needs through enteral or parenteral nutrition; or in a clinic setting, providing diet education on a variety of topics as needed.^{16,21}

As nutrition professionals, RDNs possess knowledge and skills needed to promote behavior change skills and improved decision making, not only in patients but also in other healthcare professionals they work alongside.²² This creates the ideal role for RDNs as providers

of accurate, evidence-based nutrition information to other disciplines whose nutrition expertise is lacking. These include physicians, whose nutrition knowledge is often lacking in their medical training despite their best intentions.

Healthcare Interprofessional Team Composition – Who and Why

Physicians alone cannot meet every need of a patient; rather, a team of healthcare professionals is the best way to approach all aspects of patient care. RDNs are important members of a variety of healthcare teams, especially in the acute care setting. These teams help to create more detailed health care experiences that are both comprehensive and efficient.²³ IPE is an intervention involving members of two or more professions who learn interactively from and with each other in order to improve collaboration and/or the health of patients.^{23,24}

Replacing the terms “multi-disciplinary care” and “interdisciplinary care”, IPE has been shown to lead to positive patient outcomes as well as improvements in interprofessional competencies for medical students.^{23,24} The World Health Organization endorsed IPE in 1988.⁵ IPE allows collaborative sharing of knowledge and skills, integration of new skills and knowledge areas, and improved cooperation and understanding between research and educational institutions, as well as between members of an interprofessional team of healthcare providers.⁵

There is no one definition of the composition of the healthcare interprofessional team. Commonly described team makeups include physicians, physician assistants, nurses of varying types and levels, medical assistants, dietitians, pharmacists, physical therapists, occupational therapists, respiratory therapists, social workers, and/or some combination thereof.^{23,25}

Dentistry, nursing, pharmacy, and physicians all have associations that use language to support both the interprofessional and collaborative development of nutritional approaches towards health care.²⁶ Each profession needs to have established nutrition-related professional

competencies in order to contribute to a meaningful interprofessional collaborative environment.²⁶

IPE in its true form demonstrates to future health professionals how collaborative efforts best benefit their patients.²⁵ Specifically, the “development of a cohesive practice between professionals from different disciplines” has been termed “interprofessionality”.²⁵ IPEC is responsible for developing the core competencies for interprofessional collaboration, emphasizing ethics and values, as well as team member roles and responsibilities necessary for effective communication and teamwork.²⁵

Traditionally, a patient would go to a physician for treatment for a disorder or disease. However, with the increase in chronic and complex disease states, multiple specialty providers are now needed to best meet that same patient’s needs.²⁷ These different healthcare providers may have unique knowledge and skills, however without collaboration and cooperation among each other, the patient does not benefit. Interprofessional practice is, at its roots, a veritable melting pot of professions, with each profession bringing its own attitudes, values, beliefs, customs, culture, and history.²⁷ Concerns have been expressed that interprofessional learning may be affected by beliefs about power differentials as well as a desire to avoid conflict.²⁸ While the study reporting these findings did not include RDNs, these same beliefs are likely to apply to RDNs as well. Physicians may be viewed as having “positional power”, whereas RDNs may be viewed as having “informational power” regarding nutrition when it comes to patient care.²⁸ This may be further influenced by those who self-categorize as team members, as these individuals may be more receptive to interprofessional team training than those who self-categorize only to a professional group.²⁸ The relationships and dynamics both in and out of the

interprofessional team can create challenges as well as having benefits. A strong interprofessional relationship built on trust and respect is key.

Why Healthcare Interprofessional Practice is So Important

IPE has been around in one form or another for more than 50 years, and has been reported to increase student respect for other professions as well as to increase awareness of the many benefits of teamwork.^{5,25} Without this respect and awareness of what other professions can contribute to the plan, little headway can be made towards improving patient outcomes. Unfortunately, curriculum in each profession has historically not been inclusive of dedicating time to each profession's areas of interest. At most, a passing discussion of what interprofessional practice means may be covered. However, after reports from the Institute of Medicine publicly highlighted the inadequate communication among health care providers, likely leading to the unacceptable number of medical errors, leading to poor health outcomes, interest in IPE has resurfaced, and education at all levels has begun to include more interprofessional topics.^{25,29}

Recommendations for establishing and maintaining interprofessional relationships include the following: 1) making changes at the education level of health professionals in order to graduate practitioners who will partner with patients as well as their families and communities; 2) making changes at the organizational level in order to facilitate lasting partnerships between healthcare and health profession education organizations to benefit patients, their families, and communities; and 3) building the capacity for partnerships to exist between patients, their families, and communities and healthcare and health profession education organizations.²⁷ Most importantly, the patient must be kept in the forefront, putting self last and prejudices aside.²⁷ One practitioner alone cannot solve the healthcare crisis. Instead, the

collaborative efforts of the interprofessional team working together can make significant strides in improving patient care and increasing knowledge, including nutrition knowledge.

Interprofessional Knowledge, Skills, and Values/Attitudes

Three areas of professional competencies are needed in order to develop an interprofessional approach to implementing nutrition into the healthcare team.²⁶ These are knowledge, skills, and values/attitudes.²⁶

Without the knowledge of what the different disciplines that make up an interprofessional approach bring to the table, there is a disadvantage before the healthcare team is even formed. Studies that have looked at interprofessional healthcare teams have historically included nursing, medicine, social work, and pharmacy students – not dietetics students.^{30–33} This means that right from the start, nutrition, and therefore the RDN, is not given the focus deserved.

It is recognized that each profession does bring its own unique skills to the table regarding nutrition.²² However, it is believed that many healthcare professionals lack sufficient training in interprofessional skill.³⁰ In other words, no one is taught how to function as a team member. While different disciplines require training (such as nursing school for nurses, medical school for physicians, a bachelor's degree and internship for RDNs) and passing registration examinations prior to entering the workforce that ensure the skills needed to perform their jobs are adequate, it would seem that the skills needed to work together on an interprofessional team are missing. This may be in part due to attitudes towards differing disciplines that exist.

Attitude has been suggested to be the largest influence on interprofessional work.³⁰ Attitudes and values regarding interprofessional approaches to patient care have been known to differ among various health science professions.³¹ These differences cause barriers to successfully implementing an interprofessional approach that include lack of knowledge of each

other as well as lack of respect.³¹ As the goal of IPE and the interprofessional approach is to learn about, from, and alongside each other, having the proper attitude in place is necessary to foster mutual respect and acknowledge the value other team members bring to the table.³¹ If the faculty members responsible for teaching about IPE and interprofessional teamwork do not demonstrate that in their own actions, then they are poor examples to their students. “Do as I say, not as I do” is an unacceptable approach to cultivating a well-functioning healthcare team. Attitudes are an important factor in IPE, not only from the faculty instructing about interprofessional practice, but also from the students learning how interprofessional teams should function and practice.

There is a three-fold value in interprofessional practice across the board.²⁵ First, collaborative skills are developed that allow graduating students the opportunity to apply in various aspects of life.²⁵ Second, graduates will be better positioned for employment as organizations make the switch towards team-based approaches.²⁵ Third, the learning that comes from and with other health professions leads to a better understanding of the overarching healthcare system that students will be working within.²⁵

The earlier the preparation for working as part of an interprofessional team begins, the more familiar health professionals can become with other disciplines and the importance and knowledge offered from each. The presence of an interprofessional team is becoming the new model of patient care and may provide a solution to fragmented care that unfortunately exists throughout the healthcare system.²³ Many healthcare educators are not content to sit back idly and wait for the system to fix itself. Instead, these educators are leading the way with plans to bring healthcare professionals together, teach them about other disciplines, and take steps towards solving the problems created from lack of knowledge.

Models/Strategies Used to Educate Healthcare Professionals and Build Interprofessional Practice

The Ohio State University College of Medicine developed a new curriculum called “Lead, Serve, Inspire”, which “intentionally incorporated education on nutrition, behavior, obesity, and social determinants of health as they impact disease”.⁵ This curriculum consisted of lectures and online modules detailing nutrient pathophysiology and biochemistry as well as introducing the Recommended Daily Allowance/Reference Daily Intake.⁵ However, the lack of practical use of food as nutrition therapy as an education topic remains problematic.⁵ In the aforementioned curriculum, medical students and dietetics students were paired together to conduct an experiential IPE session using problem based learning.⁵ Information taught in lectures was applied by adjusting sample meals to meet MNT guidelines.⁵ Statistically significant increases in confidence for the following abilities were noted: 1) to make correct diet or food suggestions; 2) to work alongside the dietitian to encourage patients with practical solutions; and 3) to suggest ways to overcome barriers.⁵ Additionally, medical students had statistically significant self-reported increases in the following knowledge: 1) how to alter a meal to meet appropriate nutrition therapy; 2) the role of an RDN; 3) the value of patient self-perspective of past lifestyle successes and challenges; 4) barriers and compliance issues with alterations of diet; and 5) recognizing parameters to assess nutrition risk in acute care.⁵ Cherian et al. recommended future IPE specific to medical students and dietetic students include validated pre-and post-session surveys; measuring actual knowledge, behavior, and impact on patient care; receiving input from faculty physicians who did not ever have nutrition education; learning whether these sessions impact the food choices medical students make in their own diet; and evaluating more intimate sessions with individual faculty interaction.⁵

Similarly, the University of Connecticut School of Medicine alongside the University of Connecticut College of Agriculture, Health and Natural Resources paired first-year medical students with senior-level dietetics students for nutrition counseling answering clinical questions related to nutrition counseling.²⁴ When compared to a class who did not receive one-on-one time with a dietetics student, mean nutrition counseling scores were higher in the intervention group (84% vs 68% of a 100% scale), which was statistically significant.²⁴ This method of IPE was found to be a highly rated effective way to teach nutrition counseling to medical students.²⁴

Outcomes Related to Interprofessional Practice

While being introduced to interprofessional cohorts earlier, at the undergraduate level, helps to increase awareness, the very professional diversity that defines interprofessional teams can have both positive and negative outcomes.³⁴ The relationships explaining the dysfunctional impact of professional diversity on team dynamics have been proposed to include three elements: affective conflict, elaborative behavior, and interprofessional openness.³⁴ When team members strongly identify with their profession, a moderated relationship between affective conflict and professional diversity has been reported. In other words, there is a likelihood of affective conflict occurring on interprofessional teams when members strongly identify with their profession. This conflict can be tempered when shared goals are identified and the focus is redirected to patient-centered care.³⁴ In the acute care setting, the shared goal should always be what is best for the patient at hand. Respect for other professional team members should also be ranked highly in importance. Each discipline should be able to understand the value that other disciplines contribute to the interprofessional team. This will allow the interprofessional team to perform at its best and to focus on the person being treated.

Medical School/Residency Training

Medical training is long and has been called arduous, typically involving at least 11 years of formal training and a number of standardized examinations in the years between graduating and becoming an attending physician who is fully licensed.^{35,36} A bachelor's degree in any field is required to apply to medical school, including prerequisite classes in both organic and inorganic chemistry, biology, physics, English, and mathematics.³⁶ Additionally, the Medical College Admission Test (MCAT) must be passed, which is an all-day examination assessing basic science knowledge as well as reasoning and critical analysis skills.³⁶ To be accepted to a medical school, grades and MCAT scores are reviewed, as well as admission interviews, letters of recommendation, a personal statement, and personal experiences including volunteering, leadership activities, and research.³⁶ After being accepted to medical school, medical students spend the first two years in preclinical training where the focus is on basic sciences, anatomy and physiology, and disease processes.³⁵⁻³⁷ The U.S. Medical Licensing Exam (USMLE) Step 1 tests basic science knowledge through a multiple-choice, 1-day exam, and is a required step in order to submit applications for post-graduate clinical training, or residency.³⁵⁻³⁷

Years 3 and 4 of medical school are called the clinical or clerkship years.³⁵⁻³⁷ These are the hands-on years. There are several required core clinical specialties – internal medicine (average 10 weeks), pediatrics (average 7 weeks), surgery (average 8 weeks), psychiatry (average 5 ½ weeks), and obstetrics-gynecology (average 6 ½ weeks).^{35,36} At the end of each core rotation, another test called the Shelf Exam is taken to test proficiency in each specialty area.³⁵ During the fourth year of medical school, the USMLE Step 2 exam is taken, one in Clinical Knowledge and the other in Clinical Skills.³⁵⁻³⁷ Additionally, during the fourth year, a sub-internship is required, wherein the medical student fills the role of an intern (also known as

postgraduate 1, or PGY-1) in a specialty area to determine if that area is a good fit.^{35,36} The fourth year is also when medical students begin applying to residency programs, interview with them, and then rank and submit a list of programs they would like to attend.^{35,36} The National Resident Matching Program manages “the Match”, wherein residency placement is assigned, with results being revealed in March.³⁶ After graduation with an M.D. or D.O., medical students move on to residency in order to practice and become certified for anywhere from 3-7 years, depending on the field.^{35,36} More exams follow, including passing the USMLE Step 3 in order to complete certification as a physician in the U.S.^{35,37}

Nutrition Knowledge of Medical Students/Residents

Since 1982, the American Academy of Family Physicians has required nutrition education to be a part of its residency programs.⁷ During the preclinical years, the National Academy of Sciences (NAS) recommends a minimum of 25-30 classroom hours dedicated to nutrition.²⁴ Yet, as of 2010, only 40% of medical schools were meeting that goal.³⁸ A 2010 study of 127 accredited U.S. medical schools found that most of the 109 responding schools (103; 94%) required “some form of nutrition education”, with only 25% (26/105) of those answering questions about courses actually requiring a dedicated nutrition course.³⁸ In 2013, nearly three-fourths of schools surveyed (71%) provided less than 25 hours, and 36% provided less than half of that.¹¹ The average hours of nutrition instruction during the entire medical school career was found to be 19.6 contact hours in 2010, and that decreased to 17 hours in 2013.^{11,38} This equates to less than 1% of total lecture hours, and is less than the minimum required hours set by the NAS.^{38,39} Additionally, most of those contact hours are dedicated to biochemistry rather than diets or decision-making in regards to food.³⁹

The lack of nutrition education in resident physician training is not new. In 1950, the American Medical Association Council on Food and Nutrition commented that U.S. medical schools did not provide adequate recognition to the topic of nutrition during medical education.⁷ In 1985 the National Academy of Sciences published a report highlighting the dearth of nutrition education within the medical school curriculum.^{7,38} The results of that report led to the required minimum hours of nutrition instruction. In 1989, the American Society of Clinical Nutrition recommended an even higher number of hours, 37 to 44, be dedicated to nutrition during medical school.³⁸ Yet, more than thirty years later, clearly much work remains in bridging the gap.

A recent systematic review conducted between May 1 and July 1, 2018 and again on April 10, 2019, found 24 articles published since 2012 that included “medical students’ nutrition knowledge, attitudes, skills, or confidence in nutrition or nutrition counseling”.⁴⁰ Three studies specifically addressed medical students’ nutrition knowledge, with wide-ranging results.^{41–43}

Perlstein et al. administered a survey containing 6 questions addressing nutrition knowledge.⁴¹ Between 59-93% of first-year postgraduate Australian medical students surveyed over a period of 4 years were able to correctly identify recommended daily servings of fruit, while between 61-84% were able to identify vegetable recommendations.⁴¹

Castillo et al. surveyed incoming fourth-year medical residents during orientation for a pediatric residency program and found that while most (90%) were familiar with common representations of serving sizes, only slightly more than half (52%) knew the daily recommended calorie amounts for moderately active adolescents.⁴³

Hargrove et al. surveyed first and second year medical students and found that half (50.6%) scored below the school’s defined passing grade in relation to nutrition knowledge.⁴² The mean grade of the second-year students was slightly above the passing rate, while that of the

first-year students was not.⁴² Interestingly, more than half (55.6%) felt comfortable providing nutrition recommendations to patients through counseling, yet few (11.9%) were actually aware of the current dietary reference intakes.⁴²

The most frequently cited reasons for the lack of nutrition education in medical training are related to healthcare reimbursement, or the lack thereof, for nutrition counseling and preventive care, and difficulty finding room to add another topic into medical curriculum.^{44,45} A 2013 Alliance/American College of Sports Medicine/Bipartisan Policy Center forum made up of medical students, medical-school teachers and administrators, and physicians, found that physicians at all levels want to know what to say, how to say it, who can help, what resources exist, and how to better engage with patients regarding nutrition and physical activity.⁴⁴

Though a large percentage (71%) of medical students begin medical school thinking that nutrition is clinically important, by the time graduation rolls around, less than half hold that continued belief.³⁹ The word nutrition is not even mentioned on the required proficiencies in order to obtain board certification for internal medicine certification.³⁹ Some medical schools, such as Loma Linda University School of Medicine, are the exception. Loma Linda offers resident physicians the opportunity to specialize in Lifestyle Medicine, a subspecialty using food to treat disease.⁴⁶ While there is no mention of an RDN or engaging with an RDN as part of the curriculum, one of the three required online didactic sessions totaling 6 hours includes Nutrition Education.⁴⁷ The Lifestyle Medicine specialty opportunity is a postgraduate opportunity, unlike most of the minimal nutrition instruction that medical schools do offer, which occurs during the preclinical, or first two years of, medical training.^{38,47} Training during the later clinical years, as well as continued training during residency and beyond, would afford physicians more

knowledge as well as the opportunity to stay informed on changing nutrition recommendations to make to their patients.³⁸

In 2012, the National Institute of Health's (NIH) National Heart, Lung, and Blood Institute (NHLBI) held a two-day working group meeting titled "Future Directions for Implementing Nutrition across the Continuum of Medical Education, Training, and Research".⁴⁸ The aim of the meeting was to develop recommendations for implementing nutrition across general and specialty health professional education.⁴⁸ Guiding principles that were discussed included the importance of interprofessional nutrition education, the importance of the role of the dietitian on the healthcare team, and that healthcare professionals should understand the role and responsibility of the dietitian as well as the fundamentals of assessing a patient's nutritional status, diagnosing nutrition-related problems, and how to implement, monitor, and evaluate the nutrition care plan.⁴⁸ Despite earlier extensive work through the Nutrition Academic Award (NAA), a program collaboratively funded by NHLBI and the National Institute of Diabetes and Digestive and Kidney Diseases to develop a Nutrition Curriculum Guide illustrating how to integrate nutrition into the medical school curriculum, the Association of American Medical Colleges (AAMC) had yet to emphasize the importance of nutrition in chronic disease prevention.^{48,49}

A number of initiatives to advance nutrition education have been undertaken by medical schools, though some appear to have stalled due to lack of funding.⁴⁴ The ENRICH (Expanding Nutrition's Role in Curricula and Healthcare) Act was introduced in March of 2019 to "provide for a grants program to develop and enhance integrated nutrition and physical activity curricula in medical schools".⁵⁰ The bill aimed to set aside up to \$5 million per year for each fiscal year 2019-2021, although it was listed as "Dead/Failed 12/31/2020" as of February 2021.^{50,51} These

funds would have been beneficial to schools such as the University of North Carolina, Chapel Hill, whose Nutrition Research Institute developed an online curriculum titled Nutrition in Medicine (NIM) as a free learning opportunity available to medical schools and students.^{44,52} While encouraging to see that the Assistant Project Director of NIM was an RDN, the website appears to have last been updated in 2016.⁵² Many changes in healthcare and nutrition have occurred since, which are unfortunately not reflected in the curriculum. The University of Colorado School of Medicine is another example of a medical school taking steps to integrate nutrition education into its curriculum. While initially funded through the NIH's NAA program, when funding ran out in 2005, the school set aside administrative funding specifically for an RDN to support the nutrition electives.⁴⁴

A recent publication by the American Heart Association (AHA) suggests that undergraduate medical education is experiencing an overhaul and is now providing applied nutrition knowledge and skill building as part of first- and second-year electives. These include the following: practical nutrition electives such as at Albert Einstein School of Medicine, which offers a nutrition elective combining didactics and interactive, practical learning experiences such as the science behind the Dietary Guidelines for Americans, nutrition label reading, and motivational interviewing; diet behavior electives such as at Northwestern University Feinberg School of Medicine, where an elective purports to challenge students to finish a 6-week behavior change plan comprised of monitoring baseline occurrence, setting goals, and implementing change, as well as at Boston University School of Medicine where students are challenged to limit their weekly food budgets to that of the state's Supplemental Nutrition Assistance Program; and culinary medicine electives at a variety of campuses, re-emerging as a practical way for medical students to understand healthy meal preparation skills in order to educate their patients.¹¹

As well, lifestyle medicine curricula is a recent track aimed at providing not only in-depth nutrition education, but also other lifestyle factors, such as stress management, sleep hygiene, and physical activity – all important components of health management, not only for resident physicians or students themselves, but also for their future patients.¹¹ Web-based nutrition education and training is also being utilized more frequently, as it is easier to incorporate into existing curriculum.¹¹ While no consensus has been reached on a unified framework for medical nutrition education and training content, the Accreditation Council for Graduate Medical Education (ACGME) does have nutrition competencies related to cardiovascular disease in order to impact atherosclerotic cardiovascular disease prevention (see Table 7: CVD-Related Nutrition Competencies Categorized by ACGME Domains).¹¹ The AAMC also recently developed and defined entrustable professional activities (EPAs) that graduating medical students should be able to perform by the first day of their internship without direct supervision, progressing along the learning continuum until graduating as a senior resident.¹¹ The 13 core EPAs include 10 that are relevant to nutrition (see Table 8: EPAs Relevant to Nutrition Competencies).¹¹ These are significant steps forward in emphasizing the importance of nutrition not only at the student level (both undergraduate and graduate), but also including competencies that specifically relate to acknowledging the importance of collaborating with RDNs to improve patient outcomes as well as increase nutrition knowledge in medical students and residents.¹¹ Another step that can be taken is that of mentoring between physicians and RDNs.

