

**Perceptions, adequacy, and acquisition of clinical advanced practice training and skills in
the dietetic profession**

By

Madelaine R. (Dickinson) Schaufel

Submitted to the graduate degree program in Dietetics and Nutrition and the Graduate Faculty of
the University of Kansas in partial fulfillment of the requirements for the degree of Master of
Science.

Chair: Heather Gibbs, PhD, RD

Debra Sullivan, PhD, RD

Jeannine Goetz, PhD, RD

Date Defended: April 19th, 2017

The Thesis Committee for Madelaine R. (Dickinson) Schaufel certifies that this is the approved version of the following thesis:

Perceptions, adequacy, and acquisition of clinical advanced practice training and skills in the dietetic profession

Chair: _____
Heather Gibbs, PhD, RD

Date approved: April 19th, 2017

Abstract

Purpose: This study aimed to investigate RDN use of nutrition-related lab testing as a potential advanced clinical skill, and to describe RDN perceptions of the adequacy of training for nutrition-related lab testing and advanced clinical skills.

Methods: A 40-item survey was sent electronically by email to 4951 randomly selected RDNs who have maintained dietetic registration with the Commission on Dietetic Registration \geq three years. Reminders were sent weekly for the first three weeks, and the survey was open for five weeks. Answers to 10 questions on professional training and practice were used to assign participants into beyond-entry-level (BEL) or advanced-practice-eligible (AP) groups, according to Academy of Nutrition and Dietetics (AND) and Commission on Dietetic Registration (CDR) definitions. Descriptive statistics and differences (Mann Whitney U or Chi-square) between BEL and AP groups were analyzed, and significance was defined as $p < .05$.

Results: Out of 805 participants, 64% of whom were categorized as BEL, 649 surveys were completed. A majority (85%) reported use of laboratory testing where a comprehensive metabolic panel was the most frequently used test and genetic testing the most infrequently used test. There were no differences between BEL or AP groups for use of laboratory testing except in the case of nutrient status testing, where the AP group reported significantly more frequent use ($p = .02$). The BEL group rated their professional training as more adequate for their current level of practice ($p = .03$). AP RDNs more often identified the most useful training method as self-teaching (34% vs 21%, $p < .001$).

Conclusions: There is a need for improved clinical training to support dietetic AP and nutrition-related lab testing represents one potential gap in training for advanced level clinical practice.

Acknowledgements

The student author thanks faculty advisor Heather Gibbs, PhD, RD for her dedicated assistance with each stage of the project, from literature review, to data collection and analysis, to manuscript preparation. The student author also thanks committee members Debra Sullivan, PhD, RD and Jeannine Goetz, PhD, RD for assistance with project design and manuscript review. Lastly, the student author thanks Holly Hull, Ph.D, for her assistance in literature review research and preparation and the group of RDNs involved in pilot testing the survey for their feedback.

Table of Contents

Abstract	iii
Acknowledgements	iv
List of Abbreviations	vi
List of Definitions	vii
Chapter 1: Introduction	1
<i>Previous research in the areas being studied</i>	<i>1</i>
<i>Reasons for Further Investigation</i>	<i>2</i>
<i>Statement of Purpose</i>	<i>3</i>
<i>Research Question</i>	<i>3</i>
Chapter 2 Review of Literature: The Development and Evolution of the Dietetic Profession Related to Clinical Advanced Level Practice Training and Skills	4
<i>Examination of Needs within the U.S. Healthcare System</i>	<i>4</i>
<i>Introduction of Dietetic Advanced Practice</i>	<i>6</i>
<i>Definition of Nutrition-Related Laboratory Testing</i>	<i>6</i>
<i>Hypothesis</i>	<i>7</i>
<i>Progression of Dietetics Definition and Practice</i>	<i>7</i>
<i>The Existence of Advanced Practice in Dietetics</i>	<i>9</i>
<i>Current Paths to AP</i>	<i>12</i>
<i>Current Methods of Defining AP</i>	<i>13</i>
<i>Current Issues in Dietetic Advanced Practice</i>	<i>15</i>
<i>Motivations for Pursuit of AP</i>	<i>16</i>
<i>The Future Path of AP Education</i>	<i>17</i>
<i>Future Directions for AP Research</i>	<i>20</i>
Chapter 3: Methods	23
<i>Overview</i>	<i>23</i>
<i>Sample</i>	<i>23</i>
<i>Setting</i>	<i>24</i>
<i>Ethics</i>	<i>24</i>
<i>Procedures & Materials</i>	<i>25</i>
<i>Analysis of Data</i>	<i>26</i>
Chapter 4: Results	27
<i>Survey Purpose</i>	<i>27</i>
<i>Survey & Sample Characteristics</i>	<i>27</i>
<i>Objective 1: Investigate current RDN use and training in nutrition-related laboratory testing</i>	<i>30</i>
<i>Objective (2) Identify disparities (if they exist) between professional education and clinical training versus the clinical training needed to practice at advanced clinical level and use nutrition related laboratory testing</i>	<i>33</i>
<i>Objective (3) Describe RDN demand for and perceptions of need related to nutrition-related lab testing training, credentialing, and utilization.</i>	<i>36</i>
Chapter 5: Discussion	39
<i>Connections with Previous Research</i>	<i>39</i>
<i>Major Findings</i>	<i>40</i>
<i>Limitations</i>	<i>41</i>
<i>Conclusions & Future Research</i>	<i>42</i>
References	43
Appendices	46
<i>Appendix A: Data Collection Instrument</i>	<i>46</i>
<i>Appendix B: Consent Form</i>	<i>47</i>
<i>Appendix C: Survey Questions</i>	<i>48</i>

List of Abbreviations

RD/RDN: registered dietitian/ registered dietitian nutritionist

NRLT: nutrition-related laboratory testing

AND: Academy of Nutrition and Dietetics

CDR: Commission on Dietetic Registration

AP: advanced practice

EL: entry-level

BEL: beyond entry-level

DPD: didactic program in dietetics

NCPM: Nutrition Care Process Model

KUMC: University of Kansas Medical Center

ASPEN: American Society for Parenteral and Enteral Nutrition

BCNS: Board for Certification of Nutrition Specialists

CNCB: Clinical Nutrition Certification Board

List of Definitions

NRLT: nutrition-related laboratory testing. Nutrition-related laboratory testing could comprise a broad range of laboratory tests, as so much of human health relates to nutrition. For the purposes of this study, nutrition-related laboratory testing will be considered a comprehensive metabolic panel, a complete blood count, hemoglobin A1c, fasting glucose, fasting insulin, serum lipids, nutrient status testing (i.e. serum 25-hydroxyvitamin D or other), food allergy/sensitivity testing, genetic testing, and stool analysis.

CDR: Commission on Dietetic Registration

AP: advanced practice. For this study, the CDR criteria for eligibility to take the AP certification exam were used. There are two eligibility pathways. Both require RDNs to be at least four years post-registration and a current RDN, with 8,000 hours of clinical nutrition practice experience. Pathway (1) RDNs must hold an advanced degree, excluding degrees in the arts and humanities. Pathway (2) RDNs without an advanced degree may provide documentation of at least two of the following: professional presentation experience, authorship (a research article, book, or book chapter), or hold a specialist certification in a topic related to clinical nutrition. RDNs going through either pathway must pass a two-part board exam initially, and then undergo re-examination every 5 years

EL: entry-level, a term that refers to RDNs who have practiced less than 3 years post dietetic registration

Chapter 1: Introduction

The primary justifications for the study, *Perceptions, Adequacy, and Acquisition of Clinical Advanced Level Practice Training and Skills in the Dietetic Profession*, were that it built on previous work in the area of advanced practice (AP) research in dietetics and sought to resolve unanswered questions significant to the progression of advanced practice training and credentialing in dietetics.

Previous research in the areas being studied

Within the U.S. healthcare system, there are currently no mid-level or high-level providers whose specialty or training focus is nutrition. This deficit is potentially a major concern, as nearly two-thirds of all deaths in the United States each year are due to conditions related to nutrition. The steadily increasing burden of chronic disease in this country highlights the need for enhanced preventative and interventional measures that target the source of the problem (1). Thus, dietetic AP is an issue of importance to both the profession and to how nutrition care is provided within the U.S. healthcare system. However dietetic AP that is clearly recognized both inside and outside the profession is not yet a reality. Current research supports that the dietetic profession has evolved to include three distinct levels of practice: entry-level (EL), beyond entry-level (BEL), and advanced-level practice (AP). While research has produced empirically validated definitions differentiating EL and BEL practice, AP has been much more difficult to clearly define (2). Research has identified characteristics of registered dietitian nutritionists (RDN) who meet AP criteria, however describing tasks and responsibilities unique to dietetic AP has remained elusive (3). The 2013 Commission on Dietetic Registration Advanced Level Clinical Practice Audit made progress in this area, identifying variations in

frequency of many practice activities between AP and BEL RDNs, providing support for the existence of measurable task differences in AP. One notable result was that AP-RDNs were significantly more likely to “initiate orders for laboratory or other tests” compared to BEL RDNs (4). However, practice differences remain widely variable and we have yet to agree on a clear definition of dietetic AP.

Reasons for Further Investigation

Describing what AP-RDNs do differently in practice compared to non-AP dietetic professionals is vital to the development of AP. However, AP education, training, and the resulting credentials may be a critical missing piece in role differentiation between BEL and AP. There is currently no clear path for AP education, training and associated credentialing.

The proposed study will explore the BEL and AP-eligible RDNs’ (AP-eligible according to recent CDR credential standards) perceptions related to the adequacy and question of clinical AP training and use of clinical skills in advanced practice. Due to the broad scope of possible clinical skills, it was necessary to limit in-depth inquiry to one clinical skill, nutrition-related laboratory testing. Currently, there is a gap in our understanding of how RDNs acquire and use specific AP skills, including nutrition-related laboratory testing. This may relate to the lack of standardized education for AP in the field of clinical dietetics. To be able to define, describe, and support the growth of dietetic AP, it is important to identify areas where additional clinical training is needed, in order to develop modes of education that increase clinical skills and enhance recognition of dietetic AP and the correlating advanced skill set.

