Mount Saint Vincent University
Department of Applied Human Nutrition

Exploring the use of behavioural and environmental domain nutrition care process terminology by registered dietitians working in nephrology

by
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A thesis proposal
submitted in partial fulfilment
of the requirements for the degree of
Master of Science in Applied Human Nutrition

September 2025
Halifax, Nova Scotia

Mount Saint Vincent University
Department of Applied Human Nutrition

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Abstract

Title: **Exploring the use of behavioural and environmental domain nutrition care process terminology by registered dietitians working in Nephrology**

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Introduction: Millions of Canadians are living with chronic kidney disease (CKD). Dietetic intervention is integral in preventing and treating CKD. The nutrition care process (NCP), and its associated terminology (NCPT), is a tool used to communicate identified barriers to accessing food and gaps in nutrition knowledge. Registered dietitians (RDs) often use NCPT when charting in the ADIME (Assessment/Diagnosis/Intervention/Monitoring/Evaluation) format. There are four domains of diagnostic terminology: 1) clinical, 2) intake, 3) behavioural/environmental, and 4) no nutrition diagnosis domains.

Objectives: To examine practice and perceptions of RDs practicing in nephrology in Nova Scotia on their use of the social determinants of health (SDoH) and the behavioural/environmental (B/E) diagnostic domains of the NCP.

Methods: Two main methods were implemented: 1) a retrospective audit of RDs chart notes was completed to capture usage of B/E domain and SDoH-related terminology 2) a close-ended online questionnaire collected responses to questions pertaining to RDs' perceived utilization of the B/E diagnostic domain in nutrition care. Descriptive and inferential statistics were completed including Chi Square test of independence and Fishers exact test.

Results: According to the audit of n=172 charts, RDs primarily used clinical diagnoses, accounting for 36% of the nutrition diagnoses identified. Twenty-two percent (n=38/172) of the RDs used the B/E domain. Twenty RDs completed the questionnaire. Twenty percent (n=4/20) identified that they were unfamiliar with the B/E domain, with 30% (n=6/20) responding do not use this domain in their charting. Fifteen percent (n=3/20) reported not using ADIME at all, which was confirmed by chart audit.

Significance: SDoH are core to effective and competent dietetic practice in all practice areas, as are communication and record keeping competencies. This exploration of RDs practices and perceptions is limited to a local sample of RDs working in nephrology. But it generated knowledge and understanding, and supported development of research questions, job aids and education. This work, although categorized as quality assurance, applied research methods and

tools, and resulted in quality assurance outputs. Quality improvement projects are a low cost, time effective proactive process. Through them RDs can support identification of system efficiencies and inefficiencies, aiming to facilitate co-learning, improvements, and to support change management, rather than assigning blame.

Acknowledgements

First and foremost, I would like to thank my supervisor Dr. Shannan Grant for her ongoing support and mentorship throughout my entire master's degree. Your insight to research and to life has been invaluable, and the opportunities you have provided to me through the GrantLab have been incredible. Over the last four years not only have you provided me remarkable guidance in research but also a safe space and mentorship as a fellow dietitian, and for that I will be forever grateful. Thank you for allowing me to live and learn through my experiences and encouraging me to take time to pause, process, and come back when life threw me curve balls.

To my thesis committee, Dr. Karthik Tennankore, Dr. Sarah Hewko, and Dr. Patty Williams, thank you for the time you have spent providing me guidance and feedback on this thesis. I sincerely appreciate your enthusiasm and encouragement with this project and unrelenting kindness through all the life-challenges I faced. Thank you to Dr. Jennifer Brenton-Peters for your contributions to the early stages of this project.

I would also like to acknowledge the financial support I have received during my studies as MSVU: Thank you to Research Nova Scotia for my Masters Scotia Scholar Award and to MSVU for the in-course bursaries. This funding allowed me to pursue my postgraduate studies and research at MSVU.

Thank you to all the GrantLab members past and present. Special thank you to Megan Gray and Rachel Waugh, who were always there for me, from class presentations to questions about school and life in general. You were and are both a guiding presence.

To my friends near and far, thank you for always checking in on how my master's was going and providing me a space to disconnect. I appreciate every one of you, from dog walks or romps, to getting on the ice with my synchronized skating team, you always made me feel refreshed and ready to get back to my schoolwork.

To my husband, Mitchell: What would I have done without you?! Thank you for being the calm to my storm! Through this master program you have kept me grounded, believed in me and provided me with endless support. I hope to do the same for you as you complete your masters. From our getting our dog (Maverick), to our engagement, family health challenges, planning our wedding together, and getting married weeks before my defense! We can do anything together.

Maverick (yes, I understand dogs can't read), thank you for keeping me company and bringing me joy while I sat at my computer for hours on end. Thank you for bringing me outdoors - our walks always brought fresh perspective.

Thank you to parents and family, to my brother, David, for sharing your own master's experience. To my parents: My biggest supporters, words cannot full express my gratitude for your boundless encouragement and support in everything I do. I am so grateful for everything you have done for me. Dad, I will forever appreciate you checking in and being a source of reassurance. Mom, you have always been in my corner, thank you for being a constant source of guidance, from late night phone calls to being a voice of reason, you have always been my biggest cheerleader and for that I will be forever grateful.

To my Aunt Helen: You were one of my biggest supporters. I miss our phone calls, your inquiries about my schoolwork, and you always reminding me that I can do anything I set my mind to. The hardest part of the past four years was losing you and working through my grief after your passing.

I dedicate this work in memory of you, Aunt Helen. I will love you forever.

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B	
B/E	Behavioural/environmental
C	
CAPD	Continuous ambulatory peritoneal dialysis
CCPD	Continuous cycling peritoneal dialysis
CKD	Chronic kidney disease
D	
DM	Diabetes mellitus
E	
EMR	Electronic medical record
H	
HD	Hemodialysis
N	
NCP	Nutrition care process
NCPT	Nutrition care process terminology
NS	Nova Scotia
NSH	Nova Scotia Health
P	
PARiHS	Promoting Action on Research Implementation in Health Services
PD	Peritoneal Dialysis
R	
RD	Registered Dietitian
S	
SDoH	Social Determinants of Health

1.0 Introduction

1.0 Introduction

Nutrition care and dietetic intervention is integral in the management of chronic kidney disease (CKD) and kidney failure [1]. Over 850 million adults worldwide are living with some form of kidney disease; CKD has been classified as a global health problem [1]. Nutrition intervention is an essential component of CKD medical management and has been associated with improved clinical outcomes, enhanced quality of life, and patients' achievement of life goals. It can also assist with slowing the progression of CKD to kidney failure, and in mitigating the effects of co-morbidities including but not limited to, hypertension, diabetes, and dyslipidemia. Regular nutrition counselling, including education and monitoring, contributes to continued patient adherence to nutrition recommendations [1].

Social determinants of health (SDoH), such as socioeconomic status, education, literacy, race, and gender, are consistently associated with individuals' awareness and understanding of chronic diseases [2]. Lower socioeconomic status has also been associated with increased risk of developing CKD and kidney failure in several populations [2,3]. For instance, among men who are living with CKD and kidney failure, those who identify as white have been shown to be more aware of their health status than men who identify as being from a 'minority group', i.e., an equity deserving population [2]. Further, 25% of people living with CKD have limited health literacy, a SDoH directly associated with health outcomes [4]. For example, patients with lower literacy on average, report more challenges with self-management of disease, resulting in poorer clinical outcomes [4]. Registered dietitians (RDs) are trained in assisting patients living with CKD and kidney failure, and those experiencing socioeconomic challenges [5].

The nutrition care process (NCP) is a systematic, patient-centered approach to providing high quality nutrition care [6,7]. The NCP also aims to create and maintain consistency and quality in RD's charting [6,7]. The NCP has four key quadrants (figure 1), including nutrition assessment or reassessment, diagnosis, nutrition intervention and nutrition monitoring and evaluation (ADIME) [8]. NCP terminology (NCPT) is an evidence-based, standardized set of terms for developing a nutrition care plan. For instance, the NCPT diagnoses terms help differentiate between a nutritional and medical diagnosis when they diverge. Medical and nutrition diagnoses

are occasionally identical [9]. Nutrition diagnoses are organized into four domains: 1. Intake, 2. Clinical 3. Behavioural-Environmental (B/E) and 4. No nutrition diagnosis identified. The B/E considers SDoH, and provides diagnostic terms for nutrition-related problems that are connected to knowledge, attitudes and/or beliefs, physical environment, and access to food or food safety [10]. The diagnostic terminology was updated in 2023, as some terminology was considered judgemental and new language was necessary [11]. For instance, "Limited food and nutrition related knowledge" was provided as an alternative to "Food and nutrition related knowledge deficit" [12]. A new diagnosis that was added to allow for more accurate distinction between issues in food and nutrition-based skills and limited knowledge is "Limited food and nutrition related skill".