Mentorship Programs

The term mentorship comes from Mentor, the teacher whom Odysseus trusted to raise his son while he was at war.⁵³ Ideally, a mentorship is a selfless relationship wherein a wiser, more

experienced person guides a less experienced person.⁵³ In medicine, mentoring is common between more-experienced physicians and new graduates. Similarly, in dietetics, more experienced or senior RDNs may mentor newly hired and/or newly registered dietitians as they adapt to their new environment. Preceptors for dietetic internships also function as mentors.

Mentoring has been called an essential component in the success of an academic medical center.⁵³ Mentorship as a culture should encompass not only advising and teaching, but also role modeling and demonstration of work-life balance.⁵³ A hierarchical relationship is not desired, nor is it ideal; rather, a nonhierarchical and bidirectional relationship is preferred, with both mentor and mentee challenging assumptions and shifting perspectives of each other.⁵³ As mentees mature, the benefits of mentoring may ultimately continue to grow and become apparent, perhaps over decades.⁵³ Mentoring has been described as one of the most fulfilling experiences for a physician to take part in during the latter part of a medical career.⁵⁴

In a nutrition mentoring program, there may be different goals for the mentee, the mentor, and the nutrition community as a whole.⁵⁴ Development of a mentoring program in clinical nutrition has recommended curriculum include not only one-on-one discussions, especially during rounds, but also case studies, formal PowerPoint lectures, and key article discussions.⁵⁴ Since 2009, the Nestlé Nutrition Institute Clinical Nutrition Fellowship Program for Physicians has had over 50 fellows complete the program.⁵⁵ Interestingly, the mentoring program did not include an RDN on the staff, but rather four senior nationally recognized physicians who focus on nutrition as a major area of their practice (five are now currently listed on the website).^{54,55} In fact, the RDN seemed to be referenced as an opponent of sort in the statement that lacking “new, young, enthusiastic physicians coming into the field, clinical nutrition will be relegated to other interested groups such as dietitians”.⁵⁴ Given the same article

provides criteria for “being the best nutrition mentor possible” and includes not promoting one’s own agenda, it is unfortunate that RDNs are considered competition and nutrition is referred to as “our science”.⁵⁴ Nutrition is exactly that, a science, not owned by any one person or profession. Rather, it filters into every profession and aspect of healthcare. Nutrition is considered to be an essential component of health, playing an integral role in preventing the development of a number of chronic diseases, as well as unfortunately in the development of other diseases due to over or undernutrition.²⁴

Implications for Nutrition Practice

A position paper by the Academy of Nutrition and Dietetics (AND) supports IPE, especially nutrition-focused, as an essential component of medical education.⁷ The AHA Science Advisory highlights 21st century medical education reforms that will prepare physicians for interprofessional team-based care alongside RDNs, who can help to sustain the efforts of physicians regarding dietary principles.¹¹ A collaborative nutrition care model that aligns with population-based diet improvement strategies can contribute to reducing the burdens caused by chronic diseases “to a degree not previously realized in the United States”.¹¹

Physicians need to be armed with information or know where to find information on a variety of topics, including diet, to best treat their patients. Lacking this knowledge opens the door to advisors on nutrition who may be poorly or variably qualified, including through various social media outlets, personal blogs, self-proclaimed nutritionists, personal trainers, and other non-qualified persons.⁵⁶ At its annual Nutrition Science and Practice Conference in 2020, the American Society for Parenteral and Enteral Nutrition (ASPEN) hosted a pre-conference course titled “Comprehensive Nutritional Therapy: Tactical Approaches in 2020”, which was described as being “designed to stimulate interest of nutrition in young physicians and demonstrate its

importance to patient outcomes”.⁵⁷ Unfortunately, no RDNs were listed among the nearly twenty speakers or moderators. The inclusion of an RDN as a speaker discussing the importance of nutrition and specifically, the importance of physician interest in nutrition as a part of the interprofessional team, would be a considerable addition. Mentoring with an RDN to increase nutrition knowledge of physicians, to change physician behavior by increasing the number of referrals or consults to the RDN, and for physicians to understand exactly what RDNs do and the value they add to the interprofessional team, are all significant opportunities for both the RDN and physician to improve their interprofessional relationship. While studies have shown that physicians feel inadequately prepared to offer nutrition advice, little is known about how exactly to best shape the knowledge, attitudes, and behavior of these learners.^{56,58,59}

Gaps in Knowledge

A recent review of the state of the science of interprofessional practice suggested that more research is needed regarding the “measurable impact of interprofessional collaborative practice and/or care on patient-health related outcomes” in order to increase patient satisfaction as well as to improve the health of the population at large.⁶⁰ Interprofessional practice is considered an important component of healthcare reform, thus necessitating more evidence relating interprofessional collaboration with health outcomes.⁶⁰ Yet, of the 20 reviewed papers that met inclusion criteria, not a single paper mentioned RDNs in the title. Further review confirmed that RDNs were not included despite accreditation standards advocating the importance of nutrition. This gap needs to be addressed by further research including the RDN as a valuable part of the interprofessional team contributing to improved healthcare outcomes.

Physicians rely on RDNs as most physicians lack the nutrition knowledge to properly treat their patients. A 2008 survey found that even though 94% of resident physicians feel that

nutritional counseling is important and should be required during patient visits, and recognize that diet is an important part of health, only 14% of those physicians feel trained to offer nutrition advice.⁵⁹ While the American Academy of Family Physicians has implemented nutrition education guidelines specifically for family medicine residents, low self-efficacy regarding nutrition knowledge and diet counseling skills still exists among that population.¹¹ Increased nutritional training for physicians, along with ongoing collaboration with RDNs, is critical to bridge this gap.⁵⁹

Chapter 2: Theoretical Framework

Purpose Statement

The focus of this study was to look at the nutrition knowledge of physicians, physician behavior in the form of referrals or consults to the RDN, and physician attitudes regarding their understanding of the value of the role of the RDN in healthcare and whether these were affected by mentoring with an RDN. There are several theories that touch on the different constructs of knowledge, behavior, and attitude. The most pertinent and applicable theories that relate to this study are discussed below, culminating in the overall theoretical framework that guided this study.

Critique of Theoretical Models/Frameworks

It is possible that interns and resident physicians, lacking nutrition knowledge, may be anxious when faced with being asked to provide nutrition information to a patient, or perhaps even when interacting with an RDN. This may lead to potential prejudice against or towards RDNs solely due to lack of understanding. A potential remedy for this would be having a “contact situation”, such as mentoring, occur between interns/resident physicians and RDNs to

help decrease and diffuse the anxiety and unknown as well as to help each group become comfortable with each other. This is the premise of the contact hypothesis or Intergroup Contact Theory, credited to Gordon W. Allport.⁶¹ Mentors can play an important role in training up mentees in the area of focus.

Mentoring may also be considered as a representation of Kolb's experiential learning style theory. The act of mentoring would be the concrete experience, which would be followed by reflective observation on the part of both the intern/resident physician and RDN.⁶² Follow-up testing would determine what was learned from the experience (abstract conceptualism), and hopefully that new knowledge and information would be applied through active experimentation.⁶² The main focus of the theory is the experience that the learner has.⁶³ Learning is shaped by, among many other factors, professional career choice according to Kolb.⁶³ The type of career not only lends itself to a specialized learning environment, such as the hospital setting in healthcare, but also to an overarching commitment to a problem that exists across many professions, requiring a specific orientation towards specialization and adaptation.⁶³ This leads to common values and beliefs among like-minded professionals, such as healthcare team members, affecting learning and knowledge acquisition.⁶³ Knowledge gained is a result of a combination of an experience that grasps and transforms.⁶³

Working together can also take the form of mentorship, which has been described as a way to develop inclusively excellent cultures.⁶⁴ Mentoring is a collaborative effort and requires shared responsibility in order for the relationship and interactions to be fruitful and effective.⁶⁴ Mentoring can take on many forms, including advising, role modeling, and helping the mentee to form a network of peers and other mentors on whom they can reach out to.⁶⁴ While deep-level similarities such as shared values and experiences have been suggested to be important for

mentorship to be effective, it is not always feasible to pair like-minded mentors and mentees together.⁶⁴ In this case, clear and relevant guidelines and expectations can aid in setting the stage for an effective relationship.⁶⁴ The potential positive outcomes of an effective mentorship include career commitment and satisfaction.⁶⁴ One analogy for viewing mentoring relationships is that of a pilot and a copilot – both possess knowledge regarding flying planes. However, the pilot can increase the copilot’s knowledge and potentially influence the behavior of the copilot based upon the pilot’s own knowledge and experience.

Guiding Theoretical Framework

Similarly, mentoring with an RDN to increase resident physicians’ nutrition knowledge and change their attitudes towards the importance of nutrition may change their behaviors. This is the basis of the Knowledge-Attitude-Behavior Model (KABM).⁶⁵ The KABM “stresses that a gain in new knowledge leads to changes in attitude, which in turn, result in improved dietary behavior or practices”.⁶⁶ Providing “awareness” knowledge will not only increase awareness, but also capture attention and enhance motivation, i.e. motivational knowledge.⁶⁶ For those already motivated, “how-to” knowledge, or instrumental knowledge, will be provided to encourage action.⁶⁶ Both motivational and instrumental knowledge are needed for behavioral change to occur via effective nutrition education.⁶⁶ The KABM seeks not only to measure knowledge gains, but to measure how that knowledge along with the attitude of the learner leads to behavioral changes.⁶⁵ Knowledge is defined generally as being made up of three forms: 1) declarative (knowing *what*); 2) procedural (knowing *how*); and 3) conditional (knowing *when* and *why*).⁶⁵ Regarding resident physician’s knowledge of nutrition, knowing that nutrition is a science dealing with food, nutrients, and nutrition is declarative knowledge.⁶⁷ Knowing that nutrition plays an important part in disease prevention and can, in excess, be the cause of other

diseases such as obesity, is procedural knowledge. Many resident physicians may have both declarative and procedural knowledge related to nutrition. However, the application, or conditional knowledge, regarding when to prescribe a specific diet or why certain foods should be avoided in specific conditions, is likely the missing component. Knowledge also affords people the ability to perceive whether new information, such as mentoring provided by an RDN, is meaningful or not.

Attitude, like knowledge, has multiple meanings in the research setting.⁶⁵ Historically, the definition of attitude fell into one of two separate frameworks: behavioral and cognitive.⁶⁵ In the behavioral sense, attitude has been defined as a “mental and neural state of readiness conditioned by stimuli directing an individual’s response to all objects with which it is related”.⁶⁵ Conversely, from a cognitive standpoint, attitude has been called “the affect for or against a psychological object” as opposed to a behavioral object.⁶⁵ Additionally, attitudes are considered subjective since they are comprised of feelings and dispositions towards actions, ideas, or concepts.⁶⁵ Later psychologists expanded the definition of attitude to include three components: affective, cognitive, and conative.⁶⁵ Still addressing a psychological object, the affective component is how the individual evaluates the object and the emotions associated with the object.⁶⁵ In other words, emotions and feelings that are related to behaviors.⁶⁵ The cognitive component is an idea or belief associated with the object, while the conative or behavioral component is representative of action or predisposition toward action aimed at the object.⁶⁵ Though while definitions of attitude may vary, theorists generally agree that “the characteristic attribute of attitude is its evaluative (pro-con, positive-negative) dimension”, resulting in a measurable score on an evaluative continuum.⁶⁵

Behavior, according to most psychologists, is an observable action.⁶⁵ More definitively, researchers use the constitutive definition which states that behavior is “the way in which a person, organism, or group responds to a certain set of conditions”.⁶⁵ Behavior is often measured by frequency during a set time, as well as through less direct methods such as interviews with peers or coworkers of a subject to understand behavior.⁶⁵

Operationalizing Theoretical Constructs for This Study

The basis of research is to examine relationships among theoretical constructs.⁶⁸ This is done by measuring variables corresponding to those constructs and then looking at how the variables are statistically correlated.⁶⁸ In this study, the constructs to be studied were knowledge, behavior, and attitude of physicians. The relationship between knowledge and behavior is reciprocal and dynamic – knowledge may inform attitude which may influence behavior.⁶⁵ Additionally, behaviors can form attitudes, and attitudes can impact knowledge gains.⁶⁵ Knowledge or attitude alone are not strong predictors of behavior; rather, the relationship between all three must be examined.⁶⁵ Knowledge can be identified through subject matter testing, attitude through surveys, and behavior through observation or self-report frequency measure.⁶⁵ This study used a multiple-choice quiz containing 15 questions to assess knowledge, a validated survey alongside qualitative interviews to assess attitude, and behavior change was identified through the number of referrals or consults to the RDN, as identified below.

Chapter 3: Methodology

Study Purpose

The purpose of the study was to determine whether mentoring with an RDN increased nutrition knowledge of physicians, changed physician behavior by increasing the number of

referrals or consults to the RDN, and whether physician attitudes improved regarding their understanding of the value of the role of the RDN in healthcare.

Aims

1. To increase nutrition knowledge of physicians through mentoring with an RDN.
2. To increase referrals or consults by the physician to the RDN.
3. To improve physician attitudes regarding their understanding of the role of the RDN in healthcare.

Research question

How does mentoring with an RDN affect physician nutrition knowledge, physician behavior through referrals or consults to RDNs, and physician attitude regarding their understanding of the value of the role of the RDN in healthcare?

Hypotheses

1. There will be an increase in physician nutrition knowledge after mentoring with an RDN.
2. There will be an increase in physician behavior regarding referrals or consults to RDNs after mentoring with an RDN.
3. There will be an increase in physician attitude regarding their understanding of the value of the role of the RDN in healthcare after mentoring with an RDN.

Null Hypotheses

1. There will be no increase in physician nutrition knowledge after mentoring with an RDN.
2. There will be no increase in physician behavior regarding referrals or consults to RDNs after mentoring with an RDN.

3. There will be no increase in physician attitude regarding their understanding of the value of the role of the RDN in healthcare after mentoring with an RDN.

Study Participants

The study was presented to the Ventura County Institutional Review Board via teleconference on June 26, 2020 and received verbal approval to be expedited to begin as planned on July 1, 2020. Full written approval was received on July 3, 2020 (see Appendix A: IRB Approval Letter).

According to the U.S. Bureau of Labor Statistics, hospitals are one of the largest employers of RDNs at 30%.⁶⁹ RDNs in the hospital setting work alongside nurses, physicians, speech therapists, and other ancillary care providers, ensuring patients' nutritional needs are met and providing dietary education, among other responsibilities. In teaching hospitals especially, RDNs may also provide education to resident physicians at the beginning of their three-year residency, and/or throughout the duration of the working relationship. In the hospital setting, the RDN is often centered in the interactions between physician and patient, taking the recommendation from the physician and educating, counseling, and implementing the plan with the patient. In cases where the recommendation may not be appropriate, the RDN is then responsible for discussing with the physician why, what a more appropriate plan might be, and coming to an agreement for the best interest of the patient.

In 2019, the Ventura County Medical Center (VCMC) Family Medicine Residency Program was once again named the first in the nation out of 674 Family Medicine Residency Programs in the United States that are accredited by the ACGME.⁷⁰ VCMC is the only academic teaching hospital with a residency affiliated with the University of California, Los Angeles School of Medicine.⁷⁰ More than 600 family physicians have graduated from the program since

its start in 1968, making it the largest and longest-tenured family medicine residency program in the state of California.⁷⁰ On July 1, 2020 (hereafter referred to as “Day 1”), the newest class of resident physicians began their three-year residency and began practicing medicine at VCMC. The graduating class of 2023 was comprised of 15 resident physicians. Each year, 15 new residents are accepted into the program, making a total of 45 practicing residents at VCMC each year during the three-year residency.⁷⁰ At the time of this study, the principal investigator (PI) was the Chief Clinical Dietitian at VCMC and worked with the resident physicians on a daily basis. Thus, this population was a convenience sample.

The PGY-2 and PGY-3, as of July 1, 2020, resident physicians were the control group (Group A).⁷¹ The incoming class of resident physicians (class of 2023), or interns, was the experimental group (Group B). All 15 interns and the combined 30 PGY-2 and PGY-3 resident physicians were to be included in the study; none were to be excluded. Two interns, 1 male and 1 female, declined to participate in the study due to “personal reasons”. The PI reached out via email to offer further explanation and answer questions in attempts to address any concerns, however both interns chose again to opt out. After excluding the opt-outs, there were 43 potential study participants (Group A, n = 30; Group B, n = 13), of which 38 completed the online Informed Consent (Group A, n = 25, Group B, n = 13) and were eligible to be included in the study.

Of the 38 participants who completed the Informed Consent, 37 completed the Demographic Data and Nutrition Information. One female PGY-2 who did not complete the Informed Consent was then deemed a non-responder despite weekly email reminders over the 6-month study duration (Group A, n = 24; Group B, n = 13).

Of the 37 participants who completed the Demographic Data and Nutrition Information, most of Group A (62.57%, n = 15) and all of Group B (n = 13) were between the ages of 26-30; of the remaining participants in Group A, 7 (29.17%) were between 31-35 years of age; and 1 each (4.17%) was between 36-40 years of age and 41 years of age or older. None were 25 years of age or younger. Group A was fairly evenly split between females (41.67%, n = 10) and males (58.33%, n = 14) while Group B was mostly female (76.92%, n = 10). The majority of participants in both groups were white (Group A = 66.67%, n = 16; Group B = 76.92%, n = 10;) with the remaining respondents split between Asian (Group A = 16.67%, n = 4; Group B = 7.69%, n = 1), Hispanic or Latino (Group A = 12.5%, n = 3; Group B = 7.69%, n = 1), and Other (Group A = 4.17%, n = 1; Group B = 7.69%, n = 1). More than 3/4 (79.17%, n = 19) of Group A reported having completed an MD versus a DO (20.83%, n = 5) while almost 2/3 of Group B reported having completed an MD (61.54%, n = 8) compared to a DO (38.46%, n = 5). Self-reported heights and weights were entered into the BMI calculator on the NHLBI website, and revealed BMIs ranging from 20.2 (Normal) to 28.6 (Overweight) in Group A and from 19.4 (Normal) to 33.7 (Obese) in Group B.⁷² The majority of participants in both groups (Group A = 79.17%, n = 19; Group B = 69.23%, n = 9) were in the Normal BMI range of 18.5-24.9. Five (20.83%) participants in Group A and 3 (23.08%) in Group B were in the Overweight BMI range, and 1 (2.7%) participant in Group B was in the Obese BMI range. In Group A, more than 1/3 of participants (37.5%, n = 9) reported exercising twice a week, followed by 1 day a week (25%, n = 6). Not exercising at all and exercising 3 days a week were tied (12.5% each, n = 3 each), followed by 4 days a week (8.33%, n = 2), and 5 days a week (4.17%, n = 1). In Group B, 5 days a week of exercise was the most frequently reported (38.46%, n = 5), followed by 3 days a week (30.77%, n = 4), then no exercise (15.38%, n = 2). Two and 4 days a week of exercise

were equally reported (7.69% each, n = 1 each). No one reported exercising 6 or 7 days per week. All participants reported no tobacco use. Most reported not using dietary supplements (Group A = 79.17%, n = 19; Group B = 84.61%, n = 11), though some did (Group A = 20.83%, n = 5; Group B = 15.38%, n = 2).