Statement of Purpose

The purposes of this study were to: 1) Investigate current RDN use and training in nutrition-related laboratory testing; 2) Identify disparities (if they exist) between professional education and clinical training versus the clinical training needed to practice at an advanced clinical level and use nutrition related laboratory testing; and 3) Describe RDN demand for and perceptions of need related to nutrition-related lab testing training, utilization, and advanced practice credentialing.

Research Question

Is there a need for advanced level clinical training to support use of autonomous clinical skills like nutrition-related laboratory testing in advanced dietetic practice?

Chapter 2 Review of Literature: The Development and Evolution of the Dietetic Profession Related to Clinical Advanced Level Practice Training and Skills

Examination of Needs within the U.S. Healthcare System

The United States is experiencing a growing chronic disease epidemic. According to the Centers for Disease Control and Prevention, six of the ten leading causes of death in this country are nutrition and lifestyle related. Together, these diseases contribute to 59% of the 2.6 million deaths that occur in the U.S. each year. Heart disease and cancer dominate the list; accounting for 46% of the 2.6 million deaths that occur in the U.S. each year. Stroke, Alzheimer's disease, diabetes, and kidney diseases are responsible for another 13% of all deaths. Commonalities among these conditions are their link to diet and lifestyle and their consistent upward trend in the U.S. population (1). The dramatic increase in the incidence and prevalence of these conditions evidences a healthcare system unequipped to address, reverse, or prevent these diseases.

While the etiology of the chronic disease epidemic we face is complex, one major issue that should be noted is the lack of professional training to address these conditions. There are currently no mid- or high-level health care disciplines or specialties whose focus is nutritional care. In existing mid-level and high-level provider training, education related to nutrition and lifestyle interventions ranges from hugely inadequate to non-existent. To address the swelling tide of chronic disease, it is important that nutrition education be improved across all health care disciplines (5). In addition, nutrition-focused health care professionals who understand the complex connection between diet, lifestyle, and chronic disease and who can apply this knowledge at an advanced care level have a critical and unfilled role to play in the United States health care system. It is currently unclear whether the dietetic profession will evolve to produce professionals equipped and credentialed to fill this role, or if this need will be met by another

discipline, such as medicine or nursing. Regardless of the fate of the dietetic profession, a new generation of health care practitioners must evolve to provide nutrition and lifestyle interventions with autonomy, authority, and advanced knowledge in order to curb the chronic disease crisis currently overwhelming the United States.

The development of advanced practice roles in non-physician disciplines is not foreign to health care. The nursing profession has seen great success in the development of the advanced practice nursing role, especially that of the nurse practitioner, who may function as a primary care provider in a growing number of states (6). Skipper et al. summarizes the successes of advanced practice nursing to include increased practice autonomy, greater collaboration with physicians, improved patient care, enhanced efficiency, and increased financial compensation (7). These documented outcomes have supported increased demand for advanced practice nurses and the creation of new jobs and roles (7).

Dietetic advanced practice (AP) is a significant issue on multiple levels. The increased practice autonomy that characterizes AP may have far-reaching implications. Preliminary research supports a relationship between increased RDN autonomy and improved quality of care, patient safety, efficiency, and financial savings (8). In addition to increasing avenues for advancement within the dietetics profession, AP also has the potential to enhance interprofessional collaboration (9). As discussed above, advanced dietetic practice also has implications that extend to the health of the entire U.S. population. Equipping dietetic professionals to function on an advanced level is of utmost importance to address the rising tide of morbidity and mortality related to chronic disease.

Introduction of Dietetic Advanced Practice

The purpose of this literature review is to examine how the dietetic profession has evolved over time related to advanced level clinical practice (AP), advanced training, skill development, and skill use. Dietitian (RDN) use of nutrition-related laboratory testing (NRLT) is one major example of an advanced skill that will be considered. This review will conclude with a discussion of future directions for development of AP within the dietetic profession. The concept of advanced-level practice in dietetics may be considered from two main angles. The first is *how* AP-RDNs practice. This relates to the thought process and approach to care of the practitioner. The second is *what* AP-RDNs do differently in practice compared to non-AP dietetic professionals. This relates to the function of the practitioner, advanced skills they have developed, and the increased practice privileges that may come with those skills. Autonomy is a characteristic of advanced level practice (9), and there is evidence to support autonomous use of nutrition-related laboratory testing as an AP skill (4).

Definition of Nutrition-Related Laboratory Testing

Nutrition-related laboratory testing (NRLT) is potentially a very broad category, as so much of human health relates to nutrition. For the purpose of this review, NRLT will be considered a comprehensive metabolic panel, a complete blood count, HbA1c, fasting glucose, fasting insulin, serum lipids, nutrient status testing, food allergy/sensitivity testing, genetic testing, and stool analysis. To better understand the relationship of RDNs' use of laboratory testing and advanced practice, this review will discuss the development of dietetic AP, its current status, motivations related to the pursuit of AP, and the future path of AP training, credentialing, and research. Currently, there is a gap in our understanding of how RDNs acquire and use

specific AP skills, including NRLT. This may relate to the lack of standardized education for AP in the field of clinical dietetics.

Hypothesis

For the advancement of the dietitian as a clinician and health care practitioner, it is necessary that the profession evolve to include options for standardized training and credentialing for generalist AP that expands the RDN's scope of practice to include autonomous utilization of AP skills and tools, such as nutrition-related laboratory testing. My hypothesis is that a need exists for increased training and credentialing to support autonomous use of clinical skills in advanced level dietetics practice, especially related to NRLT. The aim of this study is to investigate how RDNs use laboratory testing in practice, how they acquired the training supporting this skill, and their perceived needs for future change related to NRLT utilization, training and credentialing.

Progression of Dietetics Definition and Practice

To understand the development of dietetic AP, it is helpful to broadly understand the development of the overall practice of nutrition and dietetics. Both the conceptual and practice definitions of dietetics have dramatically evolved over time. Dietetics has no clearly defined beginning; the field and its practice have progressed over centuries. Evidence demonstrates many ancient cultures had an appreciation for the interconnection of food and health. Throughout time, dietetics and nutrition have been closely intertwined with the practice of medicine. The word dietetics can be found in the Dunglison Medical Lexicon as far back as 1839, and was listed as “‘a branch of medicine comprising the rules to be followed for preventing, relieving, or curing diseases by diet’” (10).

The concept of dietetics as a branch of medicine seems to have faded from modern definitions. Dietetics today has a more all-encompassing definition according to numerous reference works. For example, *The Dictionary of Sport and Exercise Science and Medicine* describes dietetics as “the interpretation and application of scientific principles of nutrition to feeding in health and disease” (11). The closest existing definition to Dunglison’s Medical Lexicon appears to be *The American Heritage Medical Dictionary* which defines dietetics as “The branch of therapeutics concerned with the practical application of diet in relation to health and disease” (12). Today, the practice of dietetics and nutrition in the United States is primarily represented by the Academy of Nutrition and Dietetics (formerly known as the American Dietetic Association), which was founded in 1917. This entity has helped to create an extremely diverse definition of possible dietetic practice within the United States. Thus, there is ongoing tension related to definitively describing the role of the RDN (10).

According to the Academy of Nutrition and Dietetics, RDNs can be found in a wide variety of employment settings, performing an even more varied range of functions. These settings range from hospitals, clinics, private practice, academia, the community, the food industry, to the media (13). The main unifying factor is the entry-level training each of these RDNs underwent. The diversity of the dietetic profession and the challenges related to describing what RDNs do underscore the need for standardized education and training in order to develop and delineate clinical AP.

While the roles of RDNs are extremely diverse, the clinical role of the RDN has been consistently significant in modern dietetics. An estimated 57% of RDNs provide care in inpatient, ambulatory, and long-term care settings, making clinical dietetics the most dominant subsection of the profession (14). The clinical RDN role has also gone through a series of

transformations. One method of tracing these changes is through the development of the Nutrition Care Process Model (NCPM). This model began in the 1970s as a series of conceptual diagrams intended for instruction of dietetics students. It was adapted over time and in 2003, the standardized NCPM was adopted by the Academy of Nutrition and Dietetics. This diagram clarifies the role of the RDN in clinical care by providing a conceptual framework for care delivery composed of four domains: assessment, diagnosis, intervention, and monitoring/evaluation. This framework is crucial in educating RDNs and others in the healthcare system regarding the clinical functions of the RDN. The structure the NCPM provides has significant implications for accreditation standards, reimbursement and insurance coverage, care documentation, and standardization of language and terminology (15). For improvement and advancement of the profession, it is vital that dietetics represent itself clearly both internally and externally.

The Existence of Advanced Practice in Dietetics

As the dietetic profession has evolved, three distinct levels of practice have developed for RDNs. To define advanced-level dietetic practice, it is necessary to differentiate between entry-level (EL), beyond entry-level (BEL), and advanced-level practice (AP). EL practice has been traditionally considered the first three years following registration. Recently, this definition was empirically validated (2). Consequently, BEL RDNs have practiced more than three years post-registration (4).

Clearly defining AP has presented much greater challenges than EL or BEL practice. AP in dietetics has developed over the last 50 years in response to needs within the health care system and the dietetics profession (16). According to Christie and colleagues (16), original authors Forcier, et al. support that AP training and credentialing have been topics of discussion

in dietetics since the 1970s (original work unavailable). The topic began to develop significant momentum in the early 1990s. At this point, dietetic technicians, entry-level RDNs, and beyond-entry level RDNs were recognized as the three distinct levels of dietetic practice. A fourth level, advanced practice, had only been theoretically postulated. However, results of the 1991 American Dietetic Association Practice Study provided an empirical basis for the existence and identification of AP (3). In 1993, a prototype curriculum for a “dietetics-specific practice doctorate” was also introduced. This study also substantiated RDNs’ interest in a professional doctorate and identified perceived barriers surrounding this degree in dietetics (16). Research by Skipper and colleagues in the early 2000s further confirmed RDNs’ interest in advanced practice education and professional doctorates, and provided preliminary support for educator and employer interest (17).