The NCP was designed to provide RDs with consistent terminology to be used in the medical charting of their nutrition management plan and to assist in providing high-quality nutrition care [13]. The NCP and prescribed terminology (NCPT) aim to provide a framework to assist with critical thinking and decision making [13,14]. While international research shows that the NCP has been implemented around the world, conflicting attitudes surround its implementation and utilization. Specifically, when RDs were surveyed, they reported it offered little benefit and that other health care providers would not read the nutrition diagnoses [13–15]. RDs also reported the language associated specifically with the B/E domain was harsh and offensive towards patients; this led some to avoid using the B/E standardized language [14,16].

Despite this, when RDs apply the NCP and NCPT in their record keeping, evidence supports that they are able to appropriately represent the effects a chronic disease, such as CKD, have on a patient, including how it impacts their nutritional status [17]. Research is needed on NCP and NCPT usage, specifically for B/E domain, among RDs working with populations living with CKD and kidney failure, as well as RDs' perception of their role in supporting patients impacted by the SDoH.

The proposed research involves two methods of data collection: 1) a questionnaire; examining RDs' perceptions of their usage of the NCP and 2) a chart audit; examining RDs' utilization of the B/E diagnostic domain of NCPT in their nutrition care plan. The aim of this project is to

identify how the SDoH are being captured in nutrition assessments and interventions for patients living with CKD or kidney failure. The objectives of this research are 1) to explore if nephrology RDs in Nova Scotia (NS) use of the B/E domain when documenting in patient medical charts and 2) to examine the RDs perceptions of their use of SDoH and the B/E diagnostic domains in their nutrition care/practice.

As the primary investigator for this project, it is important I acknowledge that I am also a clinical dietitian working with nephrology patients. The software I assessed to complete the I have previously used and continue to use in my front-line work. The questionnaire I have developed for the project will be distributed to RDs I have worked with and to those I have previously worked with.

2.0 Literature Review

2.0 Literature Review

2.1. Kidney Disease and Dialysis

Chronic kidney disease (CKD) is a growing concern globally that is impacting health care resources, and patient morbidity and mortality [18]. In 2020, 10% of, or approximately four million, Canadians were living with kidney disease [19]. While there are numerous causes of CKD, diabetic nephropathy and hypertensive nephropathy are the two most common causes in both developed and developing countries [20]. People living with kidney failure require maintenance renal replacement therapy or a kidney transplant to sustain their lives [20]. This section provides further information about CKD, the types of dialysis, and related nutritional requirements.

2.1.1. Chronic Kidney Disease

According to the Kidney Foundation of Canada,

"CKD is the presence of kidney damage, or a decreased level of kidney function, for a period of three months or more" [21].

Its severity can range from mild to severe and, in some incidences, can lead to kidney failure [21]. People developing CKD may present asymptomatically and may lose greater than 50% of their kidney function before becoming symptomatic [19]. Early detection of CKD is instrumental in preventing the progression of the disease through appropriate implementation of evidence-based lifestyle and pharmacological treatments and strategies [22].

2.1.2. Causes of CKD

The two leading causes of kidney failure, diabetic nephropathy and hypertensive nephropathy, are classified as the "two silent killers around the world" [20]. Diabetic nephropathy is a common complication with diabetes, its global prevalence has been increasing at an alarmingly

rapid rate [23]. Diabetic nephropathy occurs most frequently in those living with type 1 diabetes, with cumulative kidney damage reaching 50% within 10 years of having microalbuminuria. It is also common in those living with type 2 diabetes, with 20-40% of people living with type two diabetes with microalbuminuria developing diabetic nephropathy. There are various risk factors for developing diabetic nephropathy; the modifiable risk factors include hypertension, inadequate glycemic control, and dyslipidemia. The unmodifiable risk factors include age, race, and a family history of diabetic nephropathy [23]. The pathophysiological process of diabetic nephropathy is an expansion and thickening of the cells in the basal membrane, which over time leads to endothelial cell fenestration. Functionally, there is glomerular hyperfiltration with an increased albumin excretion, leading to nephropathy, increasing proteinuria and declining glomerular filtration rate (GFR) [23]. When an individual's blood sugars are consistently outside and above the target range, hyperglycemia can be experienced, which can contribute to further damage of the nephrons and increase the risk of developing diabetic nephropathy. diabetic nephropathy is the most common cause of kidney failure, accounting for about 45% of kidney failure cases in the United States as of 2015, and 20% of kidney failure in Canada as of 2022 [20,24].

High blood pressure is a prevalent issue world-wide and is a contributing factor to the development of CKD [25]. Early diagnosis and treatment of hypertension has been shown to delay the progression of hypertensive nephropathy and decrease possible complications [26]. Systemic blood pressure consistently outside the target range results in a decline in GFR [27]. The exact mechanism of how hypertension causes kidney damage remains unclear, although kidney fibrosis and scarring are the most likely causes [27]. Fibrosis and scarring damage the macro- and microvascular systems of the kidneys, causing a loss of autoregulation with increased intraglomerular capillary pressure. This, in turn, creates a hyperfiltration-mediated injury [27]. Patient awareness and understanding of the cause and/or causes of kidney failure can assist in preventing further decline.

2.1.3 Social Determinants of Health and Health Equity

SDoH are defined as the non-medical factors that influence health outcomes; these include the conditions within which people are born, develop, work, live in, age in, and their access to power, money, and resources, all of which shape their daily lives [28]. Health equity is when people have a fair opportunity to reach their maximum health potential [29]. It can be positively and negatively influenced by the SDoH including, income, social protection, education, literacy, employment security, working life conditions, food security, housing (basic amenities and environment), early childhood development, social inclusion and non-discrimination, and access to affordable health services [28]. Intermediary determinants such as income, education, occupation, social class, gender, and ethnicity, are created and maintained through structural determinants of health including: public policies, political and social institutions, the labour market, and the educational system [2]. These determinants are also known on a larger scale as structural ableism, which is a system of historical and contemporary policies, institutions, and societal norms and practices that devalue and disadvantage people who are disabled, chronically ill, neurodivergent, or living with a mental illness, while privileging people who are positioned as able-bodied and able-minded [30]. Interconnected systems of oppression and power such as racism, sexism, capitalism, and colonialism are what up-hold structural ableism, which denies disabled communities access to equitable health care [30].

Socioeconomic status, education, race, and gender are just a few social determinants that are consistently associated with patients' awareness and understanding of the chronic disease they are living with [2]. In an integrative review, Iroegbu et al. found that;

"*individuals of higher socioeconomic status and educational attainment, Caucasian race and male gender are more likely to be aware of their CKD."* [2].

Research has shown that many people are not being diagnosed with CKD as a result of being unable to afford to doctor visits, specialist consultations, or access additional health-enhancing services [2]. However, even when physician and specialist services are affordable or covered by health insurance, patients have expressed concerns around the language physicians' use and

related difficulties in understanding their CKD diagnosis. An individual's awareness of having CKD or kidney failure was more common in white men and was respectively less common in men of minority groups [2]. Early detection and awareness of CKD and kidney failure has improved overall outcomes and increased the period of time before a patient requires dialysis or an organ transplant [22]. Having access to transportation to see a family doctor and paid time from work for medical appointments enhances an individual's overall health. The intersectionality between income and education is apparent, with a lower socioeconomic status associated with lower levels of education [2,3]. Confounding social factors such as mentioned above have been associated with increased risk of developing CKD, independent of clinical and demographic factors [3]. Physicians have expressed that they are not adequately educated on how or when to communicate a CKD diagnosis with patients [2]. With physician shortages, patients are not seeing their primary care physician or being referred to a nephrologist in a timely manner [31]. Family and internal medicine trainees have noted gaps in training regarding CKD risk factors, screening and appropriate intervention [31,32]. In adults living with CKD, their risk for mortality increases with each SDoH they are experiencing [33].

Fifty-five percent of Canadians' health literacy skills are less than adequate, with 88% being 65 years of age or greater [34]. Health literacy refers to the ease at which we can receive and understand fundamental health information and make informed decisions about our health [35]. As of 2007, 40% of Nova Scotians did not understand printed information well enough to make informed decisions about their own or their family's health [35].