Regarding nutrition-focused questions, the majority (Group A = 66.67%, n = 16; Group B = 92.31%, n = 12) of participants reported not having completed any previous nutrition-specific coursework or degrees, though some did (Group A = 33.33%, n = 8; Group B = 7.69%, n = 1). There were several (Group A = 12.5%, n = 3; Group B = 30.77%, n = 4) participants who did not know what a registered dietitian nutritionist (RDN) was. Of the majority (Group A = 87.5%, n = 21; Group B = 69.23%, n = 9) who did, most (Group A = 80.95%, n = 17; Group B = 77.78%, n = 7) provided brief explanations. In Group A, all but 1 (95.83%, n = 23) participant reported having worked as a member of an interprofessional/interdisciplinary team that included an RDN before, while in Group B less than a third (30.77%, n = 4) reported doing so. When asked to choose between four statements to reflect their personal nutrition knowledge most accurately, most of Group A (66.67%, n = 16) chose “I know enough to explain the principles of nutrition to a patient” (Group B = 30.77%, n = 4). Group B participants chose “I know something about nutrition, but not enough to explain to a patient” (53.85%, n = 7) most frequently, which was Group A’s next most frequent selection (25%, n = 6). Few selected “I know very little about nutrition” (Group A = 4.17%, n = 1; Group B = 15.38%, n = 2), and only 1 participant in Group A (4.17%) selected “I know enough to treat a patient using nutrition-based treatment”. No one reported having been trained in nutrition-based treatments when asked to choose a statement that most accurately reflected their experience with nutrition-based treatments. Rather, most (Group A = 66.67%, n = 16; Group B = 53.85%, n = 7) reported having

observed or talked with people using nutrition-based treatments with patients. Several (Group A = 12.5%, n = 3; Group B = 30.77%, n = 4) admitted having NO experience with nutrition-based treatments, with some reporting to currently (Group A = 12.5%, n = 3; Group B = 15.38%, n = 2) be using or have used in the past (Group A = 8.33%, n = 2; Group B = 0.00%; n = 0) nutrition-based treatments on themselves. Regarding sources to refer to for information about nutrition, Group A most commonly selected peer-reviewed journals (79.17%, n = 19), followed by the general Internet (58.33%, n = 14). This was reversed for Group B, with more selecting the general Internet (76.92%, n = 10) followed by peer-reviewed journals (61.54%, n = 8). Textbooks and previous lectures were both selected equally in Group A (45.83% each, n = 11 each) and were the next most frequently selected in order in Group B as well (textbooks = 46.15%, n = 6; lectures = 38.46%, n = 5), followed by professional magazines (Group A = 33.33%, n = 8; Group B = 0.00%, n = 0). No one in Group A reported using blogs (Group B = 15.38%, n = 2), consumer magazines (Group B = 7.69%, n = 1), or Instagram (Group B = 7.69%, n = 1), while one person in Group A reported using Pinterest (4.17%). No sources (Group A = 4.17%, Group B = 7.69%, n = 1 each) or other sources not listed (Group A = 8.33%, n = 2; Group B = 0.00%, n = 0) were minimally selected. No one reported using Twitter as a nutrition reference (see Table 9: Demographic Data and Nutrition Information).

Instruments

Informed consent was obtained through a link provided by the researcher on Day 1 online (see Study Design, below), providing an introduction to the study and provision for a digital signature and a date and time stamp manually entered by the participant (see Appendix B: Informed Consent).

Demographic data and nutrition information were obtained via a 15-question survey, including the following: age; gender (Male (M) or Female (F)); race/ethnicity (White, Black or African American, Native American/Alaskan Native, Pacific Islander, Asian, Native Hawaiian and Other Pacific Islander, Hispanic or Latino); year of study (PGY-1, PGY-2, PGY-3); height and weight (to calculate BMI); exercise frequency (in days per week; 1, 2, 3, 4, 5, 6, 7); use of tobacco (Yes/No); use of dietary supplements (Yes/No); previous nutrition-specific coursework or degrees completed (Yes/No); along with options to choose from a list of answers regarding self-reported knowledge of nutrition in patient care, experience with nutrition in patient care, and sources of nutrition information (See Appendix C: Demographic Data and Nutrition Information).^{2,73}

The NIPS was developed as a measure of physician attitude toward nutrition in patient care, and to address the following goals of the NAA program: 1) increase coverage of nutrition in patient care in undergraduate curriculum; 2) promote clinical nutrition career development; and 3) foster clinical research on the role of nutrition in disease prevention.⁵⁸ The NAA also specifically aimed to both instill and strengthen the attitudes of medical students regarding nutrition in disease prevention, acknowledging that attitudes, combined with skills, knowledge, and motivation, are important in the formation of prevention-oriented clinical behavior.⁵⁸ A number of studies have utilized the NIPS to measure attitudes in medical students and healthcare practitioners.^{59,74–77}

The NIPS is a 45 question survey with 5 subscales – nutrition in routine care (NRC, 8 items), clinical behavior (CB, 20 items), physician-patient relationship (PPR, 8 items), patient behavior/motivation (PBM, 3 items), and physician efficacy (PE, 6 items) (See Appendix D: NIPS).⁵⁸ A 5-point Likert response scale is utilized for the first 25 questions (1 = strongly

disagree, 2 = disagree, 3 = uncertain, 4 = agree, 5 = strongly agree), with 4 questions being reverse scored (5 = 1, 4 = 2, 2 = 4, 1 = 5) to protect against response bias.^{58,78} Higher scores on all subscales except for CB indicate more positive attitudes.⁷⁸ Questions 26-45 are dichotomous (0 = No, 1 = Yes).⁵⁸ These CB subscale responses are scored by calculating the percentage of “yes” responses to questions.⁷⁸ The NIPS has been used as a validated survey to assess nutritional attitudes in other studies involving physicians.^{59,79}

Due to no known validated nutrition knowledge tests, nutrition knowledge was assessed by calculating the change in correct responses to a multiple-choice quiz containing 15 questions derived from the ASPEN Self-Assessment Program Modules (See Appendix E).⁸⁰

Research is lacking regarding physician attitudes towards RDNs specifically, outside of attitudes towards nutrition in general. An interview guide was developed to direct the line of questioning towards determining intern/resident physician attitudes towards RDNs (See Appendix F: Interview Informed Consent and Guide). The interview guide consisted of questions aimed at determining the following: whether interns/resident physicians know/knew what RDNs are and do, and where they learned that information; whether they have worked with RDNs before, and if so, what any previous experiences with RDNs were like; whether they are familiar with the RDNs at the study facility; how they would describe their interprofessional relationship with RDNs; whether RDNs are considered a reliable nutrition information source; how they feel about placing consults to RDNs; how they feel about approaching RDNs for nutrition-related concerns; and whether they feel RDNs add value to the interprofessional team.

Study Design

This mixed-methods research study utilized both quantitative (survey, quiz, questionnaire, and tracking) and qualitative (interview) methods. This allowed data collection to

occur during a shorter time frame to avoid interfering with intern and resident physician work schedules.⁸¹ The aim of the qualitative component was to enhance the results from the quantitative component. Triangulation through the different assessment methods enhanced the reliability of the results and ensured data saturation.⁸² A questionnaire was used to obtain demographic information. A survey and multiple-choice quiz were used to assess nutrition knowledge, while interviews were conducted to evaluate intern and resident physician attitudes towards RDNs. The number of referrals or consults entered were tracked pre- and post-intervention to assess behavior change.

Beginning January 1, 2020, the PI began tracking referrals or consults as described below. This allowed for 6 months of referrals by the incoming PGY-2 and PGY-3 (outgoing interns and PGY-2) to be analyzed for comparison to the 6 months of referrals generated post-intervention.

The Informed Consent, Demographic Data and Nutrition Information, NIPS, and multiple-choice quiz were intended to be distributed in person on Day 1 to all participants at the weekly resident Core Conference meeting. However, due to COVID-19 limiting the ability of in-person gatherings (see Limitations), the study was approved to be converted to an online format for gathering the above information. Instead of an in-person meeting, a welcome email was sent out on Day 1 to each intern and resident, introducing the PI and explaining the purpose of the study, as well as inviting participation in the study via a link to the Informed Consent sent separately directly from SurveyMonkey.

Both groups (A and B) received an introductory “Nutrition Basics at VCMC” packet, including a handout reviewing the basics of what diet orders are available to order, a list of the RDNs on staff and the areas covered by each, a “cheat sheet” on when parenteral nutrition is

appropriate and the formulations available at VCMC, and a formula card with the available oral and enteral supplements (See Appendix G: Introductory “Nutrition Basics at VCMC” Packet).

This was included in the introductory email sent on Day 1.

Once the Informed Consent was signed and dated, a link was sent to the Demographic Data and Nutrition Information via SurveyMonkey. After completion of the Demographic Data, a link was sent to the NIPS, and then a final link to the multiple-choice quiz after completion of the NIPS. As participants completed each next step, the PI regularly checked online to see when responses came in so that the link to each next step could be sent out as soon as possible.

All potential participants of both Groups A and B (n = 43) were provided the demographic questionnaire, the NIPS, and the multiple-choice quiz described previously, pre-intervention for Group B. Post-intervention, Group B was provided the NIPS and multiple-choice quiz again to assess whether knowledge and attitude changes occurred.

A randomized subsample of each class (interns, PGY-2, and PGY-3) was selected to be interviewed. Interviews provided qualitative data alongside the quantitative data from the multiple-choice quiz and survey. Random subsampling provided each resident physician/intern equal probability of being selected to be interviewed. The aim of the random subsample was to provide a non-biased representation of the total study population.⁸³ The name of each intern was entered into an Excel spreadsheet (n = 15). This process was repeated on a separate spreadsheet for PGY-2 (n = 15), and a separate spreadsheet for PGY-3 (n = 15). The following formula was used to select 6 names from the list to be interviewed:⁸³

=INDEX(\$A\$1:\$A\$45,RANDBETWEEN(1,COUNTA(\$A\$1:\$A\$45)),1)

After completion of the multiple-choice quiz, participants who were randomly selected to be interviewed were contacted via email to set up a time for an in-person interview. One of the

interns selected to be interviewed opted out of the study. The other 5 interns were interviewed. Two each of the PGY-2 and PGY-3 residents who were selected to be interviewed were non-responders. Of the 4 remaining PGY-2 names selected, only 1 completed everything and was able to be interviewed. Of the 4 remaining PGY-3 names selected, 3 were able to be interviewed. Numerous attempts were made to arrange interviews, however conflicting schedules made it not feasible. Interviews were conducted at the convenience of the intern or resident, often either at lunch or after-hours (after 5 or 6pm), and typically in the PI's office or elsewhere on the VCMC campus. The interviews were recorded and transcribed via the Otter.ai app on the PI's personal Android smartphone.⁸⁴ The transcriptions were then sent to the PI's personal computer, edited as needed for clarification, printed, and placed in a secure binder for review.

Referrals to RDNs, or as they are formally called in the electronic medical record (EMR) Cerner that is used at VCMC, "Consult to Nutritionist, Adult" and "Consult to Nutritionist, Pediatric", were tracked through the EMR. Referrals to RDNs are entered as an order within a patient chart and are viewed via the Multi-Patient Task List function in Cerner. RDNs have 48 hours to respond to a referral/consult per hospital policy. When the referral/consult has been completed, the RDN closes the referral/consult and it no longer appears on the Multi-Patient Task List. Each day, the PI manually printed two copies of the Multi-Patient Task List – one was provided to the staff RDNs to determine patient prioritization, and the second copy was placed in a filing cabinet belonging solely to the PI. The number of referrals/consults during the 6 months prior to the intervention (January 1, 2020-June 30, 2020) were counted and recorded, then compared to the number of referrals/consults received during the 6 months during and post-intervention (July 1, 2020-December 31, 2020). The referrals/consults were retrospectively

reviewed in the EMR to determine the physician responsible for placing the referral/consult. Only referrals/consults placed by the physicians who became PGY-2 on July 1, 2020 were of interest during the January 1-June 30 timeframe, as they were exiting interns. From July 1-December 31, only the referrals/consults placed by the incoming interns were of interest.

Group A proceeded through their normally scheduled rotations, with normal and routine interactions with RDNs occurring as is typical in the hospital setting.

For Group B, once an intern completed all the pre-intervention steps (the Informed Consent, the Demographics, the NIPS, and the multiple-choice quiz), the PI emailed them to set up a time for mentoring. Interns were offered several options for breaking up the mentoring sessions: they could choose four 15-minute sessions, two 30-minute sessions, or one 60-minute session, per their preference. The time and day of the mentoring was dependent on the schedule of the intern and offered as an option before the day's rotation began (roughly 6am), at any point during the day, or after the day's rotation ended (roughly 5-6pm). For those working night shifts, the offer of before (5-6pm) or after (roughly 6am) a shift was also available. Once a time and date was selected, the PI confirmed via email and, if needed, sent reminders via TigerText, also known as TigerConnect, prior to the meeting to determine if rescheduling needed to occur such as due to incoming traumas or other unexpected occurrences.⁸⁵ During the mentoring, the Otter.ai app was utilized to record the mentoring for later review and to capture qualitative data for further analysis. Interns were always verbally informed that the mentoring was being recorded and the purpose of the recording. No one declined to be recorded.

Mentoring covered the following topics:

- The role of the RDN as a member of the interprofessional team
- How the RDN can benefit the patient and assist the intern, such as with:

- Initiating or changing parenteral and enteral nutrition
- Diagnosing malnutrition
- Resourcing the Nutrition Care Manual/Pediatric Nutrition Care Manual
- Where RDN notes can be found in Cerner
- How to enter a “Consult to Nutritionist, Adult” or “Consult to Nutritionist, Pediatric” and what to write in the comment section.
- Discharging a patient – what to keep in mind.

After each intern completed the mentoring, they were verbally reminded that they would be receiving another email on December 1, 2020 to complete the NIPS and multiple-choice quiz again to assess for any changes. On December 1, 2020, the interns who had completed the mentoring by that time (85%, n = 11) were sent an email with a link to the post-mentoring NIPS. Upon completion of the post-mentoring NIPS, they were sent the link to the last step, the post-mentoring multiple-choice quiz.

Throughout the study, weekly email reminders were sent to participants to thank them for their participation, to thank them for completing the parts they had (as appropriate), and to remind them to please complete the step that they had not yet turned in, if any. The emails always included an offer to have any lost links resent at any time, which several participants utilized.

Data Analysis

Statistical Software

IBM SPSS Statistics Software (SPSS) for Windows, Version 27, Chicago, IL: SPSS Inc. was used to analyze data.⁸⁶

Statistical Methods

This study contained both categorical and continuous variables (see Table 10: List and Type of Variables). The number following each variable represents the number of categories for that variable. The categorical variables included: age (8); race/ethnicity (7); exercise frequency (7); personal nutrition knowledge (4); experience with nutrition-based treatments (5); and sources of nutrition information (12). Additionally, gender, use of tobacco, use of dietary supplements, and previous nutrition-specific coursework or degrees were dichotomous categorical variables. The last categorical variable was the NIPS, which is Likert scale. The remaining three categories of height, weight, and multiple-choice quiz were all continuous variables. An α of .05 was used to determine statistical significance.

To answer the question of if mentoring with an RDN (independent variable, or IV; categorical, specifically nominal, data) changes physician nutrition knowledge (dependent variable, or DV; ratio data), paired samples *t*-tests (pre and post) were used to analyze the results of the multiple-choice quiz for the interns. Frequencies were run for the test scores from the PGY-2 and PGY-3 groups to determine mean scores and then one-way ANOVA tests were run to compare means between all groups.⁸⁶

To answer the question if mentoring with an RDN (RDN (IV; categorical, specifically nominal, data) changes physician nutrition knowledge (DV; ratio data), the average number of consults entered by the interns in the 6 months prior to the study was determined. This was considered the known population. Then a one-sample *t*-test was conducted to compare the number of consults entered by the interns in the 6 months after the initiation of the study.⁸⁶

To answer the question of if mentoring with an RDN (IV; categorical, specifically nominal, data) changed physician attitudes regarding their understanding of the value of the

RDN in healthcare (DV; also categorical, both nominal and ordinal data), results from the NIPS were analyzed in several different ways. The responses to questions 1-25 (Likert scale) were separated out from the responses to questions 26-45 (yes/no). For questions 1-25, the responses from each intern pre- and post-mentoring were compared through paired samples *t*-tests. Frequencies were then run for the test scores from the PGY-2 and PGY-3 groups to determine mean scores. Then one-way ANOVA tests were run to compare means between all three groups. For questions 26-45, scores were tallied from each group and converted to percentages. The responses from each intern pre- and post-mentoring were compared through paired samples *t*-tests. Frequencies were then run for the test scores from the PGY-2 and PGY-3 groups to determine mean scores. Then one-way ANOVA tests were run to compare means between all three groups. Fischer's exact tests were run to determine if there were any associations between the demographic information and the test result for each class (see Table 11: Statistical Tests).^{86,87}

Missing Values

Frequency distributions and corresponding bar charts were run to inspect categorical variables for missing values.⁸⁸ Of the 13 respondents in the PGY-1 class who completed the demographic data, 2 did not complete the post-mentoring NIPS ($n = 11$) and 3 did not complete the post-mentoring multiple-choice quiz ($n = 10$). Of the 10 respondents in the PGY-2 class who completed the demographic data, 1 did not complete the NIPS ($n = 9$) and 4 did not complete the multiple-choice quiz ($n = 6$). Of the 14 respondents in the PGY-3 class who completed the demographic data, 1 did not complete the NIPS ($n = 13$) and 2 did not complete the multiple-choice quiz ($n = 12$). The missing data accounted for more than 5% of the total data for each class and was found to occur in a random pattern. Participants with missing data were excluded

from analysis. This reduced the statistical power due to a reduced sample size, however this allowed for unbiased observed data.⁸⁹

Chapter 4: Results

Statistical Analyses to Answer Research Questions/Hypotheses

Hypothesis 1. There will be an increase in physician nutrition knowledge after mentoring with an RDN.

On average, the post-mentoring scores ($M = 9.9$, $SE = .90$) were not significantly different than the pre-mentoring scores ($M = 8.7$, $SE = .68$), $t(9) = -1.41$, $p = .05$, $r = .42$.

The results of the multiple-choice quiz pre- and post-mentoring were analyzed using paired samples t -tests.

Frequencies were run for the test scores from the PGY-2 and PGY-3 groups. The mean score for the 6 respondents in the PGY-2 group was 10.00 ($SD = .63$, range = 9-11) while the mean score for the 12 respondents in the PGY-3 group was 9.75 ($SD = 2.09$, range = 5-13). One-way ANOVA tests were run to compare means between the PGY-1, PGY-2, and PGY-3 groups. There was no significant difference in the results of the multiple-choice quiz scores, $F(2, 28) = 1.09$, $p = .35$. ω^2 could not be calculated as the group sample sizes were unequal.

Table 1. PGY-1 Pre- and Post-Mentoring Multiple Choice Quiz Analyses

	Mean	N	SD	Std. Error Mean	Correlation	Significance	t	df	Sig (2- tailed)
Pre	8.70	10	2.16	.68					
Post	9.90	10	2.85	.90					
Pre & Post		10			.446	.197			

	Mean	N	SD	Std. Error Mean	Correlation	Significance	<i>t</i>	df	Sig (2- tailed)
Paired <i>t</i> -tests	-1.20		2.70	.85			-1.41	9	.193

Hypothesis 2. There will be an increase in physician behavior regarding referrals or consults to RDNs after mentoring with an RDN.