Work continued as multiple research teams identified characteristics of RDNs who meet AP criteria. However, describing practice tasks unique to AP has remained an ongoing challenge (3). The Commission on Dietetic Registration 2013 Advanced Level Clinical Practice Audit made significant progress in this area, identifying variations in frequency of many practice activities between AP and BEL RDNs, providing support for the existence of measurable task differences in AP. One notable result was that AP-RDNs were significantly more likely to “initiate orders for laboratory or other tests” compared to BEL RDNs (4). However, practice differences remain highly variable and a clear consensus definition of dietetic AP is yet unreachd.

Currently, the Academy of Nutrition and Dietetics broadly defines advanced practice as: “The practitioner demonstrates a high level of skills, knowledge and behaviors. The individual exhibits a set of characteristics that include leadership and vision and demonstrates effectiveness

in planning, evaluating and communicating targeted outcomes” (18). While this definition captures many aspects of AP, it not yet complete. It does not address standardized training, competencies, credentialing requirements, or increased practice privileges that may accompany AP. As discussed by Skipper and colleagues, increased autonomy is a vital part of advanced practice (9). This concept was supported by the 2013 Advanced-Level Clinical Practice Audit, which found significant differences in autonomy between AP and BEL RDNs related to frequency of autonomous order-writing and development/direction of programs (4). Despite documented dietetic AP characteristics, acquirement and recognition of dietetic AP remains elusive.

Current Paths to AP

The current pathways for recognizing and achieving advanced-level practice in dietetics are varied and poorly defined as of this writing. In July of 2015, the Commission for Dietetic Registration launched an advanced practice credentialing program (AP-RD or AP-RDN) based on The 2013 Advanced Level Clinical Practice Audit and much of the previously discussed research. Certification criteria include documented practice experience and passage of a certification examination (19). While the launch of this program represents progress, the credential is more representative of practice experience rather than standardized AP training. While vital, experience and career achievements alone may not be adequate for establishing AP that is clearly recognized both inside and outside the profession. Because of these challenges, a widely accepted definition of clinical dietetic AP may still be far off, and defining and describing AP continues to progress.

Prior to the July 2015 launch of the CDR program for board certification in clinical advanced practice (19), only a hybrid path existed featuring experience-based measures and specialty certifications. Previous formal modes for advancing dietetic practice have only been through credentialing. One system was the now-defunct Fellow of The American Dietetic Association (FADA) credentialing program. Based on a professional-portfolio review, this resulted in a credential that reflected recognition of professional achievements (20). The other mode is the exam-based Board Certification in Advanced Diabetes Management program (21). Specialty practice certifications have also been developed in the areas of nutrition support, pediatrics, gerontology, nephrology, oncology, and sports (22). However, specialty practice does not necessarily mean advanced practice, and vice versa. While specialty practice is likely more prevalent among AP-RDNs, according to current Commission on Dietetic Registration (CDR)

requirements, it is possible for an RDN to hold a specialist certification without AP standing (19, 22). Because specialty and advanced practice are distinct, the achievement of dietetic AP should not strictly necessitate specialization or specialty certification. Thus, the existence of specialist certification programs within dietetics cannot compensate for the profession's lack of a generalist AP training pathway. Although at least one professional clinical doctorate program exists, it is not directly associated with AP credentialing (23). It is likely that the disjointed approach characterizing dietetic AP education, training, and credentialing pathways relates to the lack of agreement on how to define and describe AP.

Current Methods of Defining AP

Our current method of defining AP began in the early 1990s with the work of Bradley and colleagues (3). Their approach produced a model of AP based on five factors: 1) education and experience, 2) professional achievement, 3) approach to practice, 4) professional role positions, and 5) professional role contacts. This team's attempt to measure a sixth factor, advanced level performance, was unsuccessful. Overall, this work resulted in a description of AP qualities including: at least 8 years of experience, multiple professional leadership roles, a geographically expansive network of professional contacts, and an intuitive and flexible approach to patient care (3). Work by Skipper and colleagues in the early 2000s generated a model that sought to clarify what AP-RDNs *do*. However, the resulting model was still heavily based on practitioner characteristics, rather than delineation of specific tasks (9).

The work of Brody and colleagues (24) in 2012 built off of Bradley and colleagues' earlier work (3) and produced a streamlined four-factor model based on: 1) professional knowledge, abilities, and skills; 2) approaches to practice; 3) roles and relationships; and 4) practice behaviors. This model described essential AP criteria as: possessing an advanced degree,

at least eight years experience post-registration, characteristics such as intuition and creativity, various leadership roles, and diverse professional contacts (24). Brody and colleagues published work in 2014 that featured the results of a delphi study in which RDNs who met AP criteria rated clinical activity statements by importance for AP practice. While this work contributed to the task of describing AP activities, it did not feature a control group of BEL RDNs for comparison of the results (25). Research conducted by Mueller and colleagues published in 2015 compared AP to BEL practice functions using a survey containing activity statements (4). Results of this survey supported differences in tasks performed and suggested that while RDNs who meet AP criteria may perform many of the same tasks as BEL RDNs, there are differences in frequency, autonomy, risk-taking, and leadership related to these tasks (4).

The newly launched program of the Academy of Nutrition and Dietetics for board certification in clinical advanced practice (AP-RD or AP-RDN) is based on the body of research discussed above. It is likely that this credential will heavily impact how we define AP in the future. This program's criteria for eligibility to take the certification exam feature two distinct pathways. Both require RDNs to be at least four years post-registration and a current RDN, with 8,000 hours of clinical nutrition practice experience. The first pathway is for RDNs with an advanced degree, excluding degrees in the arts and humanities. The second path is for RDNs without an advanced degree. Alternately, these RDNs may provide documentation of professional presentation experience, authorship (a research article, book, or book chapter), or hold a specialist certification in a topic related to clinical nutrition. RDNs going through either pathway must pass a two-part board exam initially, and then undergo re-examination every 5 years (19). While the dietetic profession may be reaching a place of greater agreement on the

definition of AP, challenges will still exist in empowering AP practice to reach its full potential and in persuading others within the health system of the AP-RDN credential's value (26).

Current Issues in Dietetic Advanced Practice

The numerous issues related to advanced-level dietetic practice both support the need for improved AP training and credentialing and challenge their development. One challenge is that an advanced degree, as required for the AP-RDN credential, is not necessarily a practice degree. In the case of dietetics, it is often an academic degree. The lack of a standardized advanced practice degree associated with the AP-RDN credential may impact the RDN's professional standing compared to other health professionals. A comparison of educational pathways of dietetics and other health professions will be discussed in Section VI. *The Future Path of AP Education.*

Another challenge is uncertain compensation related to advanced training. According to Brody and colleagues, original researcher The Caviart Group LLC (original work unavailable), while there is some evidence based on market analysis to support opportunities for increased compensation with an AP credential (26), this is not guaranteed. Opportunities may be slow in developing and may largely depend on the perceived value placed on the credential by employers and other health professionals. At least one study supports employer and educator interest in advanced practice education and professional doctorate degrees (17). The new AP-RDN program recognizes and credentials pre-existing experience and achievements, but does not provide additional formal AP education.

The lack of standardized AP education may potentially be a barrier for employers and other health professionals to understanding the AP-RDN credential and attributing appropriate value to it. Agreeing on the definition and description of AP within the dietetics profession has

been an ongoing struggle and it is to be expected that significant barriers also exist to establishing interprofessional understanding of dietetic AP. A final challenge is that differing ideas still exist on the best path to achieve dietetic AP. While RDN and educator interest in a practice doctorate has been documented (16), very few programs have been launched. As of this writing, there are only three known programs, though more may exist (23, 27, 28).

Motivations for Pursuit of AP

Despite these challenges, there are many motivations for pursuing AP among dietetic professionals. As evidenced by the diversity of the dietetic profession, many RDNs are adventurous, innovative, and entrepreneurial. RDNs have historically created jobs where there were none (29). The desire for professional development and growth is one of the major driving factors behind the pursuit of AP (16). Increased knowledge and personal development were the top reasons cited in a study of perceived needs for graduate clinical nutrition education (30). Research by Skipper and colleagues and Christie and colleagues strongly indicates there is a segment of clinical RDNs practicing below their desired autonomy level (16). These RDNs are interested in “ordering, performing and interpreting nutrition-related tests... nutrition physical assessment, designing, implementing, and modifying interventions, ordering macro- and micronutrient doses, and implementing and modifying nutrition-related drug therapy” (17). RDNs are motivated by the potential for improved patient outcomes and increased efficiency and effectiveness of care (17). RDNs cited multiple barriers to their achievement of desired advanced practice level, including insufficient educational preparation (most common), lack of opportunities to hone clinical skills, resistance of facility administration or physicians, and lack of interprofessional standing (16).

Interprofessional standing is another major reason among RDNs for the pursuit of AP. Competitive education and training, and the resulting security and confidence are major motivators (16). Educational requirements for many other health professions continue to rise, but core requirements of dietetics training have not significantly changed in over 80 years (31). Comparable credentialing and the opportunity for greater collaboration with health professionals and clients are also of interest (31).

RDNs are likely also motivated by unmet needs within the healthcare system. Changes to the system related to technology, increasing chronic disease, and many other factors in the last 100 years have necessitated increased knowledge, skills and scope of practice among many health professions, including dietetics (31). The potential for improved compensation and reimbursement are also probable motivators for RDNs (32). According to the 2013 Compensation & Benefits Survey of the Dietetics Profession, education, job responsibility, and qualifications were all vital to higher compensation (2). However, while all of these factors may provide motivation for the pursuit of AP, the direct effect of AP training or credentialing on many of these factors such as compensation or practice autonomy remains to be seen.

The Future Path of AP Education

In determining the future of AP training in dietetic practice, much can be learned by examining the AP education pathways of other professions. Baseline education standards within the dietetics profession include completion of a series of didactic courses in dietetics, an undergraduate degree, and completion of a supervised practice experience. This experience is a minimum of 1200 hours and usually ranges in duration from 6-12 months. While about half of RDNs hold advanced degrees, it is not currently a requirement (33). These core requirements have remained fairly stable over the past century, even as the health system and the knowledge

and skills needed for practice have transformed (31). There seems to be growing agreement on the need for radical restructuring of educational requirements within the dietetic profession (34).