"Limited health literacy affects 25% of people with chronic kidney disease" [4],

which in turn can decrease the individuals' ability to manage their health care, resulting in poorer clinical outcomes. Further, it has been found that patients' navigating multi-morbidities struggle with fragmented health care, which creates an additional challenging dimension to health literacy [36]. In 2023, a study conducted in the United Kingdom demonstrated that of 978 participants, 96% had multimorbidity, with complex multimorbidity (more than four long-term conditions) accounting for 57% of participants [37]. Fragmented care refers to patients seeing multiple different health care providers with different specialties [36]. Fragmentation can lead to

inconsistency in health recommendations and create uncertainty when deciding which health care provider to share different health issues with. When patients live with multiple morbidities, they often have more health care providers involved in their care [36]. For instance, a patient living with type 2 DM that develops diabetic nephropathy, which then causes CKD may be working with multiple health care providers, including their family doctor, endocrinologist, diabetes centre nurse, RD, nephrologist, and nephrology team members. If there are gaps in communication, patients may struggle to navigate the health system [36]. Fragmentation and inconsistency in health care creates a barrier to the patients ability to conceptualize, measure and understand health literacy across the various health fields they are working with for their health care [38]. A fragmented systems can lead the most vulnerable patients to fall through the cracks as they often experience difficulty accessing basic medical care until their health issues become emergencies [39].

2.1.4 Renal Dialysis

More than 52,000 Canadians are being treated for kidney failure [19], with 58% receiving dialysis and 42% living with a functioning transplant [19]. There are three primary types of dialysis: home hemodialysis (HD), in-center HD, and peritoneal dialysis (PD). There are two types of PD, continuous ambulatory peritoneal dialysis (CAPD) and continuous cyclic peritoneal dialysis (CCPD) [40]. In-center HD treatment can take three to four hours and is usually completed three times a week. These times are dependent on the patients' individual requirements, as some patient only need dialysis twice a week, whereas others may need it up to five times a week [41]. CAPD requires 4 fluid exchanges where the sterile fluid is placed in the patient's abdomen for four to six hours and then drained, with the draining taking thirty to forty minutes. CCPD is often completed while the patient is sleeping, during which a machine fills and drains the fluid from the patient's abdomen, a process taking eight to twelve hours [40].

There are many reasons to choose one modality over another, including one's medical status, overall health, or lifestyle [41]. Modality selection is also associated with the SDoH, particularly education, literacy, employment, marital status, and residence [42]. Home modalities can provide the individual with more independence and freedom [43]. It is more likely for patients who are

employed to choose a home modality, specifically PD, rather than in-center HD [43]. Thanabalasingam et al. (2024) found that individuals with lower education levels, were unemployed, and were single or living alone or in a long-term care residence were more likely to initiate HD instead of PD [42]. Health literacy can further impact the patient's choice of treatment modality and, additionally, their choice can affect their ability to work and have a stable income [44]. For patients who are in poor health, in-center HD is often the only choice, and when a patient's condition is poor they are less likely to be working [43].

Dialysis takes a toll on patients, often causing them to experience significant financial challenges [45]. The proportion of dialysis patients identified as being below "Canada's Low-Income Cut-Off" was much higher than that of the general population. Patients receiving dialysis often resign from their job or, if in a stable career with benefits, are placed on long-term disability, decreasing their household income by at least 40% [45]. Out-of-pocket costs such as transportation to dialysis and medications create an even greater burden on the patient and their families [46]. Patients receiving HD in Canada can spend up to $684 on travel and parking a year [46]. The cost of transportation would be greater for patients commuting from rural areas to receive dialysis in an urban center if the dialysis center closest to their home is full [46]. In a Canadian survey examining financial burden in dialysis patients, 55% of respondents reported an annual household income of less than $35,000 CAD [46]. People receiving HD are more likely to be off work/unemployed than those receiving PD, with a study from Finland showing 19% of patients receiving HD being employed, compared to 44% of patients receiving PD [43]. In a survey of select home modality patients in British Colombia was completed showing that patients who travel for PD or Home-HD training incur a significant financial cost [47]. Some of the costs the face include transportation, food, accommodations, as well as lost income, reducing the financial burden for patients may help improve the uptake for home modalities [47].

Researchers have estimated that over the next decade there will be as many as six million people diagnosed with CKD, increasing the economic burden on the health care system [2]. In 2018, it was found that when people start on dialysis their household income decreases by two-thirds [45,46]. Out-of-pocket costs related to receiving dialysis treatment can range from $1,400-2,500 depending on the modality of treatment. Medications contribute to a large portion of the costs

patients experience, with the average annual cost of prescription and non-prescription medications accumulating to $1,083 [45,46]. Patients who choose home modalities also experience burdensome out-of-pocket costs, with home hemodialysis costing upwards of $1,152 annually for increased electrical and water usage. Dialysis also come at a high cost to the health care system --- between $30,000-$100,000 per patient each year [45].

2.1.5 Medical nutritional therapy

Individuals living with CKD and kidney failure have different requirements for their overall intake as well as their micronutrient needs than those without kidney disease. Patients at the pre-dialysis stage often require a low protein diet in addition to a low sodium diet; this is quantified as 0.6-0.75g/kg IBW/day (Ideal Body Weight) of protein and a maximum of 2300mg of sodium a day [48]. Requirements for potassium and phosphate are based on the patient's blood work, meaning that only those with values outside of the target range require individualized intake levels (whether higher or lower than the standard). When patients begin to receive dialysis, their nutrient requirements change dialysis increases the protein requirements to a range of 0.9g/kg IBW/day to 1.2g/kg IBW/day. The range increases to 1.2 -1.3g/kg for acutely ill patients. Their energy requirements are 25-35kcal/kg IBW/day, with adjustments made for age, gender, co-morbidities, and physical activity level. Dialysis patients require a more restrictive sodium recommendation: i.e. 2000mg/day for those with fluid output less than 1L/day. Individuals with high serum potassium require a restriction of 2000-4000mg/day. A combination of dietary counselling to reduce intake and phosphate binders are often needed to manage serum phosphate in people receiving dialysis. RDs also assist with identifying which meals and snacks have significant amounts of phosphate and require that at least one phosphate binder be consumed concurrently to the meal or snack. Individuals receiving dialysis require a vitamin B and C complex multivitamin to replace water-soluble vitamins that are lost through dialysis [48]. Calcium-based phosphate binders and the vitamin B and C complex multivitamin are not covered by provincial health coverage, creating an additional cost burden for the patient [49]. Overall, individual specific nutrition recommendations are required for people living with CKD and kidney failure to ensure they meet their specific nutrient needs, with recommendations changing for individuals throughout their CKD journey [48]. For patients experiencing

socioeconomic challenges, the requirement to follow a low sodium and high protein diets are often more expensive [50]. These nutrition recommendations create additional challenges for patients who are accessing food banks or soup kitchens for their groceries and meals as it is less common for them to be stocked with items low in sodium or high in protein [51].

2.2 Nutrition Care

RDs play a vital role in assisting patients navigate the complexities of their CKD management [1]. For individuals undergoing dialysis, dietary choices significantly influence both their treatment plan and dialysis prescription. As described in section *2.1.3*, RDs assist patients in managing their nutrition requirements, by providing tailored recommendations based on lab results, treatment modality, co-morbidities, and overall goals of care to meet their unique nutritional needs [48]. In addition to developing personalized nutritional plans, RDs offer ongoing support and counseling to help patients adhere to their nutrition guidelines and manage the broader challenges of living with chronic illness, often related to the SDoH [1].

Facilitating learning for patients through a collaborative interprofessional team assists in providing patients with optimal CKD care [52]. RDs are one of the many team members working with patients living with CKD, the team consists of the nephrologist, nurse practitioner, nurses, social worker, pharmacist, and sometimes other specialists such as psychologists [53]. RDs have an important role in the interprofessional team [5,54]. In addition to providing individualized nutrition support, the RD simplifies the science behind nutrition to support kidney function [5,54]. When this information is provided in conjunction with medical treatment by the nephrologist and nurse practitioner, the progression of kidney failure can be slowed [5].

The first course for dietetics was offered in 1914 at John Hopkins hospital, the first recommended dietary allowances were not established until 1941 [55]. In 1936, St. Michael's Hospital in Toronto became the first hospital approved by the Canadian Dietetic Association (which became Dietitians of Canada in 1996) to educate RDs [56]. In 1991, Canada's National Dietetic profession published their first paper on hunger and food security, by 2016, Dietitians of Canada released recommendations to address household food insecurity in Canada [57–61]. In

2005, Dietitians of Canada published a position paper with seven ways an RD can play a role to ensure that the Canadian populations health and well-being are being promoted by social policies and conditions [59]. Collaborating with others including community based organizations to advocate for policies to reduce poverty, and being self-educated about the issues and processes to achieve food security through social change are just two of the ways to help promote food security in Canada [59]. The recommendations have evolved with additional position papers being published in 2016 and 2024 [59,61,62]. The 2024 position paper was written in collaboration with the Canadian Association for Social Workers, with the main recommendations being at the governmental level [62]. While dietetic programs vary across Canada, all RDs complete at least one course in Community Nutrition where they learn about the social determinants of health (SDoH) while completing a Bachelor of Science in Nutrition or preparatory education for a graduate degree in dietetics [63]. Through this course and sometimes other courses they gain a thorough understanding of the SDoH and the implications they have on individuals' lives.