The number of consults from interns in the 6 months during and after the mentoring was compared to the number of consults from interns six months prior. The number of consults entered by the interns ($n = 15$) between January 1st and June 30th was 106, or an average of 7.07 consults per intern. This was considered the known population mean for conducting a one-sample *t*-test. The average number of consults entered by the interns ($n = 13$) between July 1st and December 31st was 72, or an average of 5.54 consults per intern. Interns in the class of 2023 did not order significantly more consults ($M = 5.54$, $SE = 1.22$) than interns in the class of 2022, $t(12) = -1.258$, $p = .232$, $r = .34$.

Hypothesis 3. There will be an increase in physician attitude regarding their understanding of the value of the role of the RDN in healthcare after mentoring with an RDN.

The scores from NIPS were analyzed in several different ways to determine if any statistically significant differences in responses had occurred. First, the responses from questions 1-25, which were scored on a Likert scale of 1-5 (1 = strongly agree, 5 = strongly disagree, with 4 questions reverse scored) were tallied. The highest possible score was 120. The responses from each intern pre- and post-mentoring were compared through paired samples *t*-tests.

The paired samples correlation showed that the measurements were not significantly correlated, with a correlation coefficient of .158 and its associated p -value of .643. There was no statistically significant difference between pre- and post-mentoring scores in the responses to questions 1-25. On average, the post-mentoring scores ($M = 95.36$, $SE = 2.62$) were not significantly different than the pre-mentoring scores ($M = 96.73$, $SE = 1.893$), $t(10) = .458$, $p = .05$, $r = .14$.

Table 2: PGY-1 Pre- and Post-Mentoring NIPS Questions 1-25 Analyses

	Mean	N	SD	Std. Error Mean	Correlation	Significance	t	df	Sig (2- tailed)
Pre	96.73	11	6.28	1.89					
Post	95.36	11	8.68	2.62					
Pre & Post		11			.158	.643			
Paired t -tests	1.36	9.87	2.97				.458	10	.657

Frequencies were run for the test scores from the PGY-2 and PGY-3 groups. The mean score for the 9 respondents in the PGY-2 group was 95.44 ($SD = 11.98$, range = 77-113) while the mean score for the 13 respondents in the PGY-3 group was 94.31 ($SD = 5.28$, range = 84-100).

One-way ANOVA tests were run to compare means between the PGY-1, PGY-2, and PGY-3 groups. There was no significant difference in the results of the scores on the first 25 questions of the NIPS, $F(2, 32) = .22$, $p = .81$. ω^2 could not be calculated as the group sample sizes were unequal.

Next, the responses to questions 26-45 (dichotomous, yes = 1, no = 0) were tallied. These made up the Clinical Behavior (CB) subscale and scoring was calculated as the percentage

of yes responses, with 20/20 or 100% being the highest. The responses from each intern were converted to percentages and compared pre- and post-mentoring through paired samples *t*-tests.

There was a statistically significant difference in the Clinical Behavior subscale scoring post-mentoring as compared to pre-mentoring. On average, post-mentoring scores ($M = .9273$ or 92.73%, $SE = .0217$ or 2.2%) were significantly different than the pre-mentoring scores ($M = .8636$ or 86.36%, $SE = .03759$ or 3.76%), $t(10) = -2.283$, $p = .05$, $r = .59$.

Table 3: PGY-1 Pre- and Post-Mentoring NIPS Questions 26-45 Analyses

	Mean	N	SD	Std. Error Mean	Correlation	Significance	<i>t</i>	df	Sig (2- tailed)
Pre	.8636	11	.12	.04					
Post	.9273	11	.07	.02					
Pre & Post		11			.679	.022			
Paired <i>t</i> -tests	-.06		.09	.03			-2.28	10	.046

Frequencies were run for the test scores from the PGY-2 and PGY-3 groups. The mean score for the 9 respondents in the PGY-2 group was .9056 or 90.56% while the mean score for the 13 respondents in the PGY-3 group was .9115 or 91.15%. One-way ANOVA tests were run to compare means between the PGY-1, PGY-2, and PGY-3 groups. There was no significant difference in the results of the scores on the CB subscale questions of the NIPS, $F(2, 32) = .32$, $p = .73$. ω^2 could not be calculated as the group sample sizes were unequal.

Next, Fisher's exact tests were run to determine whether there were any associations between the demographic information and the test results for the interns. There were no significant associations between age, gender, race/ethnicity, degree type, BMI, exercise

frequency, dietary supplement use, previous nutrition-specific coursework, knowledge of what an RD/RDN is, having worked as a member of an interprofessional/interdisciplinary team including an RD/RDN, personal nutrition knowledge, or experience with nutrition-based treatment as shown in Table 4. This was also repeated for the PGY-2 and PGY-3 classes, with no associations as well (see Tables 5 and 6).

Table 4: Association Between Demographics and NIPS Results for PGY-1

n = 11	Questions 1-25		Questions 26-45	
Demographics	Value	<i>p</i> -value	Value	<i>p</i> -value
Age	11.05	.636	5.83	1.00
Gender	8.23	.745	4.84	.73
Race/Ethnicity	21.99	.382	11.44	.84
Completed Degree	8.23	.745	4.84	.73
BMI	106.33	1.00	61.52	1.00
Exercise Frequency	26.07	1.00	15.32	.90
Dietary Supplement Use	8.18	.927	5.66	.62
Completed any previous nutrition-specific coursework or degrees?	9.66	1.00	7.58	.27
Know what an RD/RDN is?	8.08	.83	6.42	.33
Worked as a member of an interprofessional/interdisciplinary team including an RD/RDN before?	8.18	.93	6.47	.18
Statement most accurately reflecting your personal nutrition knowledge?	9.57	.42	5.66	.62
Statement most accurately reflecting your experience with nutrition-based treatments?	15.57	1.00	11.45	.27

Table 5: Association Between Demographics and NIPS Results for PGY-2

n = 9	Questions 1-25		Questions 26-45	
Demographics	Value	<i>p</i> -value	Value	<i>p</i> -value
Age	20.71	1.00	8.27	1.00
Gender	8.36	1.00	4.04	.71
Race/Ethnicity	20.71	1.00	8.27	1.00
Completed Degree	8.39	1.00	5.85	.16
BMI	49.24	1.00	23.03	.48
Exercise Frequency	39.09	1.00	17.96	.73
Dietary Supplement Use	8.39	1.00	7.24	.06
Completed any previous nutrition-specific coursework or degrees?	8.36	1.00	4.05	.71
Know what an RD/RDN is?	8.70	1.00	5.16	.31
Worked as a member of an interprofessional/interdisciplinary team including an RD/RDN before?	N/A	N/A	N/A	N/A
Statement most accurately reflecting your personal nutrition knowledge?	18.43	1.00	9.31	.51
Statement most accurately reflecting your experience with nutrition-based treatments?	16.58	1.00	7.68	.85

Table 6: Association Between Demographics and NIPS Results for PGY-3

n = 13	Questions 1-25		Questions 26-45	
Demographics	Value	<i>p</i> -value	Value	<i>p</i> -value
Age	24.09	.64	7.91	.84
Gender	10.32	.71	3.91	.58
Race/Ethnicity	33.93	1.00	12.29	.78
Completed Degree	14.38	.69	3.76	1.00
BMI	137.91	1.00	48.16	1.00
Exercise Frequency	43.42	.28	16.60	.51
Dietary Supplement Use	11.90	.49	4.92	.42
Completed any previous nutrition-specific coursework or degrees?	8.64	1.00	4.97	.31
Know what an RD/RDN is?	14.38	.69	3.76	1.00
Worked as a member of an interprofessional/interdisciplinary team including an RD/RDN before?	14.38	.69	3.76	1.00
Statement most accurately reflecting your personal nutrition knowledge?	27.28	.95	7.75	1.00
Statement most accurately reflecting your experience with nutrition-based treatments?	27.28	.95	8.77	.81

Qualitative Interviews

Once the pre-mentoring components were completed, interviews were arranged and conducted with the pre-selected members of each class. Time and location of interviews varied depending on the schedule that best suited the intern or resident. Interview locations included the outpatient clinic setting after the end of clinic hours, outside locations on the hospital campus during lunch breaks, the dietitian's office in the hospital, and on hospital units during breaks.

Interviews were recorded and transcribed using the Otter.ai app, exported to a Microsoft Word document, and then reviewed and corrected as needed for accuracy by the PI. Hard copies of the interview transcriptions were printed and re-read to identify key phrases and comments, which were highlighted. The highlighted portions were then assigned codes to organize data.^{90,91} As knowledge, attitudes, and behaviors were the focus of this study, these 3 general codes were the basis for the deductive coding that occurred.⁹¹ An inductive approach was used to refine and cluster similarly coded quotes⁹¹. The following six codes ultimately resulted:

1. Lack of Knowledge of Role of the RDN
2. Lack of Nutrition Knowledge
3. Attitudes – Trust
4. Attitudes – Towards RDNs
5. Attitudes – Towards Nutrition
6. Behavior – Referrals

Once the six codes were identified, responses were grouped by class year and a codebook was developed in order to facilitate data analysis (see Table 12: Qualitative Interviews).

Taxonomies were identified as lack of nutrition knowledge of resident physicians; attitudes towards nutrition; and use of consults or referrals to RDNs.⁹¹ Reviewing the taxonomies and the qualitative data led to the emergence of the following themes:

1. Lack of personal knowledge regarding nutrition does not deter resident physicians from understanding its importance in patient care.
2. Resident physicians trust and rely on RDNs as experts in nutrition.
3. Resident physicians do not view placing referrals or consults to RDNs as a priority.

As the qualitative interviews were completed prior to the post-mentoring retaking of the NIPS and the multiple-choice quiz by the interns, the themes were used to develop an overarching theory to answer how mentoring with an RDN might affect physician nutrition knowledge, physician behavior through referrals or consults to RDNs, and physician attitudes regarding their understanding of the value of the role of the RDN in healthcare:

Resident physicians faced with a lack of knowledge of the role of the RDN in healthcare as well as a lack of nutrition knowledge as a whole nonetheless place trust in RDNs and view nutrition positively in the patient care setting, despite being unfamiliar with the importance of placing referrals or consults to the RDN, which mentoring could positively influence.

Chapter 5: Discussion

Summary

This study found that there was an increase in physician attitude regarding their understanding of the value of the role of the RDN in healthcare after mentoring with an RDN. However, there was no increase in physician nutrition knowledge or physician behavior regarding referrals or consults to RDNs after mentoring with an RDN.

Conclusions

Dietitians have historically been excluded from IPE research, leading to gaps in knowledge and understanding in how the RDN is perceived and valued.^{16,17} As well, a recent scoping review of the state of interprofessional practice did not include RDNs in even one paper.⁶⁰ As physicians rely on RDNs, an understanding of the role of the RDN is vital. This

study found that mentoring with an RDN, for as little as one hour, led to an increase in physician understanding of the value of the role of the RDN.

The results of this study align the theoretical framework on which the study was based. The KABM suggests that a gain in new knowledge leads to changes in attitudes, which then results in improved behavior.⁶⁶ The statistically significant changes in the CB subscale scores as well as the qualitative interviews mirrored this response. The CB subscale questions were framed as asking if it is important that “I”, i.e. the resident physician, perform a particular behavior. These behaviors included addressing diets and dietary habits, recommending dietary changes, following national guidelines, and referring patients.⁵⁸ After mentoring with an RDN, the interns scored higher on the CB subscale, indicating a positive change in their attitudes towards the understanding of the value of the role of the RDN in healthcare. This follows the KABM in that the change in attitude is a result of an increase in knowledge, in this case from mentoring with the RDN and understanding the role of the RDN.⁶⁶

While the PGY-1 interviewees reported minimal knowledge or understanding of the role of the dietitian, the PGY-2 and PGY-3 interviewees were able to define that role more clearly. With years of experience came increased nutrition knowledge, a change in attitudes towards nutrition, and an improvement in an understanding of the value of the role of the RDN. PGY-1 interviewees reported being “not super clear” and having a “limited impression” of the role of the RDN in the hospital setting. A PGY-3 interviewee also reported not having “learned anything specific in med school about... the role of (the RDN) and here’s what they do”. While interns typically lacked a full understanding of exactly what role a dietitian should play, there was a level of trust reported by residents, regardless of class year, in dietitians as nutrition care experts.

“I feel totally out of my wheelhouse and so I pretty much just trust that they (*RDNs*) know what they’re talking about” (PGY-1)”.

“I’m just like, I trust (*the RDN*)” (PGY-2).

“I feel like any recommendation from an RDN is pretty much gold” (PGY-3).

This level of trust in RDNs is an important factor to acknowledge. Despite feeling inadequately prepared to counsel patients on nutrition, residents of all class years reported relying on RDNs. This is critical in bridging the gap that exists in residents’ nutrition knowledge.^{11,59} Trusting in RDNs opens the doors to more opportunities for interprofessional relationships and opportunities to teach residents and help them become more knowledgeable and increase their self-efficacy in counseling skills.¹¹ The trust reported in RDNs across all class levels should not be taken lightly. Though the sample size was small, various previous and current RDNs at the hospital study site have spent years teaching residents, some of whom are now attending physicians at the same hospital, about nutrition and its importance. In this way, mentoring has informally occurred for years, aiding in the development of inclusively excellent cultures.⁶⁴ Thus, this trust has been earned prior even to the arrival of the interns, perhaps contributing in part to the residency program continually being named the top in the nation.⁷⁰

This relationship between the RDNs and residents may explain why the PGY-2 and PGY-3 respondents scored higher on the multiple-choice quiz than the pre-mentoring interns, the PGY-2 class ordered more consults during the last 6 months of their intern year than the current interns, and why both the PGY-2 and PGY-3 classes scored higher on the CB subscale of the NIPS (though lower on the other subscales) than the pre-mentoring interns. This suggests that some level of nutrition knowledge, attitudes, and behaviors were learned throughout the intern year leading to behavior change in the PGY-2 and PGY-3 years. This would be expected to

some degree, as any student would feel more comfortable and have a larger knowledge base in their successive years, but not necessarily their first year. The first year of any program comes with a steep learning curve – understanding the layout of the hospital, how rounding works, whom to call, where to be, how to use an EMR, etc., for example. To add in learning about nutrition on top of that would be unlikely to occur. Informal conversations with interns suggested that medicine rotations were the busiest, with reports of staying after hours or up most of the night trying to finish charting. While interns are reportedly given less patients during the first six months of their intern year, this did not stop interns from overall acknowledging feeling “overwhelmed” with learning how the hospital works, trying to keep up with their changing rotations (each rotation lasts 3 weeks), and with clinic duties assigned alongside rotations. This might explain why the current interns ordered less consults than the current PGY-2 class did during the last 6 months of their intern year. If the intern class truly had a smaller patient load during their first 6 months, then it may be possible that there could have been a statistically significant difference in the number of consults or referrals placed to RDNs if the total number of patients cared for was adjusted. However, it is also possible that there would not have been a difference as the interns reported being unfamiliar with the role of the RDN, which likely changed during the course of the intern year. Several interns, after the completion of the mentoring, expressed surprise at how quickly the time had passed. A common report was “That wasn’t so bad!”, or “I wish I had done this sooner”. This may indicate some level of fear of the unknown, i.e., the RDN and/or nutrition, as a reason for delays in completing the mentoring. Additionally, several interns expressed interest in further time with an RDN for continued learning, which was offered as an option after completion of the study. PGY-2 and PGY-3 residents have elective rotations during which some have requested to spend time with an RDN

to further increase their nutrition knowledge, which was expressed to interns as well for their consideration for the future.

Limitations

One of the biggest challenges facing this research was time. Interns and resident physicians have tightly choreographed schedules aimed at maximizing their family medicine residency. This leaves little margin for any additional time to spend on any outside work, including mentoring with an RDN. This challenge was broached with the program director as well as with one of the committee co-chairs who also works with the interns and residents and understands the importance of nutrition prior to the start of the study. The PI discussed with the program director that the intervention would be kept as close as possible to the strict timelines as outlined in this paper, and that the interns would be minimally affected by the mentoring time by suggesting the time-neutral solution of offering to work with the interns during their lunch break. The PI also provided the director with names of specific residents (some current, some prior, having already graduated) who have requested to spend time with an RDN to enhance their nutrition knowledge over the years. Lastly in the discussion, the PI focused on the intended goals of increasing intern and resident physician nutrition knowledge to better prepare them to appropriately order nutrition consults and gain an understanding of the importance of the RDN as a part of the inter-professional team, enhancing patient care at the bedside.

Another challenge was failure of the interns/resident physicians to complete the surveys. While the aim was for the demographics questionnaire and pre-intervention NIPS and multiple-choice quiz to be given during the orientation period prior to Day 1, this did not actually occur due to COVID-19 restricting in-person gathering. Thus, everything was sent out via email with links to the SurveyMonkey site to be completed. Due to interns and residents not regularly

checking emails, emails being misdirected to a spam folder, and general business of interns and residents who admitted to reading the emails but not clicking on the links, some residents never completed even the informed consent.

This led to an even smaller sample size than initially anticipated, which may be a limiting factor. There were only 15 resident physicians in each class and having 2 interns opt out decreased the already small potential intervention sample size even further. Due to this, the results of this study may not be generalizable to other institutions. However, other academic medical centers may have similar findings due to the interactions that occur between members of the interprofessional team, specifically resident physicians and RDNs.

From the interviews, a commonly identified theme was that there was no continuity of which RDN was responsible for which area of the hospital, except for the long-term pediatric RDN. This was affected in part due to turnover during the study of 3 RDNs, requiring frequent changes in the responsibility of cross-covering of units by other RDNs. This was meted by informing the residents of the location of the RDN office and their ability to stop by at any time, providing the residents with the RDN office phone number, and reminding the residents that the RDNs were available via TigerText or TigerConnect as well.

The largest unplanned and unforeseen limitation of this study was the rapidly evolving pandemic, COVID-19, that began during the planning and initiation of this study. At the time of the intern orientation, the County of Ventura had a total of 3,096 cases and 46 deaths related to COVID-19 (internal county e-mail communication, July 1, 2020). This led to the need to develop alternate plans for the use of virtual technology instead of face-to-face communication between the PI and the interns and resident physicians. COVID-19 initially negatively affected the number of hospitalizations due to the cancellation of planned, non-emergent surgeries (internal

memo). Due to hospital protocol, RDNs were required to transition to telenutrition for roughly the first 3 months of the academic year (July-September 2020), working remotely from an office and completing all consults via telephone instead of being visible and present on the floors on a daily basis. This decreased the number of visible opportunities between interns/resident physicians and RDNs, which may have affected the results of the responses to the interviews. As well, the lack of a visual presence of RDNs on the hospital floors may have negatively affected physician responses to the NIPS as well as number of consults or referrals entered.

Implications for Practice

This study adds a new layer to the IPE research that exists, by contributing research regarding the RDN as a member of the healthcare team, which is historically lacking.³⁰⁻³³ While participants in this study did report a lack of knowledge of the role of the RDN, there was not a lack of respect for the RDN reported, which differs from previous reported findings.³¹ There seemed to be a healthy level of respect towards the RDNs from the residents, meeting the goal of IPE to value other team members and foster mutual respect.³¹ Some of this seemed to come in a top-down format from attending physicians, with one PGY-3 reporting that the attendings “kind of encourage or remind us that (*RDNs are*) another kind of resource available”. This may be in part due to the program in this study focusing on family medicine, which has been suggested to be more accepting of other disciplines when compared to internal medicine or surgical subspecialties (personal communication). As well, being an academic medical center wherein teaching is a fundamental aspect may lend itself towards a more inclusive culture than other facilities such as a community hospital.

PGY-2 and PGY-3 interviewees agreed that an earlier introduction to the topic of an RDN in general in medical school, as well as specifically an introduction to the RDNs in the

hospital setting in the intern year would have been beneficial. This aligns with the values that interprofessional practice aims to achieve in learning from and with other health professions throughout the healthcare system.²⁵ While in this particular facility, there is usually an “Orientation Fair” with each discipline as an opportunity to put names and faces together for members of the interprofessional team, this was canceled due to COVID-19, thus putting the intern class at a disadvantage compared to previous intern years. A PGY-3 interviewee suggested a half-day rotation with the RDNs to better understand the workflow of the RDN, specifically “how you guys think through your consults... and write your note... and, like, what that even looks like. I think... (*that*) would be super beneficial”. A PGY-2 interviewee echoed that, suggesting:

“baby steps, like, a little bit at a time sort of thing. Or maybe do something in the last quarter of intern year where we have a better understanding of how the hospital works. I think that’s the time to really capture our attention with something that was never learned before, and I think people would be really interested.”