A comparative study of the educational requirements of dietetics and 15 other diagnosing and treating health professions revealed shifts in the educational landscape of many health fields. Eleven of the fifteen professions required a practice doctorate before starting any professional practice. For four of these professions, this change occurred within the last 15 years. In some cases, this involved conversion of an advanced practice doctorate to a first professional degree, as in the case of pharmacy. Three professions recently discontinued baccalaureate preparatory programs, and shifted to MS or doctorate requirements. Unlike dietetics, a practice degree, not an academic degree, was needed for entry into the majority of these fields. Though some professions required a baccalaureate degree prior to a professional degree, dietetics alone required only a baccalaureate degree. There were three professions with pathways that did not require a baccalaureate degree for entry-level practice: recreational therapists, respiratory therapists, and nurses. Recreational therapists, respiratory therapists, occupational therapists, and RDNs were the only professions without accredited post-professional training available. Dietetics also fell close to the bottom in duration of supervised practice experience required (31). To achieve competitive interprofessional standing, significant progress is necessary in the development of advanced level education pathways in dietetics.

Nursing has seen considerable success in its development of advanced practice pathways, offering practice degrees at both the master's and doctorate level, distinct from advanced academic nursing degrees. According to Skipper and colleagues, original research (citations unavailable) supports that this profession has successfully delineated what AP practitioners do, documented beneficial outcomes associated with autonomous nursing AP, stimulated job

demand, and experienced correlating increases in compensation, providing a compelling model for change within the dietetics profession (7).

It is necessary that the dietetic education continue to develop to provide motivated RDNs opportunities for professional growth and advancement in practice. Annalynn Skipper, PhD, RDN, a significant figure in dietetic AP research, has discussed potential consequences related to the lack of AP education pathways in dietetics. She cites that because standard master's and doctorate programs are constructed to equip RDNs for work in academia, they rarely include the advanced clinical training and experience needed to support clinical AP. In turn, some take their pursuit of AP education to other health fields. These RDNs may return to dietetics, but in some cases they completely exit the profession. Skipper points out that the lack of AP education pathways in dietetics may lead to a failure to retain these driven and intelligent individuals, which places the dietetics profession at a disadvantage (7). Although the exact prevalence of these trends is unknown, it has been well-documented that they exist (9). Survival and success of the profession also surfaced as a strong theme in the 2012 Academy of Nutrition and Dietetics Visioning Report (34).

The Visioning Report included a discussion of a proposed restructuring of the entire dietetic education pathway, with recommendations for raising educational requirements for dietetic technicians, registered (DTRs) and RDNs alike. The report included discussion of increasing the entry-level requirements for RDNs to either a graduate degree or a practice doctorate (34). However, a move to increase entry-level requirements does not necessarily support advanced practice. According to Skipper and colleagues, an important lesson that may be learned from the development of AP nursing is that not every nurse is interested or would derive benefit from AP credentials or training. Benefits have been observed in having both AP and non-

AP levels of practice, and there is not evidence to support that the development of AP nursing has reduced the value of the non-AP nursing credential or practice (7). Implementation of the 2012 Vision Report recommendations for increased entry-level educational requirements for RDNs may yield mixed results.

This Visioning Report also featured the results of a survey of dietetic educators. Themes of this survey included: the need for development of AP combined education and credentialing pathways for various practice areas, the creation of practice doctorates and residency programs for AP, and for the focus of future AP degree programs to be advanced skill development and complex decision-making. Educators cited the need for credentials supported by standardized training programs that enhance employer understanding of RDN value and expertise at different training levels. The educators also stressed integration of didactic and practice experience components for RDNs and incorporation of hands-on experience at multiple levels of learning. It is critical that the future path of dietetic AP education and credentialing be meaningful, understandable, and relevant to all within the healthcare system: dietetic practitioners, other professionals, employers, and the public.

Future Directions for AP Research

Significant research is still needed to illuminate the development of a cohesive AP training pathway. Future research will be needed surrounding the impact and recognition of the AP-RDN credential, studies of clinical outcomes related to dietetic AP, and the framework of successful practice doctorate programs. As discussed previously, measuring what AP-RDNs do has been a consistent challenge. Researchers have been able to identify both characteristics of AP providers and activities that AP-RDNs perform with greater autonomy and frequency, pointing to the existence of specific areas where training targeting clinical AP skill development would be

beneficial (3). However, as of this writing, no known studies have been conducted focusing on assessment of specific skills believed to be unique to dietetic AP either due to nature, frequency, or the autonomy with which the task is performed. Research that fully supports and describes specific core AP skills is lacking. This research could help validate and describe the training needed in AP education programs. Previous work has only described perceived needs related to topics for AP education in dietetics (16).

Clinical tools, methods and experiential learning that enhance practitioner autonomy have been recurring themes expressed for AP education needs (16). Advanced diagnostic skills and training are a relevant issue to dietetic AP (16). However, the AP use and training related to NRLT, a common source of clinical nutrition assessment data, has yet to be described in research. It is necessary to describe how RDNs attain training in this area currently, the perceived adequacy of this training, gaps in current formal dietetic training related to NRLT, perceived barriers to autonomous use, and to provide support that AP-RDNs are using this skill differently than BEL RDNs. The goal is to provide an example of the overall need for skill-specific advanced clinical training to match the growing needs within the profession and to support the standardization, formal recognition, and enhanced interprofessional understanding of the AP-RDN skill set. According to the 2015 Advanced-level Clinical Practice Audit Report, “Defining the credential in terms of the tasks performed by actual AP-RDNs provides the fundamental justification for certification and credentialing, namely to protect the public by warranting that credentialed practitioners are able to perform their work in a safe and effective manner. Task identification is also a requirement for developing a valid, fair, and legally defensible credentialing exam” (4). Clearly, skill-specific research is an issue with far-reaching implications.

For the advancement of the dietetic professionals as clinicians and health care practitioners, it is necessary that the profession evolve to include options for generalist AP standardized training and credentialing. Options must expand the RDN's scope of practice to include autonomous utilization of AP tools, such as nutrition-related laboratory testing. We need to improve AP training and education and create credentialing for clinical AP dietetics practitioners based on this education. To do this, we need to better understand current RDN utilization of AP skills, including laboratory testing use.

The impact of issues related to development of advanced practice dietetics extends far beyond the profession. In order to address the surging epidemic of nutrition and lifestyle-related disease in the United States, it is critical that we train and equip advanced level nutrition professionals to fully address the etiologies of these complex conditions.

Chapter 3: Methods

Overview

Study data were collected through an anonymous online survey targeting current RDNs who had been in practice three or more years. Participants were recruited through a professional email database. Stop questions were used during the survey to eliminate participants who did not meet eligibility criteria. A series of demographic questions was used to separate the respondents into the categories of beyond-entry-level (BEL) and advanced practice (AP)-eligible dietitians. Both groups of RDNs were asked the same series of questions related to their experiences and views of the use of nutrition-related laboratory testing and clinical training for advanced practice. The analysis and written thesis work were conducted by the student.

Sample

Subjects were recruited by email using a membership database maintained by the Commission on Dietetic Registration (CDR), accessible to students conducting approved research studies. The survey was sent to 5,000 randomly selected RDNs who had maintained dietetic registration with CDR for three years or more, and the potential number of subjects was equal to the number of CDR members on the list provided minus the number of emails for which delivery of the survey failed (49 returned emails resulted in N= 4,951). Surveys that were missing responses to the questions needed to separate participants into BEL or AP groups were excluded from analysis (36 surveys). Only 1 participant opened the survey and immediately left. However, between the timestamps 11/29/16 23:19 and 11/30/16 9:35, there is a section of 143 surveys where the timestamp was absent and where almost all of the missing responses for the professional demographic questions occurred, which may potentially be explained by temporary issues with the RedCAP system during that time period. Upon exclusion of these responses, the

response rate was 16.3%, or 805 respondents. Of the 805 survey takers, 649 completed the survey. Answers to 10 questions on professional training and practice were used to assign participants into beyond-entry-level (BEL) or advanced-practice-eligible (AP) groups, and criteria for separation were based on current CDR requirements for AP certification eligibility (19) and researched-based definitions of BEL practice (2). BEL subject criteria included: current RDN/RD, registration for three or more years, and present or previous clinical employment (defined as >50% of time on the job spent on clinical tasks). The survey terminated for participants who responded NO for any of the previous criteria. To separate BEL and AP-eligible groups, demographic questions were related to education level, number of years and hours of part-time and full-time clinical dietetic employment, professional achievements, and whether any specialist certification in a clinical-nutrition related topic was held.

Setting

The online survey was open from November 29th to January 4th, a total of 5 weeks, on the University of Kansas Medical Center REDCap Survey System site.

Ethics

The University of Kansas Medical Center Institutional Review Board (Human Subjects Committee) reviewed and approved the research proposal (HSC#140068). This research qualified for exempt status. A copy of the consent form (email message) that was used may be found in Appendix B.

Procedures & Materials

The study design was a descriptive survey, consisting of multiple choice and ordinal scale (Likert-type) questions. The survey was developed by University of Kansas Medical Center (KUMC) nutrition graduate student Madelaine Schaufel, RD with assistance from KUMC nutrition and dietetics professor Heather Gibbs, PhD, RD and thesis committee members. The data collection was conducted by the student and began with pilot-testing of the survey instrument using a convenience sample. The online survey was then sent to the randomized list of emails from the CDR database for approved student research. The survey was open for 5 weeks, with reminders to complete the survey sent at weeks one, two, and three. Informed consent was included in the recruitment email. Consent was implied by following the link within the email to the survey and answering questions in the online survey. At the start of the survey, respondents were provided with brief statements describing the survey purpose, an abbreviations list, and definitions of nutrition-related laboratory testing and dietetic advanced practice. Respondents were asked introductory demographic questions related to education, employment experience, and professional achievements. All respondents who met previously outlined criteria were then able to proceed to the core of the survey and were asked questions regarding their use of nutrition-related laboratory testing, perceptions of the adequacy of their clinical training, and perceptions of need for increased clinical training related to nutrition-related laboratory testing, clinical skills, and advanced practice. It is estimated that the survey took approximately 10 minutes to complete. A copy of the full survey may be found in Appendix C.