Currently, RDs in Canada are required to complete a 47-week dietetic practicum program with a minimum of four weeks spent with a community RD. The goal of this placement is for the learner to gain an understanding of RDs' roles in population-level health promotion [64]. Upon completion of the practicum program, dietetic students should have a thorough understanding of the inter-relationship among nutrition care, population health promotion, food and nutrition expertise, and food provision. Professionalism and ethics, communication and collaboration, and management and leadership frame and inform their practice. It is expected that at the end of schooling and their practicum program, dietetic students are able to integrate their understanding of population health promotion into all aspects of practice, including clinical nutrition [64]. An entry-level RD should be able to combine their learnings from community nutrition and apply them to the clinical practice as well [64]. For instance, RDs should be able to collaborate with other team members including the physician, social worker, pharmacist, and nurse practitioner to assist with managing patients whose care is more complex due to socioeconomic challenges or other SDoH, often beyond the patient's control [64].

The socio-economic circumstance of patients living with CKD and kidney failure varies greatly. RDs can play a role in helping patients navigate challenges related to their SDoH and assist in advocating for interventions to support them [65]. In Nova Scotia, this includes assisting patients in receiving additional social assistance. When patients are applying for social assistance or requesting special assistance, RDs can help patients receive additional financial aid by writing a letter to the patient's case worker in the Department of Community Services (DCS). In the letter, RDs can advocate for the patient to receive financial assistance based on their various, individualized diet modifications [66,67]. For instance, patients receiving income assistance who are living with CKD, diabetes, HTN, or those who have an increased caloric and protein need, may be approved to receive additional funds. The RD works in collaboration with the social worker to provide adequate support to the patient during the application process, and during clinic/dialysis appointments [68]. DCS of Nova Scotia has a policy manual outlining what the RD should include in the special diet request letter they write to advocate for additional funding for the patient [67]. For instance, a patient receiving income assistance living with cardiovascular disease could receive an additional $27 a month, if they are also living with hypertension they could receive an additional $81 a month, with the maximum amount that they can receive totalling $157/month [67].

2.3 Nutrition Care Process

The nutrition care process (NCP) was created to improve the consistency and quality of individual nutrition care plans [69]. It was designed to be a standard process for RDs providing care, while facilitating patient-centered, individualized nutrition care for clients [69]. The NCP model requires practitioners to consider several factors when developing an NCP plan. These factors include the practice setting, health care systems, social systems, and economics [69]. RDs also need to identify nutrition status, risk factors, collaborate with other members of the interprofessional team, and utilize appropriate tools and methods [8]. As seen in Figure 1, the NCP model includes four areas to be included in a chart note, the nutrition **a**ssessment/reassessment, a nutrition **d**iagnosis, a nutrition **i**ntervention, and nutrition **m**onitoring and **e**valuation (ADIME). The nutrition diagnosis includes a PES statement, P – identify the problem, E – determine the etiology/cause, S – state signs and symptoms [8]. The problem

identified in the nutrition diagnosis must be selected from the designated statements on the "Nutrition Diagnostic Terminology" list. The set terms for nutrition diagnosis are organized into three domains, 1. Intake, 2. Clinical, and 3. Behavioural-Environmental. If, after conducting an assessment the RD concludes that there is currently no problem with the individual's nutrition status, the clinician is to write, "no nutrition diagnosis at this time" [70].

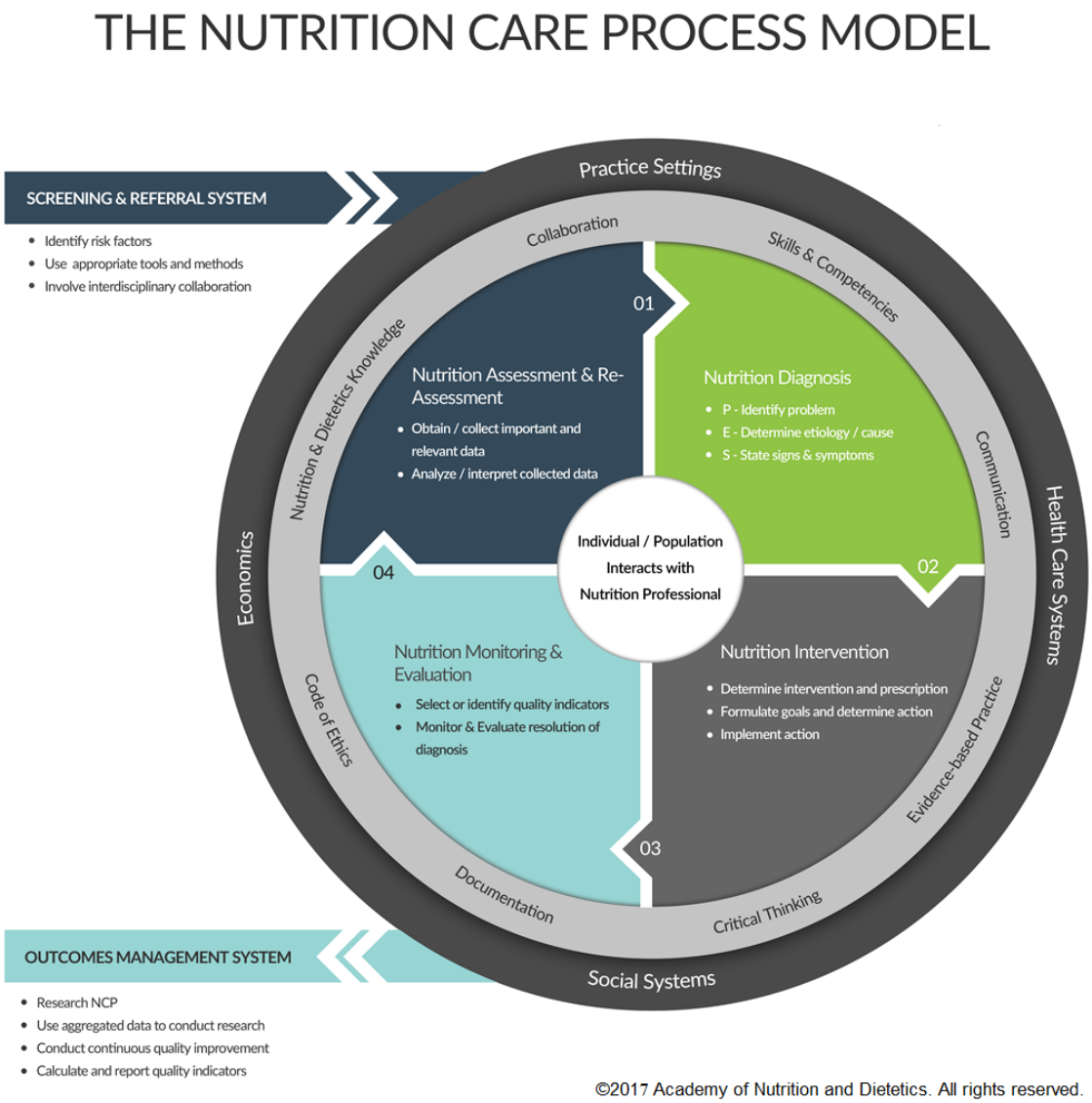

Figure 1. Four Quadrants of Nutrition Care Process (note, approved by ELSEVIER LICENCE No. 6064720090046)

2.3.1 Nutrition Care Process Overview

As seen in Table 1, RDs can identify the diagnoses under one of the three main areas, behavioural-environmental (B/E), clinical, and intake. The B/E domain has been identified by RDs as more challenging to use than the other domains [14]. For instance, a nutritional diagnosis identifies and labels a specific nutrition problem that the RD can treat independently with a nutrition intervention [71]. Whereas a medical diagnosis describes a disease or the pathology of the body systems (e.g. diabetes), with numerous potential interventions. Some may be nutrition-related but many are pharmacological or procedure-based: RDs do not identify medical diagnoses [71]. The primary focus of the nutrition diagnosis is for the RD to choose the most pressing nutrition problem for which an RD intervention can have the greatest positive impact [71].

Table 1. Nutrition diagnostic terminology domains of Nutrition Care Process.

Domain	**Definition**
Behavioural-Environmental	Nutritional findings/problems identified that relate to knowledge, attitudes/beliefs, physical environment, access to food and food safety
Clinical	Nutritional findings/problems identified that relate to medical or physical conditions
Intake	Actual problems related to intake of energy, nutrients, fluid, bioactive substances through oral diet and nutrition support.