The idea of working alongside an RDN is not new, though it has more often occurred during medical school rather than during residency with increases in nutrition knowledge and knowledge of the role of the RDN.⁵ Thus, it would be expected that mentoring with an RDN would have similar improved outcomes. While the change in multiple-choice test scores were not statistically significant among the PGY-1 group, the scores did improve and became similar to the scores of the PGY-2 and PGY-3 groups who did not receive mentoring but had worked with RDNs throughout their year(s) of residency. This suggests that working alongside an RDN as a member of the interprofessional team may lead to improved nutrition knowledge, though additional studies should pursue this formally. A longer period of mentoring may be beneficial

to gain a more thorough understanding of the changes that occur in residents' overall knowledge, attitudes, and behaviors throughout their intern year as compared to PGY-2 and PGY-3 years. Residency is a critical opportunity for RDNs to make an impression on resident physicians and to help them better understand the value of the role of the RDN in interprofessional practice.

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Table 7: CVD-Related Nutrition Competencies Categorized by ACGME Domains

Domain	Competencies
<p>Patient care:</p> <p>Demonstrate care that is patient centered, compassionate, appropriate, and effective</p>	<p>In all patients, uses most long-term care visits to inquire about diet and provide brief, focused diet recommendations and messages</p> <p>In patients with ASCVD or risk factors, demonstrates the ability to</p> <ul style="list-style-type: none"> Assess short- and long-term ASCVD risk and criteria for metabolic syndrome via the medical history, vital signs, waist circumference and BMI, laboratory data, and an ASCVD risk calculator Take a diet history informally or via a diet assessment tool Formulate a diet-related diagnosis, intervention, and follow-up plan matched to the level of ASCVD risk and to specific risk factors Consider comorbidities and socioeconomic factors that impact diet behavior; assess readiness for diet change; use evidence-based behavior change techniques, with self-monitoring when appropriate Recognize patients who will benefit from referral to RDNs for medical nutrition therapy Record all of the above in an accurate and timely manner
<p>Medical knowledge:</p> <p>Demonstrate knowledge of established and evolving biomedical, clinical, epidemiological, and social/behavioral sciences and apply this knowledge to patient care</p>	<p>Demonstrates knowledge and application of</p> <ul style="list-style-type: none"> Basic principles of nutrition science and food sources of macronutrients and micronutrients Basic evidence linking specific foods/nutrients, dietary patterns, and food habits/environments to increased or decreased ASCVD risk Diet assessment tools and evidence-based behavior change strategies and techniques
<p>Systems-based practice:</p> <p>Demonstrate awareness of the broader health system and the ability to apply its resources to individual care</p>	<p>Demonstrate the ability to</p> <ul style="list-style-type: none"> Access national dietary guidelines and Internet-based patient education tools Refer patients appropriately to RDNs, lipid specialists, diabetes mellitus care specialists, obesity specialists, bariatric surgeons, and behaviorists and to participate in team-based nutrition care delivery

Domain	Competencies
<p>Practice-based learning and improvement:</p> <p>Demonstrate the ability to evaluate one's care and to continually improve it</p>	<p>Demonstrates the ability to</p> <ul style="list-style-type: none"> Improve nutrition care delivery by incorporating new nutrition science, guidelines, assessment tools, patient education tools, and diet counseling techniques Monitor and improve patient diet behaviors and outcomes Monitor and improve one's progress in achieving nutrition competencies
<p>Interpersonal and communication skills:</p> <p>Demonstrate skills that lead to effective exchange of information and collaboration to improve patient care</p>	<p>Demonstrates the ability to</p> <ul style="list-style-type: none"> Communicate diet and nutrition information to patients based on education and health literacy levels Communicate effectively with dietitians, behaviorists, lipid specialists, and other team members in a manner that supports a team approach to health promotion and treatment of disease
<p>Professionalism:</p> <p>Demonstrate the ability to carry out professional activities and to adhere to ethical principles</p>	<p>Demonstrates</p> <ul style="list-style-type: none"> Empathy when counseling patients with alcoholism, obesity, eating disorders, dietary nonadherence, and culturally based dietary habits Professionalism in communications with all care team members and the ability to serve as a role model to those with less nutrition and medical knowledge Integrity in the delivery of evidence-based diet information (and avoids financial or other conflicts related to industry or business entities) Recognition of personal deficiencies in nutrition competency and the ability to work to rectify these

ACGME indicates Accreditation Council for Graduate Medical Education; ASCVD, atherosclerotic cardiovascular disease, BMI, body mass index; CVD, cardiovascular disease; and RDNs, registered dietitian nutritionists.¹¹

Table 8: EPAs Relevant to Nutrition Competencies

EPAs	Entrustable Behaviors
1. Gather a history and perform a physical examination	Gathers all information related to diet and CVD risk from: Personal and family history, diet/lifestyle history, and basic laboratory data Formal diet assessment, when appropriate Evaluation of social, cultural, and economic factors that influence diet habits Physical examination findings, including BMI, waist circumference, and other physical findings of CVD risk Does all of the above in a complete manner and with sensitivity and cultural awareness
2. Prioritize a differential diagnosis after a clinical encounter	Synthesizes all diet-related information and draws on knowledge and experience to recognize Relationships between dietary history and CVD risk or risk factors, including acute CVD events Social, cultural, and economic factors that impact diet habits Openly discusses conclusions with supervisors and patients
3. Recommend and interpret common diagnostic screening tests	Performs diet-related screening and testing based on Standards of care National guidelines Cost awareness Patient preferences Performs test interpretation that Is accurate Recognizes urgency when present Discusses test results with supervisors and patients
4. Enter and discuss orders and tests	Prescribes diet orders and recommendations that Match the patient's clinical diagnosis, CVD risk, or acute CVD event/illness Account for other clinical factors Recognize social, cultural, and economic factors Use health information technology and tools Include RDN referral when needed

EPAs	Entrustable Behaviors
4. Enter and discuss orders and tests	Discusses diet recommendations with patients in a nonjudgmental manner, as well as with other team members
5. Document a clinical encounter in the patient's record	Documents diet-related histories, examination findings, assessments, and plans that are Systematic, complete, timely, and legible Tailored to inpatient and outpatient care settings Inclusive of patient factors and preferences
6. Provide an oral presentation of a clinical encounter	Orally presents diet-related information tailored for the care setting (i.e. that is relevant to active problems in the inpatient setting and to chronic disease management in the outpatient setting) Maintains patient privacy and displays respect when presenting diet histories and behaviors
7. Form clinical questions and retrieve evidence to advance patient care	Accesses nutrition science (in guidelines, studies, review articles, and databases) to research and deliver nutrition care Recognizes areas of controversy or non-evidence-based diet information Listens to and learns from the nutrition care experiences of other professionals and team members
8. Give or receive a patient handover to transition care responsibly	N/A
9. Collaborate as a member of an interprofessional team	Understands the roles of the healthcare team in nutrition care delivery Makes timely and appropriate referrals to RDNs, RNs, PAs, lipid specialists, hypertension specialists, preventive cardiologists, obesity experts, and behaviorists Demonstrates mutual respect in interactions with team members
10. Recognizes patients in need of urgent care and initiate evaluation and management	Recognizes the possibility of acute illness requiring care escalation in patients with physical symptoms or severely abnormal findings related to ASCVD risk factors

EPAs	Entrustable Behaviors
11. Obtain informed consent for tests and procedures	N/A
12. Perform the general duties of a physician	N/A
13. Identify system failures and contribute to a culture of safety and improvement	Identifies gaps in patient diet knowledge and self-efficacy and works to close these gaps via diet counseling and educational tools Identifies gaps in hospital diet and nutrition care delivery and works through appropriate channels to close these gaps

ASCVD, atherosclerotic cardiovascular disease; BMI, body mass index; CVD, cardiovascular disease; EPAs, entrustable professional activities; NA, not applicable; PAs, physician assistants, RDNs, registered dietitian nutritionists; and RNs, registered nurses.¹¹

Table 9: Demographic Data and Nutrition Information

	Frequency (%)	
	Group A n = 24	Group B n = 13
Age - in years		
≤ 25	0 (0)	0 (0)
26-30	15 (62.57)	13 (100)
31-35	7 (29.17)	0 (0)
36-40	1 (4.17)	0 (0)
≥40	1 (4.17)	0 (0)
Gender		
Male	14 (58.33)	3 (23.08)
Female	10 (41.67)	10 (76.92)
Race/Ethnicity		
White	16 (66.67)	10 (76.92)
Black or African American	0 (0)	0 (0)
Native American/Alaskan Native	0 (0)	0 (0)
Pacific Islander	0 (0)	0 (0)
Asian	4 (16.67)	1 (7.69)
Native Hawaiian and Other Pacific Islander	0 (0)	0 (0)
Hispanic or Latino	3 (12.5)	1 (7.69)
Other	1 (4.17)	1 (7.69)
Completed Degree		
MD	19 (79.17)	8 (61.54)
DO	5 (20.83)	5 (38.46)
BMI - calculated from self-reported height and weight		
Normal	19 (79.17)	9 (69.23)
Overweight	5 (20.83)	3 (23.08)
Obese	0 (0)	1 (2.7)

	Frequency (%)	
	Group A n = 24	Group B n = 13
Exercise Frequency - days per week		
0	3 (12.5)	2 (15.38)
1	6 (25)	0 (0)
2	9 (37.5)	1 (7.69)
3	3 (12.5)	4 (30.77)
4	2 (8.33)	1 (7.69)
5	1 (4.17)	5 (38.46)
6	0 (0)	0 (0)
7	0 (0)	0 (0)
Tobacco Use		
Yes	0 (0)	0 (0)
No	24 (100)	13 (100)
Dietary Supplement Use		
Yes	5 (20.83)	2 (15.38)
No	19 (79.17)	11 (84.61)
Have you completed any previous nutrition-specific coursework or degrees?		
Yes	8 (33.33)	1 (7.69)
No	16 (66.67)	12 (92.31)
Do you know what an RD/RDN is?		
Yes	21 (87.5)	9 (69.23)
No	3 (12.5)	4 (30.77)

#	IF YES, PLEASE EXPLAIN BRIEFLY:
1	They specialize in nutrition and nutrition needs
2	I know they calculate tube feeds and give recs on diets in the hospital usually for more complicated patients
3	expert in nutrition and diet who can help maximize nutritional needs based on patients' medical condition
4	person with accredited degree studying nutritional/dietary sciences
5	Provider who assesses nutritional status and makes recommendations regarding dietary interventions
6	Licensed professional with training to assess and treat nutritional problems.
7	Yes they are specialized in providing recommendations regarding diet in the hospital for certain diseases and can also help with TPN recommendations.
8	experts in nutrition, also can help diagnose malnutrition, make recommendation to optimize pt's protein intake
9	More or less. People who study diet, nutrition, can be clinical or non clinical
10	specialist in nutrition
11	Helps provide proper diet and nutrition for pts
12	Helps w diet supplementation, teaching, TPN.
13	A person with formal, nutrition/dietetics specific education/training, including internship and certification.
14	Healthcare worker who is a food and nutrition expert who provides education about healthy living.
15	A person who studies the science of diet and the optimization of the nutrients for individuals. How that affects recovery and/or maintenance. Have the tools an education to educate others in the importance of food and how that can drastically affect one's life.
16	a specialist who can assess the macro- and micronutrient needs of a patient in specific clinical senarios
17	An expert on food and nutrition, especially among those who or ill
18	Practitioner of applied nutrition, qualified to treat patients with tailored diets
19	A food expert who has completed a BA + various trainings and programs to allow them to manage the diet of hospitalized individuals, oversee public health improvement of food services, and improve food industry/nutrition related business
20	Licensed professional to help diagnose and treat malnutrition, provide recs on nutritional needs in crtically ill patients.
21	Licensed professional who handled nutritional counseling and other nutritional needs such as TPN
22	Specialist in nutrition and translating food into building blocks for life
23	professional who manages inpatient diet plans
24	Someone who is trained to assess patient's nutrition needs and can give advice on supplements.

	Frequency %	
	Group A n = 24	Group B n = 13
Have you worked as a member of an interprofessional/interdisciplinary team that included an RD/RDN before?		
Yes	23 (95.83)	4 (30.77)
No	1 (4.17)	9 (69.23)
Please choose the statement that you feel most accurately reflects your personal nutrition knowledge.		
I know very little about nutrition	1 (4.17)	2 (15.38)
I know something about nutrition but not enough to explain to a patient	6 (25)	7 (53.85)
I know enough to explain the principles of nutrition to a patient	16 (66.67)	4 (30.77)
I know enough to treat a patient using nutrition-based treatment	1 (4.17)	0 (0)
Please choose the statement that you feel most accurately reflects your experience with nutrition-based treatments.		
I have had NO experience with nutrition-based treatments	3 (12.5)	4 (30.77)
I have observed or talked with people using nutrition-based treatments with patients	16 (66.67)	7 (53.85)
I have personally used nutrition-based treatments on myself in the past	2 (8.33)	0 (0)
I currently use nutrition-based treatments on myself	3 (12.5)	2 (15.38)
I have been trained in nutrition-based treatments	0 (0)	0 (0)

	Frequency %	
	Group A n = 24	Group B n = 13
Please choose which (one or more) of the following sources you do or would refer to for information about nutrition.		
Consumer magazines	0 (0)	1 (7.69)
Peer-reviewed journals	19 (79.17)	8 (61.54)
Professional magazines	8 (33.33)	0 (0)
Textbooks	11 (45.83)	6 (46.15)
Internet (general)	14 (58.33)	10 (76.92)
Previous lectures	11 (45.83)	5 (38.46)
Blogs	0 (0)	2 (15.38)
Pinterest	1 (4.17)	0 (0)
Twitter	0 (0)	0 (0)
Instagram	0 (0)	1 (7.69)
None of these, but I consult others not listed here	2 (8.33)	0 (0)
I do not consult any sources	1 (4.17)	1 (7.69)
Internet (general)	14 (58.33)	10 (76.92)

Table 10: List and Type of Variables

Variable	Type of Variable
Age	Categorical (8 categories)
Gender	Categorical (yes/no) – dichotomous
Race/ethnicity	Categorical (7 categories)
Height	Continuous
Weight	Continuous
Exercise frequency	Categorical (7 categories)
Use of tobacco	Categorical (yes/no) – dichotomous
Use of dietary supplements	Categorical (yes/no) – dichotomous
Previous nutrition-specific coursework or degrees	Categorical (yes/no) - dichotomous
Personal nutrition knowledge	Categorical (4 categories)
Experience with nutrition-based treatments	Categorical (5 categories)
Sources of nutrition information	Categorical (12 categories)
Multiple-choice quiz	Continuous
NIPS	Categorical – Likert scale

Table 11: Statistical Tests

Research Question	Variables	How it Will be Answered	Type of Data	Analysis
Does mentoring with an RDN change physician nutrition knowledge?	<i>Independent</i> – Mentoring with an RDN <i>Dependent</i> – change in knowledge	Multiple-choice quiz	<i>Independent</i> – Categorical (nominal) <i>Dependent</i> - Ratio	Paired samples <i>t</i> -test or dependent samples <i>t</i> -test (pre and post); frequencies; one-way ANOVA
Does mentoring with an RDN change number of physician referrals/consults to the RDN?	<i>Independent</i> – Mentoring with an RDN <i>Dependent</i> – change in number of referrals/consults	Number of referrals/consults	<i>Independent</i> – Categorical (nominal) <i>Dependent</i> - Ratio	Frequencies; one-sample <i>t</i> -test
Does mentoring with an RDN improve physician attitudes regarding their understanding of the value of the RDN in healthcare?	<i>Independent</i> – Mentoring with an RDN <i>Dependent</i> – change in attitude	NIPS questions	<i>Independent</i> – Categorical (nominal)	
		Questions 1-25 (Likert).	<i>Dependent</i> - Categorical (ordinal)	Paired samples <i>t</i> -test or dependent samples <i>t</i> -test (pre and post); frequencies; one-way ANOVA
		Questions 26-45 (Y/N)	<i>Dependent</i> - Categorical (ordinal)	Paired samples <i>t</i> -test or dependent samples <i>t</i> -test (pre and post); frequencies; one-way ANOVA; Fischer's exact tests
		Interviews	Qualitative	N/A

Table 12: Qualitative Interviews

Code	Qualitative Responses
Lack of Knowledge of Role of RDN	<p>“Not super clear (<i>regarding the role of the RDN</i>)”. (PGY-1)</p> <p>“My limited impression I guess is that they advise on the nutritional needs for patients.” (PGY-1)</p> <p>“Maybe this is just my own understanding of what the training is, the dietitians learn a certain type of, like, this is what you should eat, and maybe it's - old school is not the right word – like, too formulaic.” (PGY-1)</p> <p>“And so, it's like, in my mind, what is a dietitian? Maybe it's not the true role of a dietitian. I don't want to feel you do this job that I don't know what you do, you know. So, that's really the biggest barrier.” (PGY-1)</p> <p>“I don’t think we learned anything specific in med school about, ok, the role of (<i>the RDN</i>) and here’s what they do.” (PGY-3)</p>
Lack of Nutrition Knowledge	<p>“I definitely did not get much (<i>nutrition education in medical school</i>). I remember learning the basics – eat carbs and protein, more vegetables and fruit, less added sugars. I even went to the dean to ask why we weren’t learning more about nutrition.” (PGY-1)</p> <p>“I certainly wouldn’t be informed enough to have a different opinion (<i>regarding disagreeing with an RDN</i>).” (PGY-1)</p> <p>“You guys certainly know more than at least I do about the nutritional needs of patients, which is important, especially for prolonged hospitalizations to keep people alive and help them recover. So, you know, I would say that’s pretty critical.” (PGY-1)</p> <p>“I know I have a, like, lack in my knowledge. I know there’s just so much more that I’m just like, I wish I knew more of this so that I can translate it and explain it well and encourage instead of just saying... generic information.” (PGY-1)</p> <p>“We as medical students barely got an exposure to nutrition.” (PGY-1)</p> <p>“I think in med school was more of like the essential oh how much is a calorie or like the components of like carbs, the protein, and fats, but other than that... so not like what that is to provide patients and what information they might need and where to find information and things like that.” (PGY-1)</p>

Code	Qualitative Responses
Lack of Nutrition Knowledge	<p>“There's also times when I need - I need counseling from the dietitians to know what kind of diet this person needs while they're in patient.” (PGY-1)</p> <p>“I admit that I know very little about nutrition. Thank god someone knows them (<i>formulas</i>) because I don't understand.” (PGY-2)</p> <p>“I didn't really come from a science background, so I didn't have a lot of that as sort of a pre-med. And then in medical school. I think there was some attempt to, to discuss nutrition a little bit more in depth but I'm not sure that I either – it just didn't sink in with me or it didn't happen. You know, I remember instruction about like more at the molecular level, discussions of healing and how various supplementation can aid that, but thinking about, I think there's a lot more going on with nutrition as a, as a philosophy and a discipline than physicians are trained in certainly at the medical school level.” (PGY-3)</p>
Attitudes – Trust	<p>“Yeah, usually it's like any kind of order pops up or anybody texts me saying I changed this order, I'm like ‘Great’, and I just, I don't even read it, like, ‘Yes – you know what you're doing better than me’.” (PGY-1)</p> <p>“Yeah, I don't understand. I'm just like, I trust it.” (PGY-2)</p> <p>“Oh, you're checking the orders, you're following the patient – that's awesome. Because it just makes me feel even safer.” (PGY-2)</p> <p>“Most of my experience with the nutritionists here is, like, they tell me what to do. And I, like, accept the order without much further thought, because we're working as a team and I just trust because I don't have enough to really be like, are you sure? Like, it would be crazy for me to be like, ‘Oh, I don't think you did your math right’.” (PGY-2)</p> <p>“The general consensus from the residents that I've worked with, and certainly for myself is that if an RDN is making a recommendation, you know, it's something that we're going to consider strongly and likely just approve.” (PGY-3)</p> <p>“I feel like any recommendation from an RDN is pretty much gold and there's no way I'm gonna or very few reasons why I might not want to do what's recommended. And I feel like they're, they're definitely members that have the care team that when I see them involved in a patient's case, I feel really good about them being a part of the team and wanting to - to support whatever their recommendations might be.” (PGY-3)</p>
Attitudes – Towards RDNs	<p>“There's a lot more to it (<i>being an RDN</i>) that I didn't give credit to... I didn't realize how much goes into it. And I think that's just kind of part of our, I mean I don't want to speak for all physicians, but I feel like that's just kind of like an ignorance of the physician. (<i>To</i>) not realize how involved this is.” (PGY-2)</p>