Analysis of Data

Statistical analysis was conducted by the student with assistance from the KUMC Department of Biostatistics Student Tutoring Lab and Dr. Heather Gibbs. The REDCap survey was pilot tested with a convenience sample (n=10). Using the results of the pilot-testing, reliability of the survey was evaluated by Cronbach's alpha for core (non-demographic) questions to measure internal consistency. Descriptive statistics and differences (Mann Whitney U or Chi-square) between BEL and AP groups were analyzed using SPSS with statistical significance defined as $p < .05$. For Chi-square analyses of Likert-scale answers (i.e. 2 x 5) demonstrating significant differences, analyses of differences in cells with residuals greater than ± 1 were performed to identify significant differences between BEL and AP groups.

Chapter 4: Results

Survey Purpose

The purposes of the survey were to (1) investigate current RDN use of nutrition-related laboratory testing, (2) identify disparities (if they exist) between current clinical education and training vs. the training needed to support advanced dietetic practice, and (3) describe RDN perceptions of training needs related to nutrition-related laboratory testing (NRLT) and other advanced practice skills.

Survey & Sample Characteristics

Out of 805 participants, 64% of whom were categorized as BEL and 36% were categorized as AP (AP-eligible), 649 surveys were completed. Cronbach's Alpha for the survey was 0.73. A majority of dietitians surveyed (68%) had been practicing dietetics for greater than 10 years. Master's and baccalaureate degrees were equally common, with 42% of RDNs holding a Master's degree and 42% holding a bachelor's degree (excluding degrees in the arts and humanities categories). The majority (64%) of respondents reported their current job setting as clinical (**Table 2**). Twenty-two percent of RDNs reported presenting at a professional conference and 16% reported being published in a clinical nutrition journal or book. Twenty-seven percent of RDNs reported holding specialty certification in a clinical nutrition-related topic, with CNSC (Certified Nutrition Support Clinician) and CDE (Certified Diabetes Educator) as the most frequently reported specialty credentials (12.0% and 7.5% of respondents, respectively).

Table 1. Reliability Analysis of Survey Instrument

Survey Section	Part 1: Use of Laboratory Tests (11 items)	Part 2: Perceived Training Adequacy (8 items)	Part 3: Need for Training (8 items)	Overall (27 items)
Cronbach's alpha (α)	0.73	0.83	0.86	0.73

Table 2. Demographic characteristics and practice experience of CDR members responding to a survey on AP training

Characteristic/experience	All respondents % (n=801)	BEL RDNs % (n=510)	AP-Eligible RDNs % (n=291)
Years as an RD/RDN			
3 years	2.0	3.1	0.0
4 years	2.2	2.7	1.4
5-10 years	27.7	27.1	28.9
11-25 years	40.6	41.6	38.8
>25 years	27.5	25.5	30.9
Highest degree (excluding degrees from arts and humanities categories)			
Baccalaureate	42.2	58.0	14.4
Master's	41.9	18.4	83.2
Doctoral	1.6	1.2	2.4
No response	14.2	22.4	0.0
Current employment setting			
Clinical	64.2	53.7	82.5
Community	5.4	5.7	4.8
Management, Food Service	3.2	3.7	2.4
Business, Corporate	1.7	1.6	2.1
Education, Research	2.5	2.2	3.1
Other	4.4	5.3	2.7
Not currently practicing dietetics	4.4	5.5	2.4
No response	14.2	22.4	0.0
Number of years of full-time clinical employment as an RDN/RD			
0-1 years	2.6	3.7	0.7
2 years	2.6	3.9	0.3
3 years	4.1	5.1	2.4
4 years	4.1	4.7	3.1
5-10 years	30.1	24.7	39.5
11-25 years	28.1	24.7	34.0
>25 years	11.6	6.9	19.9
No response	16.7	26.3	0.0
Number of years of part-time clinical employment as an RDN/RD			
0-1 years	43.0	36.1	54.6
2 years	6.4	5.1	8.6
3 years	3.6	3.5	3.8
4 years	3.4	3.7	2.7
5-10 years	14.7	12.9	17.5
11-25 years	10.3	10.6	9.6
>25 years	2.1	1.6	3.1
No response	16.9	26.5	0.0

Table 2 Cont'd. Demographic characteristics and practice experience of CDR members responding to a survey on AP training			
Characteristic/experience	All respondents % (n=801)	BEL RDNs % (n=510)	AP-Eligible RDNs % (n=291)
8,000 hours of clinical nutrition practice since dietetic registration			
Yes	76.7	63.3	100.0
No	6.5	10.2	0.0
No Response	16.9	n/a	n/a
8,000 hours completed in the last 15 years			
Yes	72.2	56.9	100.0
No	4.5	6.5	0.0
No Response	23.3	n/a	n/a
800 of the 8,000 hours within the past two years			
Yes	10.7	15.9	1.7
No	65.7	47.1	98.3
No Response	23.6	n/a	n/a
Presented at a national, state, or local professional conference in clinical nutrition			
Yes	22.0	9.6	43.6
No	61.2	63.9	56.4
No Response	16.9	n/a	n/a
Been published in a clinical nutrition journal, book, or abstract.			
Yes	67.1	6.1	32.6
No	15.7	67.5	67.4
No Response	16.9	n/a	n/a
Hold specialist certification(s) in clinical nutrition related topic (s)			
Yes	27.2	17.1	45.4
No	55.5	56.5	54.6
No Response	16.9	n/a	n/a
Practice Level by CDR Criteria (n=801)			
	n	BEL %	AP %
	801	63.7	36.3

Objective 1: Investigate current RDN use and training in nutrition-related laboratory testing

A majority (85%) of respondents reported use of NRLT in dietetic practice. Acute care monitoring was cited as the primary reason for use of NRLT (41%) and outpatient chronic disease management was the second most common reason for use (28%). A comprehensive metabolic panel and HbA1C were the most frequently used tests and genetic testing the most infrequently used test (**Table 3**). Among BEL and AP RDNs, there were no significant differences in the frequency of use for specific nutrition-related laboratory testing such as comprehensive metabolic panel, complete blood count, HbA1C, fasting glucose, fasting insulin, serum lipids, food allergy/food sensitivity testing, except in the case of nutrient status testing, where the AP group reported significantly more frequent use ($p=.02$). The most common modes of RDN access to laboratory testing dating were ordering independently (36%), followed by use of data already available in the electronic medical record (13%). Sixty-three percent of RDNs rated their ability to independently access laboratory testing as adequate/very adequate, while only 9% rated their access as inadequate/very inadequate.

Table 3. Part 1: Use of Nutrition-Related Lab Testing

I use lab testing data in dietetic practice.

	All respondents % (n=801)	BEL RDNs %(n=510)	AP-Eligible RDNs %(n=291)
Yes	84.8	82.7	88.7
No	8.7	10.6	5.5
No Response	6.4	6.7	5.8

Frequency of the of the following statements	No Response %	Very Frequently %	Frequently %	Occasionally %	Almost Never %	Never %	Pearson's χ^2 value comparing BEL & AP RDNS	P value
I use lab testing data to make care decisions	22.3	45.7	23.3	8.3	0.3	0.1	1.475	0.397

Table 3. Cont'd Part 1: Use of Nutrition-Related Lab Testing

I use the following types of laboratory testing:								
	No Response %	Very Frequently %	Frequently %	Occasionally %	Almost Never %	Never %	Pearson's χ^2 value comparing BEL & AP RDNS	P value
Comprehensive metabolic Panel	23.7	49.2	17.9	6.6	1.1	1.4	2.62	0.154
Complete blood count	23.8	24.4	23.2	19.9	6.9	1.8	4.92	0.618
Hemoglobin A1c	23.7	45.1	21.2	7.6	1.6	0.8	3.81	0.620
Fasting Glucose	24.4	35.8	19.3	12.5	6.3	1.7	0.646	0.560
Fasting Insulin	24.5	5.0	5.2	14.5	24.1	26.7	2.04	0.462
Serum lipids	24.4	24.6	26.3	20.0	4.5	0.2	7.76	0.169
Nutrient Status Testing (Vitamin D, ferritin, etc.)	24.3	18.8	21.7	25.3	7.0	2.9	7.09	0.022
Food Allergy /sensitivity testing	24.3	1.9	3.5	18.4	24.2	27.7	9.15	0.105
Genetic Testing	24.5	1.1	0.7	5.3	19.1	49.3	13.8	0.999
Stool analysis	24.3	2.9	5.3	17.8	20.9	28.8	8.66	0.722

Objective (2) Identify disparities (if they exist) between professional education and clinical training versus the clinical training needed to practice at advanced clinical level and use nutrition related laboratory testing

The BEL and AP groups rated the adequacy of their undergraduate and internship training to support early clinical practice (the first three years) similarly ($p=0.57$). However, the BEL group rated their professional training as more adequate for their current level of practice ($p=.03$) than the AP group (**Table 4**). Overall, RDNs reported that the most useful sources of training for advanced clinical skills were self-teaching (21%), continuing education/conferences (20.6%), and other RDNs during employment (15.3%). AP RDNs more often identified the most useful training method for advanced clinical skills as self-teaching (29% vs. 16.5%, $p<.001$). For NRLT in particular, the most useful sources of training were self-teaching (26%), other RDNs during employment (13.7%), or continuing education/conferences (13.4%). AP RDNs more often identified the most useful training method for NRLT as self-teaching (34% vs 21%, $p<.001$).