Following a nutrition assessment or reassessment, the RD develops a nutrition diagnosis. This is a statement to describe the issues, the root cause, and evidence from the assessment data impacting the overall nutrition status [9]. In the NCP, the nutrition diagnosis is the link between the assessment and intervention, with the intervention clearly targeting the etiology or minimizing the symptoms identified in the diagnosis [72]. The usage of set diagnostic terminology assists with providing clarity in communication, enhances transparency, and demonstrates RDs' critical thinking and approach to members of the multidisciplinary team reviewing the client's chart [72].

2.3.2 Dietitians Use of Nutrition Care Process Terminology

Over the last decade RDs around the world have been implementing the NCP and NCPT [14]. Research has shown that, in countries where the implementation of NCP had been initiated using a specific strategy, there was an increase in utilization of the method. It was noted that inpatient RDs reported the highest implementation rates and public health RDs the lowest. In many countries, the national dietetic association implemented the NCP and provided access to the electronic version of the NCPT document to their members [14]. It was noted that RDs were more likely to incorporate the procedure of the NCP, rather than the terminology. Nutrition diagnosis was the most frequently implemented NCP step. In this study, the timing of NCP implementation with the RDs was examined, and it was observed that the education around the NCP was more often the focus of training of new staff for a short period of time rather than being provided to all staff over an extended period of time [14].

2.3.3 Diagnostic – Behavioural-Environmental Domains

When a patient is experiencing nutrition-related problems that are connected to knowledge, attitudes or beliefs, physical environment, and/or access to food or food safety, the B/E diagnostic terminology can be applied [10]. See Table 2 for definitions of each category of B/E domains. As described above, the SDoH are the non-medical factors that influence individual's overall health [28]. Social factors such as knowledge, food safety and food access can be linked to the SDoH, and can assist RDs in identifying what barriers a patient is facing and methods for intervention [11]. RDs can use the B/E domain of the NCP when supporting patients who are vulnerable, whether due to their level of education/literacy, income level, housing status, employment status, and/or marital status [73]. In 2019, critics of the NCPT argue that it does not accurately describe the patients and their issues and lacks language that would assist the RD in acknowledging and being able to address social, political, cultural, religious, or economic aspects of the patient's life [74]. As Brady (2019) shares, NCPT does not recognize the underlying social, structural and environmental inequities which are the key contributors to nutrition and health problems [74].

Table 2. Behavioural/Environmental domain categories [10]

Category	Definition	Example
Knowledge and Beliefs	Actual knowledge, attitudes, and beliefs as related, observed or documented. Absence of knowledge around nutrition, negative beliefs around food, or attitudes that hinder positive behaviour change.	"Food and nutrition knowledge deficit" "Limited food acceptance" "Limited food and nutrition related skill"
Physical Activity and Function	Actual physical activity, self-care, and quality of life problems as reported, observed, or documented. The way the client's environment affects their nutrition, lack of appropriate facilities for food preparation.	"Inability to manage self care" "Poor food and/or nutrition quality of life" "Physical inactivity"
Food Safety and Access	Actual problems with food safety, safe handling, storage and preparation to prevent foodborne illness. Problems related to access to food, water, nutrition-related supplies, or limited access to transportation for obtaining food.	"Intake of unsafe food" "Food insecurity" "Limited access to nutrition related supplies"

It is important for RDs to collaborate with other allied health care team members, especially when utilizing the B/E domain in their diagnosis. Connecting and coordinating with the social worker, community access pharmacy coordinator, pharmacist, nurse practitioner, and physician will assist the RD in finding an appropriate intervention targeting B/E-related factors and the most appropriate person to implement the intervention [75]. When asked about barriers to using the B/E domain, RDs shared feedback in 2019 that NCPT language is "judgemental" and "derogatory," which prevented them from using it [11]. From my experience, I have notice that RDs can be hesitant to use some of the B/E domain terminology in their nutrition diagnosis. Personally, it took me time to feel comfortable with identifying a diagnosis from the B/E domain, but I realized that I was already initiating interventions that supported these diagnoses when collaborating with interprofessional team members. Previously, I had found the terms somewhat intimidating and had found myself relying more on the clinical and intake domains and would only use the nutrition knowledge deficit when working with patients new to dialysis. I had seen other RDs documenting using this diagnosis when patients started on dialysis and it was the first time I had used it.

2.4 Theoretical Framework

This study draws on the Promoting Action on Research Implementation in Health Services (PARiHS) framework to examine how the Nutrition Care Process (NCP) is implemented among RDs working in nephrology in Nova Scotia. Developed by Kitson, Harvey, and McCormack in 1998, the PARiHS framework offers a structure for translating evidence-based research into practice by evaluating three core elements: evidence, context, and facilitation [76,77]. This framework considers three factors to identify the possible translation of the research results: 1) evidence – the strength of the research, for instance the validity, the experience and expertise of the practitioner and the inclusion of key stake holders 2) context – the setting where the research is being implemented, workplace culture, and 3) facilitation – the support required to assist in adapting the researchers' approach to thinking and work, as well as their attitudes, habits and skills. Applying community and practitioner experience involves understanding the positives, negatives, and other possible implications of the research evidence. The context of where the information is being implemented plays a role in the success of the uptake of research findings and the type of facilitation and the roles and skills of the facilitator(s) will assist with enhancing the implementation process [76].

The method of implementation of the NCP impacts how it is used by RDs. An international survey found that 33% of RDs reported using a nutrition diagnosis in clinical documentation and that this was the most implemented step of the NCP format [14]. The PARiHS framework can be used to guide implementation processes such as for the adoption of the NCP and NCPT. Behaviour change takes time and utilizing frameworks such as PARiHS can assist with the uptake of a concept, practice, or tool [76]. Ward et al. utilized the PARiHS framework when implementing an evidence-based program called TeamSTEPPS to thirteen rural hospitals over a nine-month period [78]. Interviews were conducted to examine participants' perspectives of the TeamSTEPPS implementation, and researchers' found that the framework enhanced outcomes, with the program being widely promoted to enhance patient safety [78].

In this study, I examined the implementation of the NCP, specifically the perceived and actual use of the B/E diagnostic domain among RDs working in nephrology in NS. As explained above,

the first factor of the PARiHS framework is adequate evidence demonstrating how research and practitioner experience provide justification for implementation. As established in the literature review, there has been observational research demonstrating how useful the NCP is in charting medical nutrition therapy, and how consistent use of NCPT supports and strengthens nutrition communication within the interprofessional team and with patients [11,72]. The second key factor of the PARiHS framework is the context, for instance, examining the quality of the environment, especially during implementation, is the leadership role and organization approach assisting to allow for continued uptake of NCPT following implementation [76]. In a qualitative study of Ugandan midwives' and managers,' context was categorized under 'Receptive context', 'Culture', 'Leadership', and 'Evaluation' as the four sub-elements of the 'context' cornerstone in the PARiHS framework [79]. Notably, there is a local initiative at Nova Scotia Health (NSH) to assist with integrating the NCP into practice. An NSH working group was formed to assist with planning and disseminating information about the NCP. The working group has hosted learning opportunities to assist RDs with their understanding of NCP and NCPT. There is also an auditing evaluation system where RDs' chart notes are reviewed for utilization of the NCP. The context will play a role when sharing the outcomes of the research, especially with NSH's NCP working group, and will inform internal strategies to further foster RD knowledge and use of the NCP and NCPT.

Finally the last factor of the PARiHS framework is facilitation; this includes both the internal and external persons acting as facilitators in the process [80]. Laycock et al. demonstrated that when stakeholders facilitated engagement opportunities at the organizational- and local-level, there were more connections made, assisting to inform policy, mitigate barriers and encourage wide-scale improvement in Indigenous primary health care [81]. Another example is how Dietitians of Canada provides their members with complementary resources through *eatright*., allowing for self-directed continued learning [82]. In the context of this research project, it is pertinent to understand the facilitation of NCP in the hospital, but specifically within the nephrology department. Coordination with NSH will be required to disseminate the findings from this project. The NCP working group with NSH are interested in having the results of the project shared through a presentation, and they are interested in having the project shared to the quarterly clinical RDs provincial meeting to ensure to reach as many RDs as possible.

3.0 Protocols & Methodology

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3.1. Rationale

The NCP provides RDs with a consistent method to chart and document their work, while keeping the patient and their unique challenges and needs at the forefront [9]. The utilization of the NCP and NCPT can assist with charting various aspects of the patient's behaviours as well as give rise to specific clinical, intake, and behavioural-environmental diagnoses [15]. Consistent usage of the NCP and NCPT can improve the quality of care and overall patient health outcomes, which in turn, enhances recognition of the importance of RDs contributions within the multidisciplinary team [83].