Code	Qualitative Responses
Attitudes – Towards RDNs	<p>“(RDNs) greatly (<i>add value to the interprofessional team</i>). And not merely because I’m talking to one... I’m just so wowed by how much literature is out there that is not – that I’m not exposed to. And it’s really quite humbling actually.” (PGY-2)</p> <p>“A lot of the things that we just don’t learn in med school in terms of all the different calculation you guys use and some of that stuff, it’s wonderful to be able to just ask ‘Hey, this is kind of what I need’ and you come back to us with the options and it’s awesome.” (PGY-3)</p> <p>“I think having been able to work alongside RDNs and seeing the value that they bring to patient care in various settings from the ICU to medicine to pediatrics, etc. It’s really helped me better understand the depth the training and knowledge that they bring, and the, the tangible benefit that patients experience when RDNs are part of their care.” (PGY-3)</p> <p>“...patients in the ICU. The difference in their nutritional rehabilitation between a regimen developed by a physician and a regimen developed by an RDN, it’s very clear that the RDNs have a much better understanding of the nuances of the nutritional needs of that particular type of patient, as well as the perhaps the unique benefits of the various feeding supplementations available to patients in, in whatever situation they’re in, whether that’s the pediatric dietitians or the intensive care dietitians or whatever I think they’re, their focused expertise certainly trumps general understanding of a physician.” (PGY-3)</p> <p>“I’ve always found them (<i>RDNs</i>) to be very open, very interested in providing feedback, interested in teaching and sharing their expertise, always found them very easy to interact with.” (PGY-3)</p> <p>“I feel very comfortable asking nutritionists questions.” (PGY-3)</p> <p>“You guys are helping us crunch a lot of numbers and make some hard decisions for some people that are critically ill. So yeah, all good stuff.” (PGY-3)</p> <p>“And so, I think one of the things that I appreciate is that, it’s also just sort of - maybe not an official part of residency training but it’s a part of our training (<i>as a resident</i>) is to better understand the, the nuances and where the line between our expertise and an RDN’s expertise is, you know, in the same way that we reach out to collaborate with other groups in the hospital, that we should be reaching out in those cases too.” (PGY-3)</p> <p>“I feel like... they’re (<i>RDNs</i>) the experts.” (PGY-3)</p>

Code	Qualitative Responses
Attitudes – Towards Nutrition	<p>“I think it’s easy for physicians to neglect the importance of nutrition.” (PGY-1)</p> <p>“There are many patients that I think would, would do well from counseling with dietary like dietitians.” (PGY-1)</p> <p>“It (<i>diet education and exercise prescriptions</i>) seems so easy when I say it, but it’s not”. (PGY-1)</p> <p>“When patients... just want, like, they want to have a longer conversation about their health and their nutrition... and while I know I can do some of that, oftentimes that happens when I’m pre-rounding on my patients and I don’t have all the time to sit there and explain”. (PGY-1)</p> <p>“I was answering some of those questions (<i>on the NIPS</i>), you know, and it’s like – should you do a nutrition screen at every visit? No. Well, in theory, that’d be wonderful. Like, how great would that be? But I mean, when you have 15 minutes and you have to talk to them about (<i>everything</i>), you know, there’s just – there’s literally just no time. And I used to be someone who was like, oh, what do you mean there’s no time, but like literally like, going from first year to second year, in the beginning of the first year I had 60 minutes to talk to a patient and could, like, learn what their grandmother’s dog’s name is, but now that I’m seeing like 12 people in a day, there’s no way”. (PGY-2)</p> <p>“Oh wow, there really isn’t time to talk about nutrition every time. Or any time. Which is why we need people.” (PGY-2)</p> <p>” I think I will say, coming from an osteopathic school, I think there’s a lot more kind of space for the consideration (<i>of nutrition</i>). Our philosophy is pretty holistic... hitting home that nutrition is where all this starts. I don’t think there was a lot of clinical training and how to think about nutrition in like an ill patient.” (PGY-3)</p> <p>“And the sort of creativity that that expertise (<i>of an RDN</i>) can bring. Whereas, with my limited training, there's - I think my toolbox is, is much more sparse, in terms of the things that I would typically reach for, you know. So, I think, I think the benefits are the patients can - as we're more and more understanding the benefits of nutrition in the healing process, I think patients are probably getting on their feet faster than they would have otherwise.” (PGY-3)</p>

Code	Qualitative Responses
Behavior – Referrals	<p>“I’ve been given the impression that I’m supposed to know more about diet and nutrition than I do. And I should try and figure it out before consulting them (<i>RDNs</i>). That said, I recognize that I have very limited training in it and so I often consult them anyway.” (PGY-1)</p> <p>“I don’t want to bog you guys down (<i>with consults</i>)”. (PGY-1)</p> <p>“I think I’m mostly putting in referrals when my attending asks for it.” (PGY-2)</p> <p>“I think there’s probably a lot of people more in the gray area where they could benefit from specific nutrition consult that we either don’t think about it or yeah just don’t recognize it.” (PGY-3)</p>

Appendix A: IRB Approval Letter

VCMC
SPH



**Ventura County Medical Center
Santa Paula Hospital**

Associated with the UCLA School of Medicine

A Division of the Ventura County Health Care Agency
INSTITUTIONAL REVIEW BOARD

MEDICAL STAFF SERVICES

Phone: (805) 652-6062

Fax: (805) 652-6169

NOTICE OF FULL APPROVAL

TO: A. JONES, MD
FROM: Institutional Review Board
DAVID CHASE, MD
DATE: July 3, 2020
SUBJECT: STUDY 290: PHYSICIANS & DIETITIAN RELATIONSHIP STUDY

The IRB has received and granted approval of the submitted documents for Study 290: PHYSICIANS & DIETITIAN RELATIONSHIP STUDY. You will be required to submit updates to the IRB on an ANNUAL basis until the closure or completion of the study. The IRB looks forward to reviewing your important research on this promising protocol.

Sincerely,

David Chase, MD Chairman, Ventura County Institutional Review Board

Online Informed Consent Document

My name is Amy Motley Jones and I am a doctoral candidate in the Doctorate in Clinical Nutrition program at the University of North Florida (UNF) as well as a Registered Dietitian Nutritionist (RDN) at Ventura County Medical Center (VCMC). I am conducting a research study on physician knowledge, attitudes, and behaviors towards RDNs in order to determine whether mentoring with an RDN increases nutrition knowledge, changes physician behavior by increasing the number of referrals or consults to the RDN, and whether physician attitudes change regarding their understanding of the role of the RDN in healthcare.

Although there are no direct benefits to you or compensation for taking part in this study, others may benefit from the information we learn from the results of this study. Additionally, there are no foreseeable risks for taking part in this study. Participation is voluntary and there are no penalties for deciding not to participate or withdrawing your participation. You may choose not to participate in this research without negatively impacting your relationship with VCMC.

If you have any questions or concerns about this study, please contact me at the email or phone number listed below. A copy of this consent form will be printed and maintained in a secure location for record-keeping purposes.

Amy Motley Jones, MS, RDN-AP
Doctoral Candidate at UNF

Mark Lepore, MD
Sponsoring Physician at VCMC
Email: mark.lepore@ventura.org

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Date: Time: AM/PM

Appendix C: Demographic Data and Nutrition Information

Demographic Data and Nutrition Information

* 1. Age

- ☐ 25 years or younger
- ☐ 26-30 years
- ☐ 31-35 years
- ☐ 36-40 years
- ☐ 41 years or older

* 2. Gender

- ☐ Male
- ☐ Female

* 3. Race/Ethnicity

- ☐ White
- ☐ Black or African American
- ☐ Native American/Alaskan Native
- ☐ Pacific Islander
- ☐ Asian
- ☐ Native Hawaiian and Other Pacific Islander
- ☐ Hispanic or Latino
- ☐ Other

* 4. Please select your completed degree.

- ☐ MD
- ☐ DO

* 5. What is your height in feet and inches? For example, if you are 5 feet and 4 inches, write 5'4".

* 6. What is your current weight in pounds?

* 7. Exercise Frequency – days per week

☐ None

☐ 1

☐ 2

☐ 3

☐ 4

☐ 5

☐ 6

☐ 7

* 8. Tobacco Use

☐ Yes

☐ No

* 9. Dietary Supplement Use

☐ Yes

☐ No

* 10. Have you completed any previous nutrition-specific coursework or degrees?

☐ Yes

☐ No

* 11. Do you know what a Registered Dietitian Nutritionist (RD/RDN) is?

☐ No

☐ Yes

If yes, please explain briefly:

* 12. Have you worked as a member of an interprofessional/interdisciplinary team that included an RD/RDN before?

☐ No

☐ Yes

* 13. Please choose the statement that you feel most accurately reflects your personal nutrition knowledge.

- ☐ I know very little about nutrition
- ☐ I know something about nutrition, but not enough to explain to a patient
- ☐ I know enough to explain the principles of nutrition to a patient
- ☐ I know enough to treat a patient using nutrition-based treatment

* 14. Please choose the statement that you feel most accurately reflects your experience with nutrition-based treatments.

- ☐ I have had NO experience with nutrition-based treatments
- ☐ I have observed or talked with people using nutrition-based treatments with patients
- ☐ I have personally used nutrition-based treatments on myself in the past
- ☐ I currently use nutrition-based treatments on myself
- ☐ I have been trained in nutrition-based treatments

* 15. Please choose which (one or more) of the following sources you do or would refer to for information about nutrition.

- ☐ Consumer magazines
- ☐ Peer-reviewed journals
- ☐ Professional magazines
- ☐ Textbooks
- ☐ Internet (general)
- ☐ Previous lectures
- ☐ Blogs
- ☐ Pinterest
- ☐ Twitter
- ☐ Instagram
- ☐ None of these, but I consult others not listed here
- ☐ I do not consult any sources

Done

Appendix D: NIPS

Nutrition in Patient care Survey (NIPS)

Please complete the following questions on your own. Do not discuss your answers with anyone else.

* 1. A change toward a healthier lifestyle is important at any stage of life.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 2. Nutritional assessment and counseling should be included in any routine appointment, just like diagnosis and treatment.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 3. I have an obligation to improve the health of my patients including discussing nutrition with them.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 4. Patients will rarely change their behavior if they do **not** have active symptoms of a disease.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 5. Patients need specific instructions about how to change their eating behavior.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 6. All physicians, regardless of specialty, should counsel high-risk patients about dietary change.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 7. Most obese patients want to lose weight but feel frustrated and confused about how to do it.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 8. Patients need good tasting alternatives in order to change their eating patterns.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 9. Nutrition counseling should be part of routine care by all physicians, regardless of specialty.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 10. Most physicians are **not** adequately trained to discuss nutrition with patients.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 11. Specific advice about how to make dietary changes could help some patients improve their eating habits.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 12. After receiving nutrition counseling, patients with poor eating patterns will make major changes in their eating behavior.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 13. Patients need ongoing counseling following my initial instruction to maintain behavior changes consistent with a healthier diet.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

*14. Patients will only change their eating patterns if faced with a significant health problem (e.g., a heart attack).

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

*15. Most patients will try to change their lifestyle if I advise them to do so.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

*16. Physicians can have an effect on a patient's dietary behavior if they take the time to discuss the problem.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

*17. Patient motivation is essential to achieving dietary change.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

*18. My patient education efforts will be effective in increasing patients' compliance with nutrition recommendations.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

*19. Nutrition counseling is **not** an effective use of my professional time.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

*20. Individual physicians have **little** impact on a patient's ability to lose weight.

- | | |
|---|--------------------------------------|
| <input type="radio"/> Strongly disagree | <input type="radio"/> Agree |
| <input type="radio"/> Disagree | <input type="radio"/> Strongly agree |
| <input type="radio"/> Uncertain | |

* 21. It is **not** worth the time to counsel patients with poor dietary patterns about nutrition.

☐ Strongly disagree

☐ Agree

☐ Disagree

☐ Strongly agree

☐ Uncertain

* 22. For most patients, health education does **little** to promote adherence to a healthy lifestyle.

☐ Strongly disagree

☐ Agree

☐ Disagree

☐ Strongly agree

☐ Uncertain

* 23. Preventive health care is **boring**.

☐ Strongly disagree

☐ Agree

☐ Disagree

☐ Strongly agree

☐ Uncertain

* 24. Patients are **not** motivated to change unless they are sick.

☐ Strongly disagree

☐ Agree

☐ Disagree

☐ Strongly agree

☐ Uncertain

* 25. After receiving nutrition counseling, patients with poor eating patterns will make moderate changes in their eating behavior.

☐ Strongly disagree

☐ Agree

☐ Disagree

☐ Strongly agree

☐ Uncertain

* 26. It is important that I:
Address the importance of diet whenever I care for a patient.

☐ No

☐ Yes

* 27. It is important that I:
Identify dietary risk factors in pediatric patients by assessing diet and energy balance.

☐ No

☐ Yes

* 28. It is important that I:
Assess each patient's intake of vitamin, mineral and dietary supplements.

☐ No

☐ Yes

* 29. It is important that I:
Counsel patients regarding their use of supplements and emphasize when they are contraindicated.

☐ No

☐ Yes

* 30. It is important that I:
Whenever possible recommend dietary changes before initiating drug therapy.

☐ No

☐ Yes

* 31. It is important that I:
Assess each patient's fat, fiber, and fruit and vegetable intake as a preventive strategy.

☐ No

☐ Yes

* 32. It is important that I:
Request that patients bring a food record or perform another diet assessment measure when they come in for routine visits.

☐ No

☐ Yes

* 33. It is important that I:
Encourage patients to ask diet related questions and refer them for additional assistance when warranted.

☐ No

☐ Yes

* 34. It is important that I:
Perform at least some level of nutritional assessment with every patient.

☐ No

☐ Yes

* 35. It is important that I:
Follow the National Heart, Lung and Blood Institute (NHLBI) guidelines for prevention and treatment of high blood cholesterol and high blood pressure by advocating a DASH type diet high in fruits, vegetables, whole grains and low fat dairy.

☐ No

☐ Yes

* 36. It is important that I:
Assess each patient's weight status in accordance with the national (NIH) guidelines on the identification, evaluation, and treatment of overweight and obesity in adults.

☐ No

☐ Yes

* 37. It is important that I:
Refer patients with diet-related problems to registered dietitians or other qualified nutrition staff.

☐ No

☐ Yes

* 38. It is important that I:
Evaluate patients' alcohol intake as part of their overall nutritional status.

☐ No

☐ Yes

* 39. It is important that I:
Assess each patient's stage of change before initiating dietary intervention.

☐ No

☐ Yes

* 40. It is important that I:
Assess dietary sodium, potassium, and calcium intake especially among patients at risk for hypertension, osteoporosis, or stroke.

☐ No

☐ Yes

* 41. It is important that I:
Refer diabetic patients for detailed dietary counseling.

☐ No

☐ Yes

* 42. It is important that I:
Advocate diet and activity balance to promote weight control.

☐ No

☐ Yes

* 43. It is important that I:
Assess my patient's ability to read a food label.

☐ No

☐ Yes

* 44. It is important that I:
Advocate a low fat diet for weight control.

☐ No

☐ Yes

* 45. It is important that I:
Assist pediatric patients to establish healthy eating habits early to prevent risk for chronic diseases.

☐ No

☐ Yes

DONE

Appendix E: Multiple-Choice Quiz to Assess Nutrition Knowledge

Multiple-Choice Quiz

Please complete the following questions on your own. Do not discuss your answers with anyone else.

* 1. A previously well-nourished patient with persistent fever is admitted to the hospital. His laboratory tests reveal: albumin, 2.1 g/dL; C-reactive protein, 30 mg/L; serum calcium of 7.2 mg/dL. Which of the following is the most likely etiology of hypoalbuminemia?

- ☐ Caloric deficiency
- ☐ Protein deficiency
- ☐ Hypocalcemia
- ☐ Inflammatory response

* 2. Which of the following predictive equations has demonstrated the greatest accuracy in estimating actual resting metabolic rate in healthy obese and nonobese adults?

- ☐ Owen using adjusted body weight
- ☐ Harris-Benedict using actual body weight
- ☐ Harris-Benedict using adjusted body weight
- ☐ Mifflin-St. Jeor using actual body weight

* 3. In the critically ill obese patient, specific guidelines for the provision of calories and protein have been recommended by both the Society of Critical Care Medicine and the American Society for Parenteral and Enteral Nutrition. For a patient with a BMI 33.4 kg/m², which of the following choices best reflects the calorie recommendations for parenteral and enteral nutrition?

- ☐ 11-14 Kcal/kg ideal body weight/day
- ☐ 11-14 Kcal/kg actual body weight/day
- ☐ 22-26 Kcal/kg actual body weight/day
- ☐ 22-26 Kcal/kg ideal body weight/day

* 4. Your patient is receiving the following PN order: 2400 mL with 300 grams dextrose, 90 grams protein in addition to 225 mL 20% ILE. How many total calories and grams of fat is your patient receiving?

- ☐ 1830 kcals, 40 grams fat
- ☐ 2010 kcals, 40 grams fat
- ☐ 1830 kcals, 48 grams fat
- ☐ 1470 kcals, 48 grams fat

* 5. A decrease in food intake in older adults is most likely attributable to

- ☐ Decreased taste and flavor sensations.
- ☐ Age-related decreases in stomach capacity.
- ☐ Fear of stool or flatus incontinence.
- ☐ Enhanced olfaction sensation.

* 6. JD is an 85 year old male whose height is 63 inches and weight is 46kg. Ten years ago his weight was 66kg. His weight loss has been non-volitional and gradual, and he has no major health problems or changes in oral intake. Which of the following statements most appropriately describe JD's weight loss?

- ☐ JD demonstrates a decrease in lean body mass known as sarcopenia, which occurs during the aging process.
- ☐ JD's weight loss is not a normal phenomenon. He should be evaluated for an underlying disease process.
- ☐ JD demonstrates a decrease in fat mass, which occurs with the aging process.
- ☐ JD should be placed on a specialized nutrition support regimen to replace the weight he has lost.

* 7. Enteral nutrition formulas supplemented with fiber are often used in the older adult to prevent constipation. Which of the following considerations is most important if this type of formula is chosen?

- ☐ Addition of a prokinetic agent
- ☐ Avoidance of lactose
- ☐ Lowering feeding rate to prevent bloating
- ☐ Provision of adequate water

* 8. When reviewing a child's growth chart data, the child's weight-for-length curve is falling below the 3rd percentile. Which Z-score indicates severely wasted?

- ☐ Z-score above 3
- ☐ Z-score above 2
- ☐ Z-score below -2
- ☐ Z-score below -3

* 9. Which of the following best describes the benefit of megestrol acetate in patients with cancer-associated cachexia?

- ☐ Increase in lean muscle mass
- ☐ Decreases the risk of thromboembolic events
- ☐ Improves blood glucose control in diabetes mellitus
- ☐ Improves appetite and ameliorates weight loss

* 10. In the critically ill obese patient, specific guidelines for the provision of calories and protein have been recommended by both the Society of Critical Care Medicine and the American Society for Parenteral and Enteral Nutrition. For a patient with a BMI > 33.4 kg/m², which of the following choices best reflects those recommendations for the provision of protein in parenteral and enteral nutrition?

- ☐ Less than 2.0 g/kg ideal body weight/day
- ☐ Greater than or equal to 2.0 g/kg ideal body weight/day
- ☐ Less than 2.0 g/kg actual body weight/day
- ☐ Greater than or equal to 2.0 g/kg actual body weight/day

* 11. A patient has an advanced directive stating a desire to forego medical technology, including nutrition and hydration, in order to prolong life. The patient is now in an irreversible vegetative state. In deciding whether to continue nutrition and hydration by medical means, the patient's surrogate decision-maker must:

- ☐ Consult with a lawyer.
- ☐ Have a psychiatric evaluation to be declared competent to make any decisions in the patient's care.
- ☐ Honor the patient's expressed wish to withdraw nutrition and hydration by medical means.
- ☐ Decide, based upon own values, to make a decision to withdraw the patient's nutrition and hydration by medical means.