Table 4. Survey Part 2: Perceived Training Adequacy							
Level of adequacy for following statements	Responses (n)	Adequate %	Marginally Adequate %	Inadequate %	No/almost no training %	Pearson's χ^2 p value comparing BEL & AP RDNS	P value
For my first 3 years of clinical practice, the training I received during my undergraduate and internship experience to use NRLT was:	502	61.6	28.5	7.8	2.2	1.50	0.858
For my first 3 years of clinical practice, the training I received during my undergraduate and internship experience to other clinical skills was:	447	78.3	17.4	3.8	0.4	3.93	0.574
Beyond my first 3 years of clinical practice, the training I received during my undergraduate and internship experience to use NRLT was:	491	64.4	26.1	6.7	2.9	0.75	0.446
Beyond my first 3 years of clinical practice, the training I received during my undergraduate and internship experience to use other clinical skills was:	462	75.8	18.2	3.9	2.2	1.73	0.219
For the level at which I currently practice, the training I received during my undergraduate and internship experience to use nutrition-related lab data was:	492	55.1	30.1	13.2	1.6	2.475	0.174

Table 4. Survey Part 2: Perceived Training Adequacy Continued							
	Responses (n)	Adequate %	Marginally Adequate %	Inadequate %	No/almost no training %	Pearson's χ^2 p value comparing BEL & AP RDNS	P value
For the level at which I currently practice, the training I received during my professional education (undergraduate and internship experience) to use other clinical skills was:	468	66.0	24.1	9.0	0.9	12.14	0.027
	Responses (n)	Adequate %	Marginally Adequate %	Inadequate %	Pearson's χ^2 p value comparing BEL & AP RDNS	P value	
The professional opportunities available to develop clinical skills related to nutritional lab testing have been:	490	53.7	35.7	10.6	1.313	0.272	
The professional opportunities available to develop advanced clinical skills in general have been:	476	64.1	27.7	8.2	4.60	0.299	

Objective (3) Describe RDN demand for and perceptions of need related to nutrition-related lab testing training, credentialing, and utilization.

A majority (59%) of RDNs agreed that there is a need for increased formal clinical training related to both NRLT and advanced practice (**Table 5**). If additional clinical training were to be included to support use of NRLT, the most frequent response for the most appropriate timing of this training was during the dietetic internship (31%). If additional clinical training were to be included to support advanced practice, the most frequent response for the most appropriate timing of this training was during continuing education (37%), followed by graduate studies (15%) and board certification programs (14%). Sixty-three percent of respondents agreed that increased formal clinical training of RDNs would support advanced practice development, and 62% of RDNs agreed that training specifically related to NRLT would support advanced practice development (**Table 5**). Thirty-four percent of RDNs agreed that advanced practice skill level is currently a limiting factor in RDN utilization of NRLT, while 33% agreed that practice autonomy was a limiting factor. Thirty-six percent of RDNs agreed that a lack of opportunities for advanced clinical skill development is currently a barrier to dietetic advanced practice. Among the BEL and AP groups, there were no significant differences in opinions related to the timing of clinical training or needs for clinical training (**Table 5**).

When asked what dietitians are looking for in an advanced practice degree, increased clinical training and skills was the most frequent response (53%), followed closely by improved compensation (52%), specialization of practice (45%), and increased autonomy (38%). Forty-three percent of RDNs reported personal interest in advanced training for NRLT, and 35% reported interest in additional advanced practice training to develop other clinical skills. The most frequently mentioned areas of interest for additional training were: nutrition support (10%), condition-specific topics (10%), and nutrition-focused physical examination (7%).

Table 5 Part 3: Need for Training								
Level of agreement with the following statements	Responses (n)	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	Pearson's χ^2 p value comparing BEL & AP RDNS	P value
There is a need for increased formal clinical training of RDNs in the area of nutrition-related lab testing	562	35.8	49.3	12.8	2.0	0.2	4.88	0.651
There is a need for increased formal clinical training of RDNs to support advanced practice in general	562	38.4	45.9	13.5	2.0	0.2	2.44	0.669
Increased formal clinical training of RDNs would support advanced practice skill development	562	37.0	53.2	8.5	0.9	0.4	5.26	0.313
Increased formal clinical training of RDNs related to nutritional lab testing would support advanced practice skill development	562	34.3	54.6	10.0	0.7	0.4	5.95	0.922

Table 5. Part 3: Need for Training Continued								
Level of agreement with the following statements	Responses (n)	Strongly agree %	Agree %	Neutral %	Disagree %	Strongly Disagree %	Pearson's χ^2 p value comparing BEL & AP RDNS	P value
Lack of advanced practice skill is currently a limiting factor in RDN utilization of nutrition-related lab testing	561	12.8	36.0	32.4	18.0	0.7	4.49	0.307
Practice autonomy is currently a limiting factor in RDN utilization of nutrition-related lab testing	561	15.5	31.2	37.4	14.3	1.6	5.85	0.567
A lack of opportunities for advanced clinical skill development is currently a barrier to dietetic advanced practice.	561	12.8	38.7	28.9	17.6	2.0	9.70	0.501

Chapter 5: Discussion

Connections with Previous Research

While defining dietetic AP remains an ongoing challenge, previous research has provided evidence to support the existence of dietetic AP (3). The differences seen in responses among AP and BEL groups in this study provide further support for the existence of dietetic AP. If dietetic AP exists, as there is evidence to suggest, it follows that there should be differences in how the two groups think or act. Previous research has shown that while RDNs who meet AP criteria may perform many of the same tasks as BEL RDNs, there are differences in frequency, autonomy, risk-taking, and leadership related to these tasks (4). The finding that AP RDNs are more likely to report the most useful source of training as self-teaching, expands on previous research by Skipper and colleagues that identified the advanced practice theme of “using initiative to achieve autonomy,” and correlates with the aptitude and attitude subthemes of the same study (9). Self-teaching appears to be one way that AP RDNs take initiative and seek continued growth and professional development. The findings that BEL RDNs were more likely than AP RDNs to rate their professional training as adequate for their current level of practice and that nearly two thirds of all RDNs agreed that increased formal clinical training is needed provide insight into the needs of the dietetic profession. These findings also contribute to the ongoing discussion about the restructuring of educational requirements within the dietetic profession (34).

However, the differences in responses between BEL and AP RDNs did not extend across all topics investigated in the survey. While AP RDNs differed in how they rated adequacy of their training to support current practice and most useful sources of training, AP and BEL groups responded very similarly in many areas, such as their use of laboratory testing, the adequacy of

dietetic training to support entry-level practice, and the need for increased clinical training to support AP development. To the knowledge of the authors, this study is the first to report perceptions surrounding AP clinical training on nutrition related laboratory testing, and thus cannot be compared to previous work.

Major Findings

The data showed that most RDNs regularly use lab testing in dietetic practice, and that with the exception of nutrient status testing, the use of specific tests between AP and BEL RDNs appeared to be similar. Access to lab testing data did not appear to be a significant barrier to RDN use of lab testing. The data related to RDN perceptions of training adequacy showed that BEL and AP RDNs agreed that the undergraduate and internship support entry-level practice (the first three years) and to some extent beyond three years. However, it did appear that between BEL and AP practice levels, there is a training gap. As discussed previously, AP dietitians reported the most useful source of training to support their current practice level as self-teaching. While the use of self-teaching among AP RDNs may represent the initiative, drive, or intellectual curiosity that motivates RDNs to pursue AP, it also may point to a lack of formal training opportunities within dietetics to support AP. The data related to RDN vision for future training needs showed divergences in RDN opinion as to the best timing of additional training to support AP and needs related to training. Though a majority agreed that additional formal training would support AP, only a third agreed that opportunities for advanced clinical skill development are currently a barrier to dietetic advanced practice. The data also indicated that while many RDNs appear to view their training and the opportunities available as adequate, there is a significant subset of the population (35%) interested in additional training to further expand clinical skills.

Implications

Findings of this study support the progression of advanced practice training and credentialing in dietetics for advancing the dietetic profession. Improvement and standardization of AP clinical training is critical in this effort and will increase recognition of the AP credential for health professionals both internal and external to nutrition. As noted by Skipper, the lack of AP education pathways in dietetics may lead to a failure to retain certain driven and talented dietitians, which may place the dietetics profession at a significant disadvantage (7).

Additionally, the development of dietetic AP also has significant implications for healthcare reform. The U.S. chronic disease epidemic highlights the need for mid and/or advanced level providers whose specialization and focus is nutrition, in order to elevate the authority and prominence of intensive nutrition interventions as first line therapy.

Limitations

There were multiple limitations associated with this research. First, it is possible that those who elected to respond to the survey were more likely to respond in a certain way that may not be representative of the population as a whole, due to personal interest in the topic. Bias created by taking the survey was also a possibility in that RDN opinions on AP practice issues may have been impacted as respondents moved through the survey. Technology also posed some challenges. While only 1 participant opened the survey and immediately left, between 11/29/16 23:19 and 11/30/16 9:35, there was a section of 143 surveys where the time stamp was missing; this same section featured a much higher rate of incomplete responses potentially explained by temporary lag or connectivity issues with the REDCap system during that time period.

Differentiating BEL from AP practice remains an ongoing challenge, so although the criteria used in this study were evidence-based, it is also possible that the criteria used to support

differentiation between BEL and AP-eligible practice were not fully representative of the true differences between BEL and AP. A modified definition of AP practice may significantly alter comparisons drawn between BEL and AP-eligible dietitians in this study. However, it would not have altered the interpretation of the results from the composite sample (ie. non-entry level RDNs, as defined by three or more years of dietetic practice). Additionally, any respondent who said yes to the specialty certification questions was considered to have met the criteria, though some of the certifications listed in “other” were not widely recognized clinical nutrition credentials.

It is also possible that RDN understanding of the definition of dietetic AP could have affected responses. Some confusion surrounding AP was evident as significant numbers of RDNs responded that a reason for the pursuit of AP was to support specialty practice, and there was also a segment of RDNs who responded that training to support AP should happen at the DPD or internship level. Additionally, although significant, nutrition-related laboratory testing is just one facet of clinical dietetic practice. It is possible that dietitian attitudes would be different if the focus had been on another area of clinical practice. Unfortunately, the scope of this study did not allow the investigation of multiple facets of advanced clinical practice.