The number of patients living with kidney failure has grown by 31% since 2011, with no cure for kidney failure, the only solutions are to start dialysis or to receive a kidney transplant [19]. Patients who require dialysis experience significant financial challenges [45]. Dialysis also impacts the patient's physical and emotional quality of life [44]. It is important for health care providers to take these into consideration when providing medical interventions. Patients often experience

"…disruption in their employment, eating habits, vacation activities, sense of security, self-esteem, social relationships, and an inability to enjoy life due to physical, psychological, socioeconomic, and environmental aspects of their lives being negatively affected…" [44].

When consulting with patients it is imperative that RDs consider how the patient's quality of life is impacted by CKD and/or receiving dialysis to optimize the support they provide [44]. When RDs utilize the NCP and NCPT, they can appropriately represent how the patients' lives are being affected by the chronic disease and by requiring dialysis. There is a need for research that examines RDs' usage of the NCP and NCPT, specifically of the B/E domains among RDs working with clients living with CKD and kidney failure. Research is also needed to develop an understanding of RDs' perceptions of their role supporting patients being negatively impacted by the SDoH. Utilization of the B/E diagnostic domain of the NCP and NCPT is a way to recognize the impacts of SDoH that impair patients' nutritional status [65]. Patients' SDoH can be

recognized and identified using the NCP and the NCPT, but it is important to note that SDoH exist outside of the NCP and NCPT [83]. As seen in the Nutrition Care Process Model, social systems and economics are located in the outer circle and can be classified as SDoH (as seen in Figure 1), meaning that the SDoH are affecting patients both positively and negatively outside of a nutrition diagnosis. When the NCP is implemented efficiently among RDs, the specific SDoH-related barrier(s) each patient is facing can be consistently identified and understood by RDs, as well as other health care professionals [83]. The aim of this study is to explore if RDs' working in nephrology use and perception of their use of the B/E domain and the SDoH when documenting in patient medical charts. Results from this study can be used to inform education provided to RDs to facilitate effective utilization of the B/E diagnostic domain of NCPT.

3.2 Question

The aim of this project is to explore the following questions:

1) Do RDs working in outpatient nephrology clinics in NS use the B/E domains of the NCP and SDoH in their medical charting?
    - Sub-question: Does the electronic medical charting software effect the domain used?
2) Do RDs working in outpatient nephrology perceive they are using the B/E domain in their medical charting?

3.3 Purpose and Objectives

The purpose of this project was to:

1. Capture and describe RDs' practicing in nephrology outpatient clinics in NS use of the B/E diagnostic domain and SDoH in their medical charting.
   1.1 Compare the RDs' use of the B/E diagnostic domain on two charting platforms, My Nephrology and Renal Insight, used in NS

2. Examine RDs' practicing in nephrology outpatient clinics in NS perceptions of their use of SDoH and the B/E diagnostic domains in their nutrition care/practice.

3.4 Design

A survey design, this project was cross-sectional, applying two methodologies: 1) chart audit and 2) questionnaire, focusing on the period between 2015 to 2023. This study can be classified as a quality assurance project, as it sought to explore if the NCP approach and NCPT were effectively implemented among RDs working in outpatient nephrology at NSH. A quantitative approach was applied to collect, analyze, and present the data. A pRoject Ethics Community Consensus Initiative (ARECCI) Ethics screening tool is an instrument that helps the primary investigator address and mitigate ethical risks by providing decision support tools. It is a mixed methods form that the primary investigator filled in to assess the level of risk the project may pose, it was completed for both methods and defined risk as minimal (score of 0 (range 0-7)).

The chart audit preceded the survey to prevent any modifications to RD charting practices that could be triggered following RDs completion of the survey. The questionnaire was sent to RDs who practiced in the nephrology outpatient department from 2015 to 2023. The face, content, and construct validity of the audit tool and questionnaire were not assessed. The primary investigator met with RDs practicing in nephrology and discussed the best approach to collect the information. Since the group the questionnaire was being distributed to was small it was agreed upon by the committee that completing a face, content and construct validation could indirectly influence the cohort's response to questions in the questionnaire, as it would be the same group of people assessing the tool as using it.

3.5 Study Samples

3.5.1. Chart Audit

Two main charting platforms have been used throughout NS over the last ten years. One platform, My Nephrology incorporated an NCP-based charting method for the nutrition note. It

was possible that RDs who used this platform would be more comfortable with the B/E domains of the NCPT [14]. The second platform was Renal Insight; in this platform, RDs have the opportunity to create and amended note templates. This system lacks the capacity to list the set of diagnostic terms, meaning that RDs wishing to apply the NCP need to be familiar with the three diagnostic domains, and the respective terminology, in order to select the appropriate diagnosis for each chart entry. Comparisons were made between the type of software to see if having the drop-down options incorporated into the charting, such as in My Nephrology versus the free-hand text for Renal Insight made a difference in documentation.

The sample for the chart audit included a review of RD chart notes from both charting programs described above. The charts of any patients who received care from a RD in the nephrology program and who were/are living with stage five CKD or were/are receiving dialysis treatments at any point between the years 2015 and 2023 in Nova Scotia were reviewed. It has been estimated using the Renal Insight platform that the fourteen RDs practicing in nephrology see, on average, 100-150 patients a year: totaling approximately 1750 patients annually.

Using G*Power software, a power analysis was calculated to estimate the required sample size to observe a significant difference between the use of the B/E domain in the two charting platforms [84]. It was determined that a sample size of 172 charts was required to achieve a significance level with 90 percent power. This was 10.2% of the total population seen by a RD in one year, which is in agreement with previous chart auditing research [85,86]. Eighty-six charts were reviewed on each platform.

3.5.2 Questionnaire

The sample for the questionnaire included RDs working with patients living with CKD or who were receiving dialysis in the outpatient setting. At the time of the study there were only fourteen RDs working with the nephrology program in NS. However, the survey was shared with other RDs who have worked in the nephrology program at any point since 2015, with the hope to reach thirty RDs (n=30). Owing to a lack of up-to-date contact information for two of these RDs, the survey was only circulated to 28 RDs (n=28). We predicted, based on preliminary discussions

with this population, that 80% of the RDs currently working in nephrology would complete the survey. Reasons for non-completion likely included increases in workload and RDs taking time off for vacation or illness. Twenty RDs completed the survey, which was 71% of those invited to participate.

3.6 Materials and Methods

Survey studies includes several designs and data collection methods, including questionnaire, chart audit, or interview [1]. Two survey methodologies were applied during this study: 1) a questionnaire and 2) a chart audit. By applying these methodologies, I examined the perceived utilization and actual utilization of the B/E diagnostic domains in nutrition care. Surveys such as questionnaires have been used to examine the implementation of the NCP and the NCPT among RDs across various countries and cultures [14,88]. As the goal of this research project was to learn directly from the RDs, the primary investigator distributed a questionnaire directly to the those working with outpatient nephrology patients. Examination of medical records has been used in both nursing and dietetics, as it can lead to suggestions for improvements to the quality of documentation [89,90]. A chart audit examining RDs' use of the B/E diagnostic domain will help inform next steps if any further implementation of the NCP and the NCPT is required.

3.6.1. Chart Audit

A retrospective chart audit of RDs' nutrition notes for patients living with stage five CKD or receiving dialysis was completed. The auditor examined the RDs' usage of the B/E diagnostic domain in their charting and identified the frequency of the use of B/E terminology, as shown in Appendix A, using a preformulated chart on Microsoft (MS) Excel™, as seen in Appendix B.

Medical records were searched using Renal Insight, a Canadian nephrology electronic medical record and My Nephrology a webpage unique to the Halifax nephrology team, where patient care was managed and accessible for some RDs to chart. The primary investigator screened patient records for patient who had been seen by a RD from 2015-2023. In Renal Insight, patients were randomly selected to be screened based on their medical record number (MRN) and the area of the province they reside, in My Nephrology, patients were randomly selected using their

modality of dialysis as well as the area of the province they reside. These steps were taken to ensure an even distribution of patients was selected from both platforms, as well as geographically, and from all modalities. A decision tree was used to select patients from each modality (HD or PD). The number of patients selected from each modality was related to the number of patients in that population and randomization was conducted via MS Excel™ table to track the software being used, the modality the patient received and to provide the patient with a randomized number. As seen in Appendix C, the decision tree was used to help maintain consistency in data collection, as it was collected over a couple of months. As it was not possible to have a blind selection of the patients from My Nephrology, additional patients were selected and placed in an additional MS Excel™ document where patients were given a random identification number. Following this, a random number generator website was used to identify a representative sample.