* 12. Increased mortality in maintenance hemodialysis patients has been associated with

- ☐ Low baseline body fat percentage and low muscle mass.
- ☐ Elevated albumin and decreased CRP values.
- ☐ Increased body mass index.
- ☐ Decreased serum cholesterol.

* 13. A home enteral nutrition patient recently treated for pneumonia is noted to have new onset diarrhea. Of the following, the first intervention should be to

- ☐ Change to an elemental feeding.
- ☐ Obtain an order for a bile-sequestering agent.
- ☐ Obtain a Clostridium difficile toxin stool assay.
- ☐ Obtain an order for an antidiarrheal medication.

* 14. Which of the following is most suggestive of malnutrition?

- ☐ 10th percentile of triceps skinfold thickness
- ☐ Voluntary body mass index change from 30 to 28 over 6 months
- ☐ Involuntary weight loss of 10% usual body weight over six months
- ☐ Albumin decrease from 4.0 to 3.8

* 15. A 60-year-old female (height 162 cm, weight 45 kg) is receiving PN for a rectovaginal fistula. The PN formula consists of the following components: 70 grams protein, 400 grams dextrose, and 25 grams fat in a total volume of 1.5 liters, including all electrolytes and additives, which is infused continuously over 24 hours daily. Which one of the following complications is she at greatest risk for developing?

- ☐ Hypertriglyceridemia
- ☐ Azotemia
- ☐ Hyperglycemia
- ☐ Pulmonary edema

Done

Answer Key and Rationale for Multiple-Choice Quiz to Assess Nutrition Knowledge

1. **D** – Inflammatory response. Albumin may decrease during inflammation and hypervolemia. Even though it is a good predictive indicator of clinical outcome, it does not always reflect nutritional status. Elevated C-reactive protein reflects an inflammatory status, which may be the reason for hypoalbuminemia. Positive acute phase protein concentrations such as C-reactive protein increase during inflammation, whereas negative acute phase protein concentrations such as albumin and pre-albumin decrease during inflammation. Although there is a causal relationship between hypoalbuminemia and hypocalcemia, a low serum calcium does not cause a low serum albumin.
2. **D** - Mifflin-St. Jeor using actual body weight. The Mifflin-St. Jeor equations have demonstrated the greatest accuracy with healthy obese and non-obese people when compared to the Owen equations and Harris-Benedict equations using either adjusted or actual body weight. The Mifflin-St. Jeor equations are as follows: For males: actual body weight in kg x 9.99 plus height in cm x 6.25 minus age in years x 4.92 plus 5. For females: actual body weight in kg x 9.99 plus height in cm x 6.25 minus age in years x 4.92 minus 161.
3. **B** - 11 - 14 Kcal/kg actual body weight/day. For all classes of obesity where BMI is >30 kg/m², the goal of the parenteral and enteral regimen should not exceed 65% to 70% of target energy requirements as measured by indirect calorimetry. If indirect calorimetry is not available, using the weight-based equation 11–14 kcal/kg actual body weight/day for patients with BMI 30-50 kg/m² and 22–25 kcal/kg ideal body weight/day for patients with BMI > 50 kg/m² is recommended. Protein should be provided in a range greater than

or equal to 2.0 g/kg ideal body weight/day for patients with BMI 30–40 kg/m², and up to 2.5 g/kg ideal body weight/day for patients with BMI ≥40 kg/m².

4. **C** - 1830 kcal, 45 grams fat. One (1) gram of dextrose is equal to 3.4 calories. Three hundred (300) grams provide 1,020 kcal. One (1) gram of protein is equal to 4 calories. Ninety (90) grams of protein provide 360 kcal. One (1) mL of 20% ILE is equal to 2 calories. ILE 20% provides 20 grams fat/100 mL; thus 225 mL provides 45 grams fat and 450 kcal.
5. **A** - Decreased taste and flavor sensations. A decrease in food intake in older adults is usually attributed to changes in taste and flavor sensations. Older adults may also exhibit decreased hunger and early satiety, which also contribute to decreased oral intake. Fear of incontinence typically interferes with fluid intake rather than food intake. Older adults, particularly women, with reduced olfaction (sense of smell) have a reduced interest in cooking and consuming a variety of foods, thereby potentially resulting in reduced oral intake.
6. **A** - JD demonstrates a decrease in lean body mass known as sarcopenia, which occurs during the aging process. Sarcopenia is the loss of lean body mass and function that is normal in the aging process. Non-volitional weight loss over a few months may indicate an underlying disease process, but when it occurs over a longer period of time, as a process of aging, it may not herald a disease process. Fat redistribution occurs with aging, but the primary loss is due to loss of lean body mass. Specialized nutrition support is indicated if the weight loss is associated with a disease process or if compromised gastrointestinal function is present.

7. **D** - Constipation is a common problem in the elderly. For patients requiring long-term enteral feedings, a formula that contains fiber is often helpful to prevent constipation; however, the provision of adequate water is required when using these products in order to prevent adverse gastrointestinal effects. Often, the presence of fiber and fluid will be adequate to maintain adequate bowel movements and a prokinetic agent will not be required. All enteral products are lactose free. Lowering the rate of the enteral feeding may be required in short term periods to prevent bloating, but this would not be a long-term solution to prevent adverse gastrointestinal effects.
8. **D** - Z-score below -3. The standard deviation (SD) score is also called the Z-score, which is useful to express how far a child's weight falls from the median, or 50th percentile on the growth charts. When compared over time, a positive change in SD indicates growth, whereas a negative change indicates a slowing of the growth rate. A Z-score of below -3 is consistent with severely wasted, whereas a Z-score below -2 indicates wasted. A Z-score above 2 and above 3 is consistent with overweight and obese, respectively.
9. **D** - Improves appetite and ameliorates weight loss. Megestrol acetate is a synthetic progestational agent that promotes weight gain and helps to stimulate appetite. Progestagens induce the release of Neuropeptide Y from the hypothalamus and downregulate the synthesis and release of proinflammatory cytokines. The change in weight is thought to be largely due to increased adipose tissue and edema. Megestrol acetate can exacerbate underlying diabetes mellitus, and rarely leads to adrenal suppression. It may also be associated with a small increase in the risk of deep venous thrombosis.

10. **C** - Greater than or equal to 2.0 g/kg ideal body weight/day. For all classes of obesity where BMI is $>30 \text{ kg/m}^2$, the goal of the parenteral and enteral regimen should not exceed 65% to 70% of target energy requirements as measured by indirect calorimetry. If indirect calorimetry is not available, using the weight-based equation 11–14 kcal/kg actual body weight/day for patients with BMI 30–50 kg/m^2 and 22–25 kcal/kg ideal body weight/day for patients with BMI $> 50 \text{ kg/m}^2$ is recommended. Protein should be provided in a range greater than or equal to 2.0 g/kg ideal body weight/day for patients with BMI 30–40 kg/m^2 , and up to 2.5 g/kg ideal body weight/day for patients with BMI $\geq 40 \text{ kg/m}^2$.
11. **C** - Honor the patient's expressed wish to withdraw nutrition and hydration by medical means. In the Cruzan case, the US Supreme Court assumed that a competent individual has the same right to refuse life-sustaining treatment (including nutrition and hydration by medical means) as to refuse any other kind of medical intervention. Where evidence of an incompetent person's previously expressed wish not to be kept alive by medical technologies meets state evidentiary standards, the exercise of that choice by a surrogate decision-maker must also be honored.
12. **A** - Low baseline body fat percentage and low muscle mass. Lower muscle mass reflects poor nutrition status and inflammation. Low fat mass reflects low body stores of energy and demonstrates poor coping with catabolic stress as caused by dialysis. A BMI between 30 Kg/m^2 and 34.9 Kg/m^2 as demonstrated by Dialysis Outcomes and Practice Patterns Study is considered protective in dialysis patients. A BMI of less than 25 Kg/m^2 is not considered beneficial for patients on HD.

13. **C** - Obtain a *Clostridium difficile* toxin stool assay. There are many causes of diarrhea in the tube-fed patient including the patient's underlying medical condition, tube-feeding intolerance, medication effects, and infectious causes including bacterial contamination of enteral tube feeding formula or equipment and *Clostridium difficile*. *Clostridium difficile* should be ruled out in any patient recently receiving antibiotic therapy. This should be done prior to ordering antidiarrheal medication since antidiarrheal medications are not indicated in those with *Clostridium difficile*. There is no need to change to an elemental formula if there are no other indications for an elemental diet.
14. **C** - Involuntary weight loss of 10% usual body weight over six months. Triceps skinfold thickness below the 5th percentile is abnormal in hospitalized patients. Triceps skinfold may be falsely elevated with edema and may not be reliable in obese patients. Recent involuntary weight loss of 10% of usual body weight over 6 months detects obese and non-obese patients at risk for malnutrition. Voluntary weight loss from a BMI of 30 (obese) to a BMI of 25 (normal) does not reflect malnutrition. Albumin may be altered by conditions not related to nutritional factors.
15. **C** – Hyperglycemia. Current guidelines for adults recommend the following maximum amounts for PN components: 7 g carbohydrates/kg/day and 2.5 g fat/kg/day. Protein and fluid requirements for adults are estimated at 0.8 - 2 g-protein /kg/day and 30-40 mL fluid/kg/day. Hyperglycemia from dextrose is the most likely complication this patient will develop because she is receiving more than the recommended daily amount of carbohydrate (10.9 g carbohydrates/kg/day). The other components in this PN formula are within recommended ranges (1.56 g protein/kg/day, 0.56 g fat/kg/day, and 33 mL fluid/kg/day).

Appendix F: Interview Informed Consent and Guide

Informed Consent

Thank you for your participation in this qualitative research study interview today. My name is Amy Jones, and I am a Registered Dietitian and a doctoral student in the Doctorate in Clinical Nutrition program at the University of North Florida.

The aim of this interview is to explore physician knowledge, attitudes, and behaviors towards RDNs and their understanding of the role of the RDN in healthcare.

I would like to ask you some questions about your background and work experience to learn more about your experiences working with RDNs. You were randomly chosen to participate in this interview.

This interview should take about 15 to 30 minutes or so, and I will be recording the interview as well as taking notes so that I won't miss anything. Please speak up so that all of your comments are recorded, especially with masks on.

Regarding ethical issues and privacy, your name will not be used in the results of this study. You are free to end the interview at any time, and you do not need to discuss anything that you do not want to.

Do you have any questions or concerns at this time?

Interview Guide

Before you started your residency, did you know what an RDN was?

If yes, how did you know?

If no, do you now know?

Have you worked with RDNs before?

If so, what were your experiences like?

If not, have you wanted to?

If you have worked with RDNs before, have your experiences been consistent?

Since you started your residency, have you met any of the RDNs at the hospital?

What is your understanding of the role of RDNs in the hospital?

How would you describe your interprofessional relationship with RDNs?

Do you consider RDNs a reliable source of nutrition information?

How do you feel about placing referrals or consults to RDNs?

Do you feel you can ask RDNs nutrition-related questions or address nutrition-related concerns?

Do you feel RDNs add value to the interprofessional team?

Appendix G: Introductory “Nutrition Basics at VCMC” Packet

Handout Reviewing Basics of What Diet Orders are Available to Order

Summary of Diets Available to Order in Cerner

Bariatric Diets	These diets are inadequate in all nutrients and are to be used only after bariatric surgery while under the direction of the bariatric surgery team.
Bariatric Stage 1 – Clear Liquid	The first diet ordered for patients admitted for bariatric surgery.
Bariatric Stage 2 – Full Liquid	The second diet ordered/diet advancement for patients admitted for bariatric surgery.
Bariatric Stage 3 – Pureed	Often ordered for patients admitted with a history of bariatric surgery.
Breast Milk	Ordered for breastfeeding babies as needed.
Clear Liquid	Technically an obsolete diet per the NCM. Nutritionally incomplete. Should be used minimally, only when absolutely necessary. Should not be ordered for more than 2 meals. Add supplements to boost calories/protein.
Consistent Carbohydrate	Provides a range of 3-5 carbohydrate servings (45-75g) at each meal.
Dietary Supplements	Currently on our formulary (V – Vanilla; C – Chocolate; S – Strawberry): Boost Plus (V,C,S) – standard supplement Boost Breeze (Orange, Peach) – clear liquid supplement Boost Very High Calorie (V) – for weight gain Boost Glucose Control (V,C,S) – for patients with diabetes Novasource Renal (V,S,Mocha) – for patients with kidney disease Peptamen Junior with Prebio (V) – semi-elemental pediatric supplement for malabsorption in ages 1-13 Nutren Junior Fiber (V) – standard pediatric supplement for ages 1-13 Unjury protein powder (V,C,S,unflavored) – high-protein powder to be added to foods or beverages Banatrol Plus – banana flakes to aid in diarrhea control
Dysphagia 1 – Pureed	Blended, whipped, or mashed, easy to swallow foods.
Dysphagia 2 – Ground or Finely Chopped	Blended, chopped, ground, or mashed, easy to swallow foods. Meats ground or minced, no larger than ¼ inch pieces. Foods are moist and soft-textured.
Dysphagia 3 – Advanced	Nearly regular textures excepting very hard, sticky, or crunch foods. Moist, bite-sized pieces (< 1 inch).
Fat-Restricted	Limit the total amount of fat served to 25-35% of total energy. Commonly prescribed for disorders of the pancreas, gallbladder, liver, and GI tract.

Fiber-Restricted	< 13 grams of fiber per day. Limits indigestible foods and avoids whole grains, seeds, whole nuts, raw vegetables.
Full Liquid	Often meant as a short-term use as a transition step between clear liquid and soft foods after surgery, though lacking supportive data. Includes foods allowed on the clear liquid diet + milk and small amounts of fiber. Heavily milk-based – monitor for lactose intolerance.
Gestational Diabetes	Designed for the pregnant woman with GDM. 6 meals and snacks. No juice. 30g carbohydrate at breakfast, 15g at snacks TID.
Gluten Free	Only medically indicated for celiac disease or gluten sensitivity. Restricts all sources of gluten and gluten-containing products.
Heart Healthy	Limits saturated fat (<7% total calories), cholesterol (<200mg/day), and sodium (<2g/day), replacing these foods with heart-healthy unsaturated fats. Trans-fats are eliminated. Includes 20-30g fiber per day.
High Calorie-High Protein	Often used for patients needing increased calories and protein, i.e. malnutrition, cystic fibrosis, severe weight loss.
High Fiber	Added sources of fiber from fruits, vegetables, legumes, and whole grains to obtain 25-35g fiber per day. Aids in constipation relief. Recommended for individuals with diverticulosis. Requires adequate fluid intake.
No Added Salt	Mild sodium restriction, 3-4g/day. No salt substitutes. More palatable than more restrictive sodium-controlled diets, improving meal acceptability.
Pediatric Diet (age 9-12 months)	For pediatric patients aged 9-12 months. Pureed and ground foods. No fluids served as infants should be receiving breastmilk or iron-fortified formula.
Pediatric 1 Diet (age 12-36 months)	For pediatric patients aged 12-36 months. Small servings, soft meats. No hot dogs, whole grapes, raw carrots, peanut butter, or raw celery.
Pediatric 2 Diet (age > 36 months)	For pediatric patients aged > 36 months. Bite sized meats for 4-5 year olds, whole meats for 6-12 year olds. Teenagers may prefer a Regular diet.
Regular	For adults requiring no dietary modification. Healthy balanced diet.
Renal Chronic Dialysis	Higher in protein than nondialysis. Restricted in sodium, potassium, phosphorus, calcium.
Renal Nondialysis	Lower in protein than chronic dialysis. Restricted in sodium, potassium, phosphorus, calcium.
Sodium-Restricted	Strict sodium restriction, 1.5-2g/day. Less palatable. Requires substitution of standard menu items with low-sodium options.
Vegan	Avoids all animal products.
Vegetarian	The standard is a lacto-ovo (includes milk and eggs).

List of the RDNs on Staff and the Areas Covered by Each

Ventura County Medical Center

Registered Dietitians (RDs)



Office Phone Number:
(805) 652-6177



Kim Dufresne
MS, RD
Pediatrics/PICU/NICU/OB



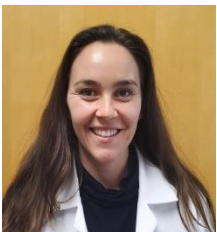
Stephanie Riley Stai
MS, RDN
NICU/Pediatrics/PICU/OB



Natalie Mendez
MS, RDN
Backup NICU/OB



Eva Reyes-Manzer
RDN
ICU1/ICU3



Kimmy Madden
RDN
ICU2/MS1



Gillian Chong
RDN
MS3/Backup ICU1



Amy Motley Jones
MS, RDN-AP
Chief Clinical Dietitian
IPU
Backup for all floors



Alex Jose
RD
Staffing Services Specialist

RD available hours:

Monday-Friday 7:30am-5pm
Saturday 8am-4:30pm

Amy is also available Sunday/after-hours via TigerText
for emergencies only please!
amy.motleyjones@ventura.org

Please don't hesitate to call us if you have any questions!

Dietitian

Definition:

*Actual expert in nutrition
*Provides science-based evidence to clients/patients

Education:

*Bachelor's degree
*Completion of dietetic internship
*Passed national exam
*Completes continuing education credits

Accreditation:

*Registered with the Commission of Dietetics Registration
*Licensed in one's individual state to practice

Nutritionist

Definition:

*Self-proclaimed expert in nutrition

Education:

*None required

Accreditation:

*None
*Not legally accepted as nutrition expert

www.FreshFitHealthy.com

NUTRITION BASICS

- ✓ Serum proteins (Albumin, Prealbumin) – limited clinical utility
 - Albumin is NOT a nutritional marker in hospitalized patients
 - Do NOT use hypoalbuminemia to diagnose protein-malnutrition
 - Prealbumin alone is not a sole indicator of nutrition status
 - Check a CRP – Albumin and PAB are inversely related to CRP
- ✓ Consults
 - Please consult us!
 - To start tube feeds
 - To start PN (RD and Pharmacy should both be notified to initiate)
 - For diet education
 - For nutrition assessment
 - Anytime you feel a patient needs nutrition intervention!
- ✓ Nutrition Assessments
 - We follow a screening protocol and see everyone for the most part within 2-4 days of admission depending on their level of nutrition acuity
 - We see patients with 48 hours of a consult per our hospital department policy
- ✓ Diets
 - Please limit the amount of restrictions you impose on a patient's diet – a Consistent Carbohydrate + Renal Dialysis + Pureed diet doesn't leave a lot of options, or tasty foods!
 - We can help you figure out which restriction(s) is/are most critical and how to work within those parameters
 - Also – we do not provide fad/trendy/non-standard diets (Please no orders for Paleo/Keto/Raw/GMO-free/etc.)
 - Guest Trays must be ordered/re-ordered for every meal (except in Pediatrics and OB/Post-Partum) and are ALWAYS a Regular diet – NO EXCEPTIONS!
- ✓ If you are discharging a patient
 - Please know that Friday afternoons are busy!
 - Please give us as much lead time as possible for education consults so that we can ensure the family/caregivers are present and unhurried, the patient is appropriate, and we are able to source materials.
 - We do NOT provide oral nutrition supplements or tube feedings for home use – this must be arranged with case management/social services PRIOR TO D/C.

Please!



Parenteral Nutrition “Cheat Sheet”

VCMC Parenteral Nutrition Guidelines for Adults

So you want to start parenteral nutrition (PN) for your patient...

Is it appropriate?