Conclusions & Future Research

There is a need for improved clinical training to support dietetic AP. Nutrition-related lab testing represents one potential training gap for advanced level clinical practice. Further research is needed to fully investigate the needs related to AP training. Specific areas include most appropriate training timing and format, requirements, and specific topics to be included. Investigation is needed to explore the range of skills involved in advanced clinical practice and areas for training improvement.

References

1. Centers for Disease Control and Prevention. Leading Causes of Death. CDC/National Center for Health Statistics, 2013.
2. Ward B, Rogers D, Mueller C, Touger-Decker R, Sauer KL. Entry-level dietetics practice today: results from the 2010 commission on dietetic registration entry-level dietetics practice audit. *J Am Diet Assoc* 2011;111(6):914-41. doi: 10.1016/j.jada.2011.03.025.
3. Bradley RT, Young WY, Ebbs P, Martin J. Characteristics of advanced-level dietetics practice: a model and empirical results. *J Am Diet Assoc* 1993;93(2):196-202.
4. Mueller C, Rogers D, Brody RA, Chaffee CL, Jr., Touger-Decker R. Report from the advanced-level clinical practice audit task force of the commission on dietetic registration: results of the 2013 advanced-level clinical practice audit. *J Acad Nutr Diet* 2015;115(4):624-34. doi: 10.1016/j.jand.2014.12.021.
5. Adams KM, Lindell KC, Kohlmeier M, Zeisel SH. Status of nutrition education in medical schools. *Am J Clin Nutr* 2006;83(4):941s-4s.
6. Gadbois EA, Miller EA, Tyler D, Intrator O. Trends in state regulation of nurse practitioners and physician assistants, 2001 to 2010. *Med Care Res Rev* 2015;72(2):200-19. doi: 10.1177/1077558714563763.
7. Skipper A. The history and development of advanced practice nursing: lessons for dietetics. *J Am Diet Assoc* 2004;104(6):1007-12. doi: 10.1016/j.jada.2004.04.005.
8. Roberts SR. Improving patient outcomes through registered dietitian order writing. *Nutr Clin Pract* 2013;28(5):556-65. doi: 10.1177/0884533613499375.
9. Skipper A, Lewis NM. Using initiative to achieve autonomy: a model for advanced practice in medical nutrition therapy. *J Am Diet Assoc* 2006;106(8):1219-25. doi: 10.1016/j.jada.2006.05.008.
10. Cassell JA. Carry the flame: the history of the American Dietetic Association: The American Dietetic Association, 1990.
11. Churchill Livingstone. dietetics. *Dictionary of Sport and Exercise Science and Medicine*, 2008.
12. Houghton Mifflin Company. dietetics. *The American Heritage Medical Dictionary*, 2007.
13. Academy of Nutrition and Dietetics. Internet: <http://www.eatrightpro.org/resources/about-us/what-is-an-rdn-and-dtr> (2015).
14. Rogers D. Compensation and benefits survey 2013: education and job responsibility key to increased compensation. *J Acad Nutr Diet* 2014;114(1):17-33. doi: 10.1016/j.jand.2013.11.008.
15. Hammond MI, Myers EF, Trostler N. Nutrition care process and model: an academic and practice odyssey. *J Acad Nutr Diet* 2014;114(12):1879-94. doi: 10.1016/j.jand.2014.07.032.
16. Christie BW, Kight MA. Educational empowerment of the clinical dietitian: a proposed practice doctorate curriculum. *J Am Diet Assoc* 1993;93(2):173-6.
17. Skipper A, Lewis NM. Clinical registered dietitians, employers, and educators are interested in advanced practice education and professional doctorate degrees in clinical nutrition. *J Am Diet Assoc* 2006;106(12):2062-6. doi: 10.1016/j.jada.2006.09.011.

18. Academy of Nutrition and Dietetics Quality Management Committee. Internet: <http://www.eatrightpro.org/~media/eatrightpro%20files/advocacy/definitionofterms.ashx> (2015).
19. Commission on Dietetic Registration. Internet: <https://www.cdrnet.org/board-certification-in-advanced-practice> (2015).
20. Bradley RT. Fellow of the American Dietetic Association credentialing program: development and implementation of a portfolio-based assessment. *J Am Diet Assoc* 1996;96(5):513-7.
21. Daly A, Kulkarni K, Boucher J. The new credential: advanced diabetes management. *J Am Diet Assoc* 2001;101(8):940-3. doi: 10.1016/s0002-8223(01)00233-4.
22. Commission on Dietetic Registration. Internet: <https://www.cdrnet.org/certifications/board-certified-specialist> (2015). Date accessed: June 27, 2015.
23. Rutgers School of Health Related Professions. Internet: http://shrp.rutgers.edu/dept/nutr/programs/doc_clinnutr.html (2015). Date accessed: June 27, 2015.
24. Brody RA, Byham-Gray L, Touger-Decker R, Passannante MR, O'Sullivan Maillet J. Identifying components of advanced-level clinical nutrition practice: a Delphi study. *J Acad Nutr Diet* 2012;112(6):859-69. doi: 10.1016/j.jand.2012.02.022.
25. Brody RA, Byham-Gray L, Touger-Decker R, Passannante MR, Rothpletz Puglia P, O'Sullivan Maillet J. What clinical activities do advanced-practice registered dietitian nutritionists perform? Results of a Delphi study. *J Acad Nutr Diet* 2014;114(5):718-33. doi: 10.1016/j.jand.2014.01.013.
26. Brody RA, Skipper A, Chaffee CL, Jr., Wooldridge NH, Kicklighter JR, Touger-Decker R. Developing an advanced practice credential for registered dietitian nutritionists in clinical nutrition practice. *J Acad Nutr Diet* 2015;115(4):619-23. doi: 10.1016/j.jand.2014.12.020.
27. Maryland University of Integrative Health. Internet: <http://www.muih.edu/academics/doctoral-degrees/doctor-clinical-nutrition> (2016).
28. University of North Florida. Internet: https://www.unf.edu/graduateschool/academics/programs/Clinical_Nutrition.aspx (2016). June 27, 2015.
29. Casell JA. Carry the flame: the history of the American Dietetic Association: The American Dietetic Association, 1990.
30. Tatum C T-DR, Brody R, Byham- Gray L, O'Sullivan-Maillet J. Perceived Needs for Graduate Level Clinical Nutrition Education for Registered Dietitians. *Top Clin Nutr* 2008;23(4):320-32.
31. Skipper A, Lewis NM. A look at the educational preparation of the health-diagnosing and treating professions: do dietitians measure up? *J Am Diet Assoc* 2005;105(3):420-7. doi: 10.1016/j.jada.2004.12.004.
32. O'Sullivan Maillet J, Brody RA, Skipper A, Pavlinac JM. Framework for analyzing supply and demand for specialist and advanced practice registered dietitians. *J Acad Nutr Diet* 2012;112(3 Suppl):S47-55. doi: 10.1016/j.jand.2011.12.009.
33. Academy of Nutrition and Dietetics. Internet: <http://www.eatrightpro.org/resources/about-us/what-is-an-rdn-and-dtr/what-is-a-registered-dietitian-nutritionist> (2015). Date accessed: June 27, 2015.

34. Kicklighter JR, Cluskey MM, Hunter AM, Nyland NK, Spear BA. Council on Future Practice Visioning Report and consensus agreement for moving forward the continuum of dietetics education, credentialing, and practice. *J Acad Nutr Diet* 2013;113(12):1710-32. doi: 10.1016/j.jand.2013.10.010.

Appendices

Appendix A: Data Collection Instrument

REDCap System <https://informatics.kumc.edu/work/wiki/REDCap>

Appendix B: Consent Form

Form Used: “Survey consent form template - anonymous, no HIPAA”

<http://www.kumc.edu/human-research-protection-program/institutional-review-board/informed-consent/consent-templates.html>

Subject: Survey investigating needs related to RDN advanced practice training

Dear Colleagues,

My name is Madelaine Schaufel and I am a graduate student in Nutrition at the University of Kansas Medical Center. I am currently conducting research for my thesis project about how dietitians receive training related to advanced practice and use advanced clinical skills like nutrition-related laboratory testing. I received your e-mail address from the Commission on Dietetic Registration (CDR), which provides a complimentary e-mail list of its membership database to students conducting approved research.

I am recruiting research participants who are ***RDNs who have been in clinical practice 3 years or more***. Your participation in this short, anonymous study only takes about 10 minutes and will help me to complete my master’s thesis. The goal of my project is to investigate current RDN use and clinical training in nutrition-related laboratory testing, identify disparities (if they exist) between professional education and clinical training needed to support advanced practice, and to describe RDN demand for and perceptions of need related to advanced practice clinical training.

In addition to the brief survey questions, we will request basic information related to your RDN registration status, educational status, and your work and professional experiences as an RDN. This survey will be administered through the secure KUMC REDCap System. Please take the survey by clicking or copy/pasting the enclosed link. When you have completed the survey, please click submit. There are no personal benefits or risks to participating in this study. Participation is voluntary, and you can stop taking the survey at any time.

If you would like to be taken off this e-mail list and not receive any future requests to participate in this survey, please click on the link at the bottom of the page to opt out of future e-mails.

If you have any questions, please contact me, Madelaine Schaufel (mdickinson@kumc.edu), or my advisor, Dr. Heather Gibbs (hgibbs@kumc.edu). For questions about the rights of research participants, you may contact the KUMC Institutional Review Board (IRB) at (913) 588-1240 or humansubjects@kumc.edu

Sincerely,

Madelaine (Dickinson) Schaufel, RD
Master’s in Nutrition Student
Department of Dietetics and Nutrition
University of Kansas Medical Center
mdickinson@kumc.edu

Appendix C: Survey Questions

Section i. Survey Introduction:

Survey Purpose:

The purposes of this survey are to: 1) Investigate current RDN use and training in nutrition-related laboratory testing; 2) Identify disparities (if they exist) between professional education and clinical training versus the clinical training needed to practice at advanced clinical level and use nutrition related laboratory testing; and 3) Describe RDN demand for and perceptions of need related to nutrition-related lab testing training, credentialing, and utilization.