A MS Excel™ spread sheet was used to complete the chart audit. Participants were de-identified and assigned an ID number. In the audit, RD notes from the years 2015 to 2023 were reviewed, with My Nephrology being used from 2015 until 2020 and Renal Insight being used from 2020 until present day. The MS Excel™ spread sheet included a column identifying which diagnostic domain the RD applied. Each B/E diagnostic problem statement was listed in a drop-down option in each cell on the MS Excel™ spreadsheet, to assist in identifying which diagnoses were used and how often they were used. A column to identify the SDoH was created for cases where the RD did not use the NCP diagnostic domains but still identified a SDoH, although this only happened once. Since there was only one chart where the SDoH was recognized without being associated with NCP, separate from a nutrition diagnosis in the B/E domain, all B/E diagnosis were also assessed and classified using the SDoH that it best aligned with.

Examples of the drop-down options are in Appendix B. The patient's date of birth was used to track if the patient has been seen more than once by a RD to prevent duplication of the same patient data. The patient's date of birth was converted to age to de-identify the patients in the data collection forms when the data tracking was complete.

Audit data MS Excel™ spreadsheets were stored on a password protected MSVU OneDrive account, to which only the primary investigator and thesis supervisor had access. All study data will be kept for five years after study closure at which point the files will be permanently deleted.

3.6.2. Questionnaire

This is a seven-item questionnaire that included only close-ended questions. These questions included dichotomous and Likert scale questions to collect information on RDs' perception of their utilization of the NCP and NCPT and the B/E diagnostic domain. The Likert scale question responses ranged from "not at all effective" to "extremely effective". The questionnaire was provided to all nephrology program RDs in NS that had practiced in this department at any time from 2015 to the present day. The questionnaire was accessible on the online application *REDCap* and was distributed through email. The objective of the survey was to examine RDs' perception of their use of the B/E domains of the diagnostic terminology in their nutrition care and charting. The questionnaire was used to assess RDs' practicing in nephrology perception of their use of the B/E domains in their medical charting.

3.6.2.1 Sample

As the response rate in the original two-week period of November 2024 to December 2024 was below target at 13 participants, the questionnaire was redistributed and circulated for a total of two months. An email with the questionnaire was recirculated in the early part of 2025. It was self-administered by the participants and was therefore open for a total of two months (November 26, 2024- January 20, 2025). The contact information for the primary investigator and supervisor were included, if any questions arose.

3.7 Ethical Considerations

Prior to completing the chart audit and administering the questionnaire, Nova Scotia Health Ethics (REB#1030374) and MSVU Ethics (REB # 2023-286) approval was obtained. Those who completed the questionnaire were provided with a consent form at the beginning of the survey

outlining an overview of the thesis, voluntary participation and participant rights, data management, and contact information for the Laura Gosine and Dr. Shannan Grant, supervisor. The consent section also included a list of the thesis committee members (with exception of Patricia Williams as she rejoined the committee after the questionnaire was circulated) and reviewed as well as a glossary defining key terms, as seen in Appendix D.

All questionnaire responses were recorded on REDCap; a system affiliated with Nova Scotia Health and all questionnaire data was stored on NSH servers. All study data will be kept for five years after study closure at which point the files will be permanently deleted.

3.8 Data Analysis

Data analysis was mixed format for the chart audit, both descriptive and inferential statistics, and only descriptive for the questionnaire. All descriptive and inferential statistical analysis were completed using MS Excel™ (Version 16) and IBM SPSS (Version 29) Software.

3.8.1 Chart Audit

Nominal data were described using counts (n) and percentages (%) and continuous data by means (mean) and standard deviations (SD). Descriptive statistics were performed to compare the utilization of the three diagnostic domains as well to identify the usage pattern of the B/E diagnostic domains. The key outcomes measured were the types of diagnostic domain being used, which of the B/E diagnostic domain terms were being used, and the frequency of usage of the Individual B/E diagnostic terms. The frequency of the utilization of the SDoH was measured.

Inferential statistics were used to analyze nominal outcomes and, Pearson's Chi-Square test with two-sided significance was performed to determine if there was an association between the type of software used and the type of NCP diagnostic domain used. It is important to note that the term association, also referred to as independence, will be used throughout the remainder of the thesis to indicate whether there is a relationship between variables. An association shows that the variables are related in some way and the observed distribution is likely not due to chance [91].

In cases where a large enough sample size was not possible, a Fishers Exact test was used. A large enough sample size was not obtained for three domain comparisons, the B/E domains, or the SDoH to meet minimum cell frequencies for analysis, thus inferential analysis was not performed.

3.8.2 Questionnaire

Descriptive statistics including counts (n) and percentages (%) were generated for all categorial, and nominal data collected. Continuous data were analyzed using means and standard deviations (SD). As this project was examining RDs perception of their use of B/E domain and the SDoH, there was no comparison of these values as they were being looked at independently.

4.0 Results

4.0 Results

4.1 Chart Audit

The target sample was obtained (n=172), each unit representing one chart entry written by an RD and therefore one patient-RD interaction. The number and type of diagnoses/ domain reported/ charted are shown in Table 3. The clinical domain was the most used domain with 36.6% (n = 63/172) instances recorded. No nutrition diagnosis identified was the next most used domain (23.8%; n = 41/172). Of the 41 charts with no nutrition diagnosis identified, 20 of the charts had used the terminology no nutrition diagnosis identified, with 21 not including an NCPT diagnosis, and 17.4% (n = 30/172) intake. Twenty-two percent (n = 38/172) included B/E diagnoses, a comparison of the total count from the B/E domain and the other three domains is shown in Figure 2.

Supplementary analysis was complete to compare these data between software applications, as described in the methods section of this thesis, also shown in Table 3 below. For nutrition intake and no nutrition diagnosis domains, the observed frequencies differ significantly from the expected frequencies (assuming equal preference for all), so the chi-squared test reveals a statistically significant difference in the application of these domains between software. Specifically, the intake domain was used more frequently in My Nephrology (n=22 incidents) when compared to Renal Insight (n=8 incidents, p=0.006). There were no statistical differences in other domains between the software platforms.

Table 3. A comparison of Nova Scotian registered dietitians' practicing in nephrology utilization of each diagnostic domain based on the electronic medical charting systems

Software	Diagnostic Domain				Total
	Clinical	Behavioural/ Environmental	Intake	No Nutrition Diagnosis	
My Nephrology	34	19	22	11	86
Renal Insight	29	19	8	30	86
Total	63	38	30	41	172
p-value[a]	0.321	0.934	0.006	$\leq$ 0.001	

Significance detected at $p \leq 0.05$.
[a] p-value derived by Chi-Square Analysis

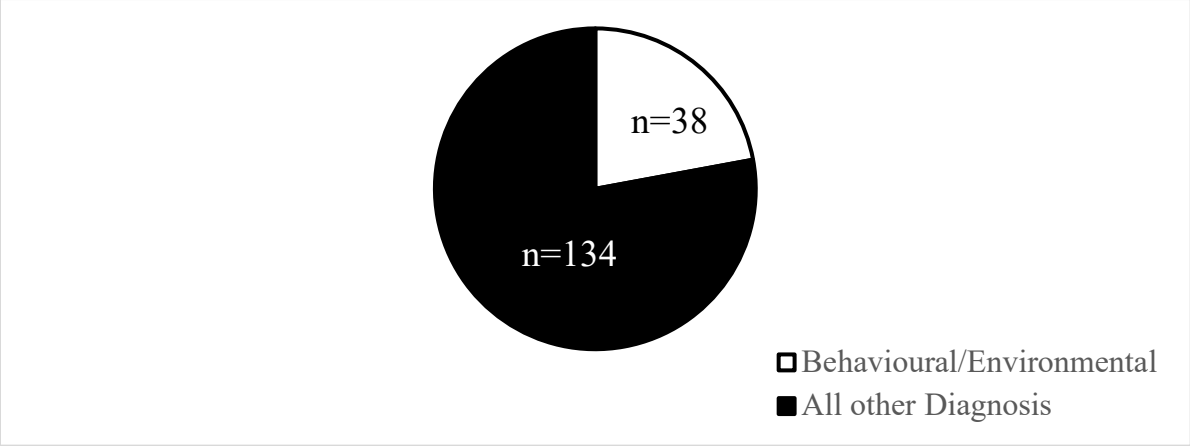

Figure 2. A comparison of registered dietitians practicing in nephrology in Nova Scotia utilization of the Nutrition Care Process Behavioural/ Environmental domain to the other three domains.

The mean age of patients was 64 years with the standard deviation being 14.98 as seen in Figure 3. This indicates that most patients were between 50-78 years of age.