Indications, Relative Indications and Contraindications for Parenteral Nutrition

Parenteral nutrition is usually indicated in the following situations

- Documented inability to absorb adequate nutrients via the GI tract such as:
 - Massive small-bowel resection/short bowel syndrome (at least initially)
 - Radiation enteritis
 - Severe diarrhea
 - Untreatable steatorrhea/malabsorption (i.e., not pancreatic insufficiency, small bowel bacterial overgrowth, or celiac disease)
- Complete bowel obstruction, or intestinal pseudo-obstruction
- Severe catabolism with or without malnutrition when GI tract is not usable within 5–7 days
- Inability to obtain enteral access
- Inability to provide sufficient nutrients/fluids enterally
- Pancreatitis accompanied by abdominal pain with jejunal delivery of nutrients
- Persistent GI hemorrhage
- Acute abdomen/ileus
- Lengthy GI work-up requiring NPO status for several days in a malnourished patient
- High output enterocutaneous fistula (>500 mL) and inability to gain enteral access distal to the fistula site
- Trauma requiring repeat surgical procedures

Parenteral nutrition may be indicated in the following situations

- Enterocutaneous fistula
- Inflammatory bowel disease not responding to medical therapy
- Hyperemesis gravidarum when nausea and vomiting persist longer than 5–7 days and enteral nutrition is not possible
- Partial small bowel obstruction
- Intensive chemotherapy/severe mucositis
- Major surgery/stress when enteral nutrition not expected to resume within 7–10 days
- Intractable vomiting when jejunal feeding is not possible
- Chylous ascites or chylothorax when low fat/fat free EN does not adequately decrease output

Contraindications for Parenteral Nutrition

- Functioning gastrointestinal tract
- Treatment anticipated for less than 5 days in patients without severe malnutrition
- Inability to obtain venous access
- A prognosis that does not warrant aggressive nutrition support
- When the risks of PN are judged to exceed the potential benefits

Used with permission from the University of Virginia Health System Nutrition Support Traineeship Syllabus (Parrish CR, Krenitsky J, McCray S). Parenteral Module. University of Virginia Health System Nutrition Support Traineeship Syllabus, 2003.

Will it be for < 5 days?

→ YES - NOT APPROPRIATE

→ NO - Next step

Does the gut work?

→ YES – Use it! Consider EN

→ NO – Next step

Does the patient have a central line?

→ NO – only option is peripheral parenteral nutrition (PPN)

→ YES – options are stress formula or standard formula central parenteral nutrition (CPN)

○ See page 2

Has a registered dietitian (RD) seen the patient?

→ NO – please order a

“Consult to Nutritionist Adult”

→ YES – please order a

“Consult to Nutritionist Adult”

or **call the RD office at 652-6177** and ask to speak to the RD covering the unit your patient is on (i.e. 3W, ICU1, etc.)

“Prior to initiating PN, a nutrition assessment is necessary to determine nutrient needs and anticipate any metabolic changes that may occur due to the patient’s underlying condition, medications, or concurrent therapies.”

(Madsen, H. and Frankel, E.H. “The Hitchhiker’s Guide to Parenteral Nutrition Management for Adult Patients”. Nutrition Issues in Gastroenterology, Series #40.

Practical Gastroenterology. July 2006.)

VCMC Parenteral Nutrition Guidelines for Adults

- Available parenteral nutrition formulations (see page 3 for maximum infusion rates):

PPN – 5% Dextrose 4.25% Amino Acids (D5AA4.25)

1L or 42ml/hr provides ~342kcal, ~42.5g protein

2L or 84ml/hr provides ~684kcal, ~85g protein

Typically 3L of PPN are not given 2/2 too high of volume (125ml/hr) peripherally

CPN – Stress formula 15% Dextrose 5% Amino Acids (D15AA5)

➔ Use if patient has a h/o diabetes, malnutrition, and/or is critically ill

1L or 42ml/hr provides ~715kcal, ~50g protein

2L or 84ml/hr provides ~1430kcal, ~101g protein

3L or 125ml/hr provides ~2130kcal, ~150g protein

Standard formula 20% Dextrose 5% Amino Acids (D20AA5)

➔ Use for patients without diabetes, malnutrition, and/or are non-critically ill

1L or 42ml/hr provides ~887kcal, ~50g protein

2L or 84ml/hr provides ~1774kcal, ~101g protein

3L or 125ml/hr provides ~2640kcal, ~150g protein

- Typically, PPN or CPN is initiated at 1L or 42ml/hr to start, and increased by 1L/d to goal
- Both PPN and CPN rates can be increased by ½ (i.e. from 42 → 63 → 84ml/hr) if concern for risk of refeeding syndrome or intolerance present

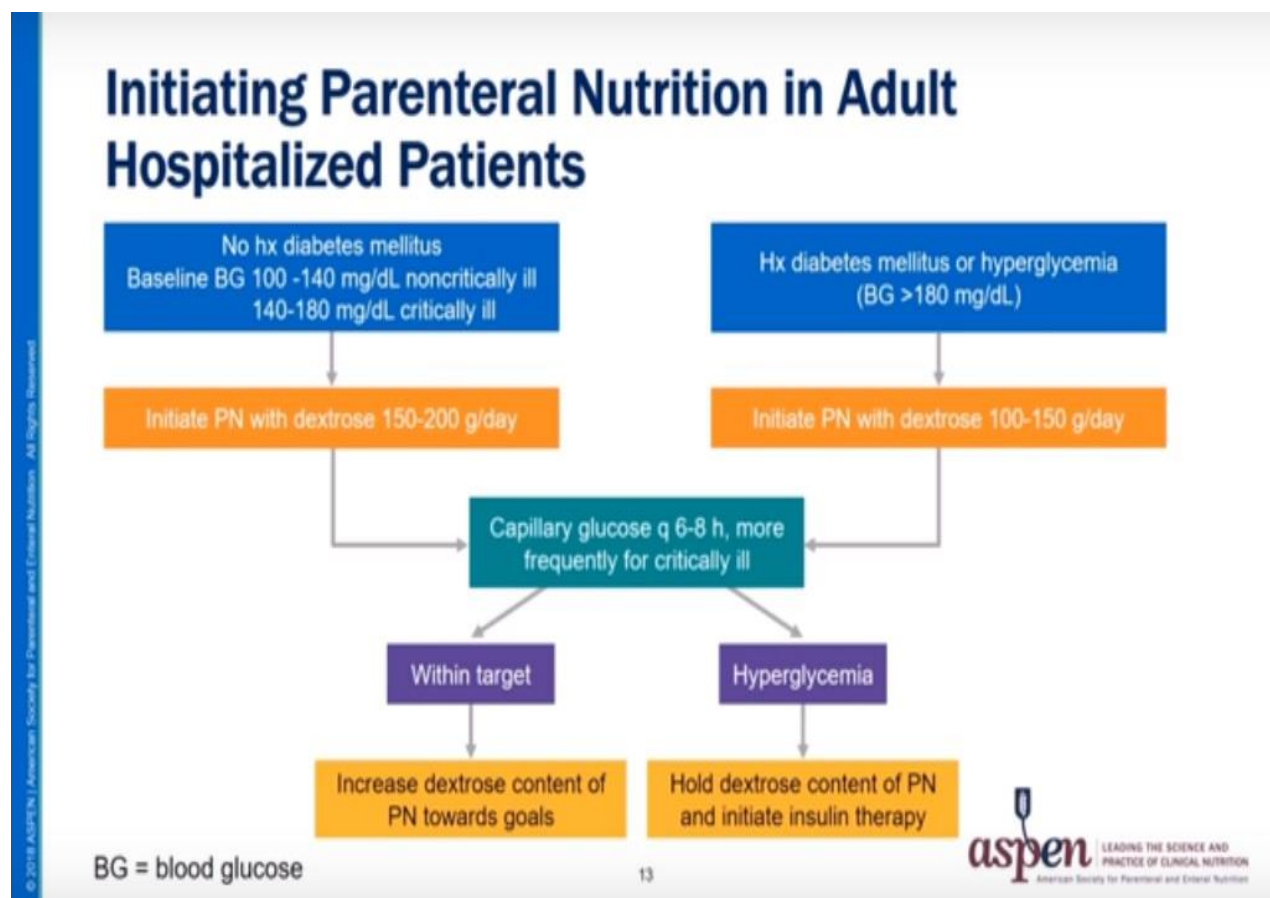
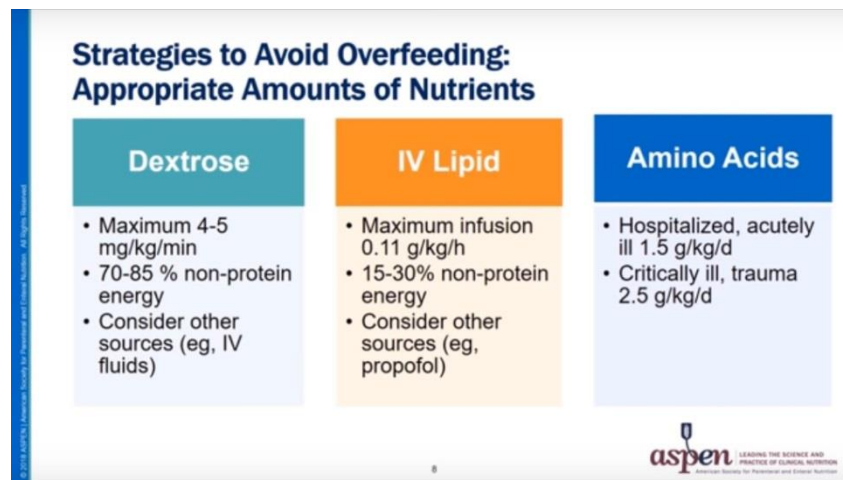
IntraLipids (IL) are also available in the following amounts:

100ml bag (or ~8ml/hr x 12hrs) provides 200kcal

250ml bag (or ~20ml/hr x 12hrs) provides 500kcal

500ml bag (or ~42ml/hr x 12hrs) provides 1000kcal

Limit triglycerides (TG) to < 400 while IL are infusing, otherwise hold



¹ Reference: SmartPN Video Series Part 3: Avoiding Overfeeding and Glucose Control Management. ASPEN. Published October 10, 2018. Available at: <https://www.youtube.com/watch?v=9sC09RwT5K4> and at <http://www.nutritioncare.org/SmartPN/> (requires ASPEN membership login).

Formula Card with the Available Oral and Enteral Supplements

Oral Supplements Per Serving								Gastric Tube Flush or Oral	
Product Name	BOOST BREEZE®	BOOST PLUS®	BOOST VHC	BOOST GLUCOSE CONTROL®	PEPTAMEN JUNIOR® WITH PREBIO™	NUTREN JUNIOR® FIBER	NOVASOURCE® RENAL	UNJURY®	Banatro® Plus
Replaces	Ensure Clear®	Ensure Plus™		Glucerna® Shake	PediaSure® Peptide	PediaSure® Enteral With Fiber	Nepro®		
Description	Clear Liquid Nutritional Drink	House oral supplement. May tube feed stable patient	Very high calorie i.e. cystic fibrosis Fluid restriction	Reduced carbohydrate Diabetes	Semi-elemental. Malabsorption Children age 1-13	Children age 1-13, Oral or tube feed	Renal failure. Reduced Na, K, P & fluid Oral or tube feed	Protein supplement Tube feeding flush Addition to foods or beverages	Danreze control Prebiotic + banana flakes Start T10, range 1-6 ppts/d
Volume	237 mL	237 mL	237 mL	237 mL	250 mL	250 mL	237 mL	1 oz. Packet (28 g)	10.75 g Packet
Calories Per serving	250	360	530	250	250	250	475	Unflavored: 80 Flavored: 100	40
Protein (g)	9	14	22	14	7.5	7.5	21.6	21	<1
Carbohydrate (g)	54	45 (3 g fiber)	52	23 (3 g fiber)	35 (1.9 g prebiotic)	29 (1.5 g fiber)	43.5	Unflavored: 1 Flavored: 4	9
Fat (g)	0	14	26	12	9.5	12	23.8	0	0
Water (%)	83%	78%	67%	84%	84%	85%	72%	N/A	N/A
Carbohydrate Source	Sugar, Corn Syrup	Corn Syrup, Sugar, FOS, Inulin, Gum acacia	Glucose Syrup, Sugar	Tapioxa Dextrin, Fructose, Corn Syrup, FOS, Partially Hydrolyzed Guar Gum, Soy fiber	Sugar, Maltodextrin, Corn Starch FOS, Inulin	Maltodextrin, Sugar, FOS, Inulin	Corn Syrup, Sugar, Maltodextrin	Flavored Only: Fructose + Sugar Substitutes Acesulfame K, Sucralose or Aspartame	Banana Flakes, Trans-Galacto-Oligosaccharide, 2 g Fiber + 2.75 g Prebiotic Fiber
Protein Source	Whey Protein Isolate (Milk)	Milk Protein Concentrate, Calcium and Sodium Caseinate (Milk), Soy Protein Isolate	Calcium Caseinate (Milk), Potassium Caseinate (Milk), Soy Protein Isolate	Sodium and Calcium Caseinate (Milk), L-Arginine	Enzymatically Hydrolyzed Whey Protein (Milk)	Milk Protein Concentrate, Whey Protein Concentrate (From Milk)	Sodium and Calcium Caseinate (Milk), Soy Protein Isolate	Whey Protein Isolate (Milk)	N/A
Fat Source	N/A	Canola Oil, High Oleic Sunflower Oil, Corn Oil	Canola Oil	Canola Oil	Medium Chain Triglycerides, Soybean Oil, Canola Oil	Canola Oil, Medium Chain Triglycerides	Canola Oil	N/A	N/A
Osmolality (mOsm/kg)	750	670	950	400	450	350	800	N/A	N/A
Na (mg)	80	200	280	270	120	120	225	55	0
K (mg)	0	360	420	260	375	375	225	95	120
P (mg)	150	300	250	200	225	225	195	85	5
Flavors	Orange, Peach	Vanilla, Chocolate, Strawberry	Vanilla	Vanilla, Chocolate, Strawberry	Vanilla	Vanilla	Vanilla, Strawberry, Mocha	Unflavored, Vanilla, Chocolate, Strawberry	No added flavor
Meets or exceeds 100% RDV/DRI (mL)	N/A	1185	N/A	1180	1-8 years 1000 mL, 9-13 years 1500 mL	1-8 years 1000 mL, 9-13 years 1500 mL	1000*	N/A	N/A

* Except for vitamin A, thiamine, phosphorus, and magnesium.

VENTURA COUNTY MEDICAL CENTER



VENTURA COUNTY
MEDICAL CENTER

Tube Feeding per 1000 mL											
Product Name	FIBERSOURCE® HN	REPLETE®	IMPACT® PEPTIDE 1.5	PEPTAMEN AF®	PEPTAMEN INTENSE VHP	NUTREN® 1.0	NUTREN® 2.0	NOVASOURCE® RENAL	DIABETESOURCE® AG	ALFAMINO® JUNIOR	PEPTAMEN JUNIOR® WITH PREBIO™
Replaces	Jevity® 1.2 Cal	Promote®	Pivot® 1.5 Cal	Vital AF 1.2 Cal®	Vital® High Protein	Osmolite® 1 Cal	TwoCal® HN	Nepro®	Glucerna® 1.0 and 1.5 Cal	Necocate® Junior with Prebiotics	PediaSure® Enteral With Fiber
Description	House formula Contains fiber	High protein Medical ICU Fiber-free	Immune supporting Semi-elemental Major surgery, major trauma & TBI Fiber-free	Semi-elemental High protein Malabsorption Severe pancreatitis Low-residue	Semi-elemental Very high protein Permissive underfeeding Low-residue	House formula Fiber-free	Concentrated for Fluid restriction Fiber-free	Renal failure Low Na, K, Phos & fluid Fiber-free	Reduced carbohydrate Contains fiber	Amino acid-based GI disorders Hypoallergenic Children age 1-13 Fiber-free	Semi-elemental Malabsorption Children age 1-13 Contains prebiotic
Calories per mL	1.2	1.0	1.5	1.2	1.0	1.0	2.0	2.0	1.2	1.0	1.0
Protein (g)	54	64	94	76	92	40	84	90.7	60	33	30
Carbohydrate (g)	164 (15.2 g fiber)	112	140	112 (6 g prebiotic)	76	136	216	183	100 (15.2 g fiber)	122	116 (6 g fiber)
Fat (g)	40	34	63.6	54	38	34	92	100	58.8	44	48
Water (%)	81%	84%	77%	81%	84%	85%	69%	72%	62%	84%	84%
Carbohydrate Source	Corn Syrup, Maltodextrin, Psa Fiber, FOS, Inulin, Gum Acacia	Corn Syrup, Maltodextrin	Maltodextrin, Corn Starch	Maltodextrin, Corn Starch, FOS, Inulin	Maltodextrin, Corn Starch, FOS, Inulin	Corn Syrup, Maltodextrin	Corn Syrup, Maltodextrin	Corn Syrup, Sugar, Maltodextrin	Corn Syrup, Fructose, and Vegetables Blend, Fructose, Maltodextrin, FOS, Partially Hydrolyzed Guar Gum, Soy Fiber, Green Peas and Green Bean Puree, Peach Puree, Orange Juice	Corn Syrup Solids, Potato Starch, Maltodextrin	Sugar, Maltodextrin, Corn Starch, FOS, Inulin
Protein Source	Soy Protein Isolate, Sodium Caseinate (Milk), Calcium Caseinate (Milk)	Sodium Caseinate (Milk), Calcium Caseinate (Milk)	Hydrolyzed Casein (Milk), L-Arginine - 18.7 g/liter	Enzymatically Hydrolyzed Whey Protein	Enzymatically Hydrolyzed Whey Protein (From Milk)	Soy Protein Isolate, Sodium Caseinate (Milk), Calcium Caseinate (Milk)	Sodium Caseinate (Milk), Soy Protein Isolate, Calcium Caseinate (Milk)	Sodium and Calcium Caseinate (Milk), Soy Protein Isolate	Soy Protein Isolate, L-Arginine - 4 g/liter	Free Amino Acids	Milk Protein Concentrate, Whey Protein Concentrate (From Milk)
Fat Source	Canola Oil, Medium Chain Triglycerides	Canola Oil, Medium Chain Triglycerides	Medium Chain Triglycerides, Refined Fish Oil (Anchovy, Sardine), Soybean Oil	Medium Chain Triglycerides, Refined Fish Oil (Anchovy, Sardine), Soybean Oil	Medium Chain Triglycerides, Refined Fish Oil (Anchovy, Sardine), High Linoleic Safflower Oil, Soybean Oil	Canola Oil, Medium Chain Triglycerides	Medium Chain Triglycerides, Canola Oil	Canola Oil	Canola Oil, Refined Fish Oil (Anchovy, Sardine)	Medium Chain Triglycerides, Soybean Oil	Soybean Oil, Canola Oil, Medium Chain Triglycerides
Osmolality (mOsm/kg)	480	300	510	390	345	330	780	600	450	590	450
Na (mg / mEq)	1120 / 49	880 / 38	1170 / 51	720 / 32	680 / 26	880 / 38	1500 / 65	945 / 41	1060 / 46	480 / 21	480 / 21
K (mg / mEq)	1920 / 49	1600 / 41	1870 / 48	1800 / 48	1500 / 40	1600 / 41	2100 / 54	945 / 24	1600 / 41	1400 / 36	1500 / 38
P (mg / mEq)	960 / 61.9	800 / 51.6	1000 / 64.5	800 / 51.6	680 / 43.9	800 / 51.6	1480 / 95.5	819 / 52.8	800 / 51.6	840 / 54.2	900 / 58.1
Mg (mg)	340	280	420	340	300	280	560	197	320	240	200
Meets or exceeds 100% RDV/DRI (mL)	1250	1500	1000	1250	1500	1500	750	1000*	1250	1-8 years 1000 mL, 9-13 years 1500 mL	1-8 years 1000 mL, 9-13 years 1500 mL

* Except for vitamin A, thiamine, phosphorus, and magnesium.

Disclaimers: All formula substitutions require clinical judgment; please contact a clinician for appropriateness of alternative options. Not all clinical considerations are included and the listed alternatives may not be nutritionally compatible or equivalent in all respects. All product information is obtained from product literature as available upon the date of issue and is subject to change. For specific nutritional information, please consult the manufacturer. For assistance in Nestle product selection and clinical application, call Nestle at 1-800-422-ASPD (2752). In addition, please note the following: PEPTAMEN® formulas contain milk protein. They may not be appropriate for individuals with cow's milk protein allergy. © 2010 Nestle. All rights reserved.

DISSERTATION CERTIFICATE OF APPROVAL

The dissertation of Amy Motley Jones is approved:

Dr. Lauri Wright, Committee Chair

Date

Dr. Kristen Hicks-Roof

Date

Dr. Mark Lepore

Date