What is nutrition-related laboratory testing?

Nutrition-related laboratory testing could comprise a broad range of laboratory tests, as so much of human health relates to nutrition. For the purposes of this study, nutrition-related laboratory testing will be considered a comprehensive metabolic panel, a complete blood count, hemoglobin A1c, fasting glucose, fasting insulin, serum lipids, nutrient status testing (i.e. serum 25-hydroxyvitamin D or other), food allergy/sensitivity testing, genetic testing, and stool analysis.

Abbreviations & Definitions:

RD/RDN: registered dietitian/registered dietitian nutritionist

CDR: Commission on Dietetic Registration

DPD: didactic program in dietetics

BEL: beyond-entry-level, RDN practice beyond 3 years post-registration

AP: advanced practice, although its existence in the RDN profession has been validated by research and the Academy of Nutrition and Dietetics has recently launched an AP credentialing program, advanced practice in dietetics has yet to be identified definitively.

ASPEN: American Society for Parenteral and Enteral Nutrition

BCNS: Board for Certification of Nutrition Specialists

CNCB: Clinical Nutrition Certification Board

Section 1. Demographic & Professional Questions

1. I am a current RDN or RD

Yes No (STOP)

2. I have been an RDN/RD for:

less than 3 years (STOP)

3 years

4 years

5-10 years

11-25 years

>25 years

3. My highest degree or level of completed education (excluding degrees from arts and humanities categories) is:

Baccalaureate

Masters

Doctoral

4. Which of the following best describes your current job setting? (CHOOSE ONE)

A. Clinical

B. Community

C. Management, Food Service

E. Business, Corporate

F. Education, Research

G. Other

H. Not currently practicing dietetics

5. I currently hold OR have held employment as an RD/RDN where >50% of my time is/was spent on clinical dietetics responsibilities.

Yes No (STOP)

6. My number of years of full time clinical employment as an RDN/RD

0-1 years

2 years

3 years

4 years

5-10 years

11-25 years

>25 years

7. My number of years of part time clinical employment as an RDN/RD

0-1 years

2 years

3 years

4 years

5-10 years

11-25 years

>25 years

8. Have you completed 8,000 hours of clinical nutrition practice since you became a registered dietitian?

(If yes) Were the hours completed in the last 15 years?

(If yes) Have you completed 800 hours within the past two years?

9. I have presented at a national, state or local professional conference in clinical nutrition (e.g. practice topics/poster/research).

Yes No

10. I have been published in a clinical nutrition research or non-research article in a peer reviewed professional journal; had a clinical nutrition book or book chapter published(not self-published); edited or reviewed a clinical nutrition peer reviewed professional journal article or book; or had a clinical nutrition abstract published in a peer reviewed journal.

Yes No

11. I hold Specialist Certification in a clinical nutrition-related topic (s).

A. Yes (Please indicate all certifications that you hold)

Gerontological Nutrition (Credentialing organization: CDR)

Renal Nutrition (Credentialing organization: CDR)

Oncology Nutrition (Credentialing organization: CDR)

Pediatric Nutrition (Credentialing organization: CDR)

Sports Dietetics (Credentialing organization: CDR)

Certified Nutrition Support Clinician ® (CNSC®) certification (Credentialing organization: ASPEN)

The Certified Nutrition Specialist® (CNS®) (Credentialing organization: BCNS)

Certified Clinical Nutritionist (CCN) (Credentialing organization: CNCB)

Other: (please specify)

B. No

Section 2. Survey Core Questions

Objective #1 Describe beyond-entry-level and advanced practice RDNs' current use of laboratory testing in practice (frequency of use, type of testing, type of use)

1. Do you use laboratory testing data in your practice as an RDN? Y/ N (N=STOP)

2. I use laboratory testing data to make care decisions:

very frequently, frequently, sometimes, almost never, never

3. I use the following types of testing:

Comprehensive metabolic panel (CMP)

very frequently, frequently, occasionally, almost never, never,

Complete blood count (CBC)

very frequently, frequently, occasionally, almost never, never,

HbA1c

very frequently, frequently, occasionally, almost never, never,

Fasting glucose

very frequently, frequently, occasionally, almost never, never,

Fasting insulin

very frequently, frequently, occasionally, almost never, never,

Serum lipids (cholesterol panel)

very frequently, frequently, occasionally, almost never, never,

Nutrient status testing (ie. serum 25-hydroxyvitamin D, serum ferritin, etc.)

very frequently, frequently, occasionally, almost never, never,

Food allergy/sensitivity testing

very frequently, frequently, occasionally, almost never, never,

Genetic testing

very frequently, frequently, occasionally, almost never, never,

Stool analysis

very frequently, frequently, occasionally, almost never, never,

4. My use of laboratory testing is primarily related to (choose ONE):

Acute care monitoring

Outpatient chronic disease management

Wellness

Sports

Personalized nutrition

Integrative and/or functional nutrition

Other: (please explain)_____

5. How do you normally acquire access to laboratory testing data? (choose ALL that apply)

Use data already in electronic medical record

Order independently

Request other health professional to order

Have patient order

Other: (please explain)_____

6. My ability to independently access laboratory testing data is:

1 2 3 4 5 (1= very restricted, 5 = fully adequate)

Objective #2 Identify disparities between professional education and clinical training vs. the training needed to practice at advanced clinical level and use nutrition-related laboratory testing.

1. For my first 3 years of clinical practice, the training I received during my professional education (undergraduate and internship experience) to use nutrition-related laboratory data was:

Above adequate

adequate

marginally adequate

inadequate

I received no/almost no training

2. For my first 3 years of clinical practice, the training I received during my professional education (undergraduate and internship experience) to use other clinical skills was:

- Above adequate
- adequate
- marginally adequate
- inadequate
- I received no/almost no training

3. Beyond my first 3 years of clinical practice, the training I received during my professional education (undergraduate and internship experience) to use nutrition-related laboratory data was:

- Above adequate
- adequate
- marginally adequate
- inadequate
- I received no/almost no training

4. Beyond my first 3 years of clinical practice, the training I received during my professional education (undergraduate and internship experience) to use other clinical skills was:

- Above adequate
- adequate
- marginally adequate
- inadequate
- I received no/almost no training

5. For the level at which I currently practice, the training I received during my professional education (undergraduate and internship experience) to use nutrition-related laboratory data is:

- Above adequate
- adequate
- marginally adequate
- inadequate
- I received no/almost no training

6. For the level at which I currently practice, the training I received during my professional education (undergraduate and internship experience) to use other clinical skills is:

- Above adequate
- adequate
- marginally adequate
- inadequate
- I received no/almost no training

7. The professional opportunities available to develop clinical skills related to the use of nutrition-related laboratory testing data have been:

Above adequate
adequate
marginally adequate
inadequate
very inadequate

8. The professional opportunities available to develop advanced clinical skills in general have been:

Above adequate
adequate
marginally adequate
inadequate
very inadequate

9. I received training on how to use nutrition-related laboratory testing data from (select ALL that apply):

Didactic program in dietetics (DPD)
Internship experience
Continuing education/conference
Self-taught during employment
Other RDN during employment
Non-RDN health professional during employment
Other: (please explain)

10. I have received the most useful training related to the use of laboratory testing data from: (pick ONE)

Didactic program in dietetics (DPD)
Internship experience
Continuing education/ conference
Self taught during employment
Other RDN during employment
Non-RDN health professional during employment
Other: (please explain)

11. I have received the most useful training related to the use of advanced clinical skills from: (pick ONE)

Didactic program in dietetics (DPD)
Internship experience
Continuing education/ conference
Self taught during employment
Other RDN during employment
Non-RDN health professional during employment
Other: (please explain)

Objective #3 Describe RDN demand for and perceptions of need related to nutrition-related laboratory testing training, credentialing, and utilization.

1. There is a need for increased formal clinical training of RDNs in the area of nutrition-related laboratory testing:

- strongly agree
- agree
- neutral
- disagree
- strongly disagree

2. There is a need for increased formal clinical training of RDNs to support advanced practice in general:

- strongly agree
- agree
- neutral
- disagree
- strongly disagree

3. If additional clinical training were to be included for the use of nutrition-related laboratory testing, the most appropriate timing of this training in the course of RDN professional education would be:

- Didactic program in dietetics (DPD)
- Dietetic internship
- Master's level graduate program
- Board certification program
- Professional doctorate
- Continuing education

4. If additional clinical training were to be included to support advanced practice, the most appropriate timing of this training in the course of RDN professional education would be:

- Master's level graduate program
- Graduate certificate
- Board certification program
- Professional doctorate
- Continuing education

5. Increased formal clinical training of RDNs would support advanced practice skill development.

- strongly agree
- agree
- neutral

disagree
strongly disagree

6. Increased formal clinical training of RDNs related specifically to nutrition-related laboratory testing would support advanced practice skill development.

strongly agree
agree
neutral
disagree
strongly disagree

7. Lack of advanced practice skill is currently a limiting factor in RDN utilization of nutrition-related laboratory testing.

strongly agree
agree
neutral
disagree
strongly disagree

8. Practice autonomy is currently a limiting factor in RDN utilization of nutrition-related laboratory testing.

strongly agree
agree
neutral
disagree
strongly disagree

9. A lack of opportunities for advanced clinical skill development is currently a barrier to dietetic advanced practice.

strongly agree
agree
neutral
disagree
strongly disagree

10. What are dietitians looking for in an advanced practice degree? (select ALL that apply)

diet order privileges
laboratory testing order privileges
increased clinical training and skills
prescriptive rights - nutraceuticals and botanicals
increased autonomy
increased compensation
focused practice in specialized areas (e.g. oncology, pediatrics, endocrinology, etc.)
other (please explain):

11. I am personally interested in advanced practice training in the use of nutrition-related laboratory testing:

strongly agree

agree

neutral

disagree

strongly disagree

12. I am personally interested in training to develop other clinical dietetics skills for advanced practice:

Yes [Please specify] _____

No