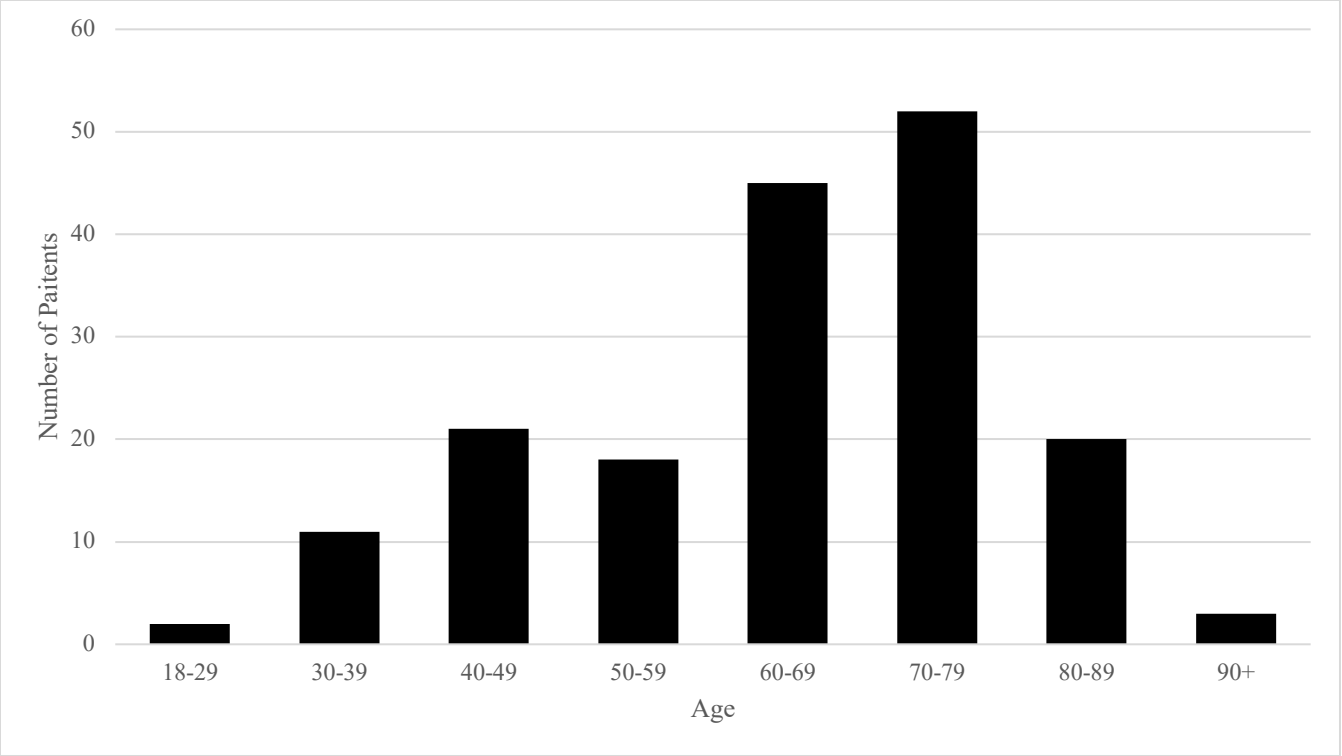

Figure 3. Patient age at time of nutrition diagnosis from chart audit reviewing charts from 2015-2023 (n=172).

The B/E domain has 19 diagnoses of these two diagnoses were used in the charts audited, as seen in Table 4. Knowledge deficit was the most used with the other diagnosis being limited adherence. Comparisons were made between the two software programs and there was little statistical significance, p = 0 .486. In My Nephrology, the 'knowledge deficit' diagnosis was the only B/E domain (n = 19/19), where with Renal Insight, 'knowledge deficit' consisted of 89.5% (n=17/19) of the B/E diagnoses. The diagnosis, 'limited adherence' was used in Renal Insight but not in My Nephrology, representing 10% (n = 2/19) of the B/E diagnoses.

Table 4. Registered dietitians practicing in nephrology in Nova Scotia use of the Behavioural/Environmental diagnosis in their medical charting.

Behavioural/Environmental Diagnosis	**Renal Insight (n=19)**	**My Nephrology (n=19)**	**p-value**
Knowledge Deficit	17	19	0.486
Limited Adherence	2	0	0.486

Derived by Fisher's Exact Test

The SDoH in Table 5 were identified and aligned based on the nutrition diagnosis utilized by the RD and analyzed based on the determinant and context of the diagnosis. All but one of the SDoH were instances the RD utilized the B/E domain. The SDoH "education" was largely based on nutrition knowledge deficit, in some cases this was due to low literacy and for instances where the patient was new to clinic (i.e. had likely received a new CKD diagnosis). "Education" was also common for patients who were new to receiving hemodialysis, and in some cases a new CKD diagnosis as they started on dialysis. "Access to affordable health care" was commonly used for patients who were unable to have adequate follow-up due to limited staffing. "Structural conflict" was selected for a patient who had decreased mobility and were visually impaired, where the patient had decreased ability to access equitable care. This was the one instance where no nutrition diagnosis identified was identified by the primary investigator, but the chart included details that aligned with the SDoH. There was little difference of the utilization between the two software's of the SDoH terms used, education represented 94% (n=17/18) in Renal Insight and 88.8% (n=16/18) in My Nephrology. The term "affordable health care" was used once with Renal Insight, and terms "work life conditions" and "structural conflicts" were used once with My Nephrology (n=1/18, 5.5%).

Table 5. Alignment of the Social Determinants of Health from nutrition diagnosis in chart audit.

Social Determinant of Health	**Renal Insight**	**My Nephrology**	**p-value**
	n= 18	n= 18	
Education	17	16	0.848
Access to affordable health care	1	0	1.0
Work life conditions	0	1	1.0
Structural conflicts	0	1	1.0

Derived by Fisher's Exact test

4.2 Questionnaire

Over a two-month period (November 26, 2024- January 20, 2025) 20 respondents completed the questionnaire. Twenty-eight RDs who worked in nephrology in Nova Scotia Health from 2015 to

2023 were invited to complete the questionnaire. Seventy-one percent of dietitians responded to the to the questionnaire as seen in Appendix D.

Eighty-five percent (n=17/20) of respondents identified that they apply the ADIME charting format, while three respondents do not. Approximately 90% (17/19, 89.5%) of respondents reported that they use NCPT in their charting, with two identifying that they do not (Table 6). One participant did not respond to this question, the total number of responses to this question was 19.

Table 6. Registered dietitians perceived use of Assessment Diagnosis Intervention Monitor Evaluation (ADIME) and Nutrition Care Process Terminology in their medical charting.

Question (N)	**Yes [*n* (%)]**	**No [*n* (%)]**
Do you follow ADIME formatting when charting? (20)	17 (85)	3 (15)
Do you use NCPT when charting? (19)	17 (89.5)	2 (10.5)

N = number of respondents; *n*=number of responses

A Likert scale with response options ranging from “not at all effective” to “extremely effective”, was used to assess RDs perception of how effective ADIME and NCPT were in their medical charting (Table 7). Thirty percent (*n* = 6/20) of respondents rated NCP as “neutral” and “moderately effective” for patient care outcomes, with 10% (*n* = 2/20) rating it as “low effectiveness”, “slightly effective”, “very effective”, and “extremely effective”. Forty percent (*n* = 8/20) rated NCPT “very effective” for communication between RDs, 30% (*n* = 6/20) rated it “moderately effective”, 15% (*n* = 3/20) rated it “slightly effective”, 10% (*n* = 2/20) rated it “extremely effective”, 5% (*n* = 1/20) rated it “neutral” in its effectiveness, with none of the respondents rating it “not at all effective” or “low effectiveness” (n=0/20).

Table 7. Registered dietitians practicing in nephrology in Nova Scotia perception of how effective they believe the Nutrition Care Process is on patient outcomes and for communication between RDs.

Question (N)	**Not at all effective [*n* (%)]**	**Low Effectiveness [*n* (%)]**	**Slightly Effective [*n* (%)]**	**Neutral [*n* (%)]**	**Moderately Effective [*n* (%)]**	**Very Effective [*n* (%)]**	**Extremely Effective [*n* (%)]**
Patient care outcome (20)	0 (0)	2 (10)	2 (10)	6 (30)	6 (30)	2 (10)	2 (10)
Communication between RDs (20)	0 (0)	0 (0)	3 (15)	1 (5)	6 (30)	8 (40)	2 (10)

N = number of respondents; *n* = number of responses

Eighty percent (*n* = 16/20) of respondents reported being familiar with the B/E domain (Figure 4). Seventy percent (*n* = 14/20) of the participants reported using the B/E domain for their nutritional diagnoses (Figure 5)

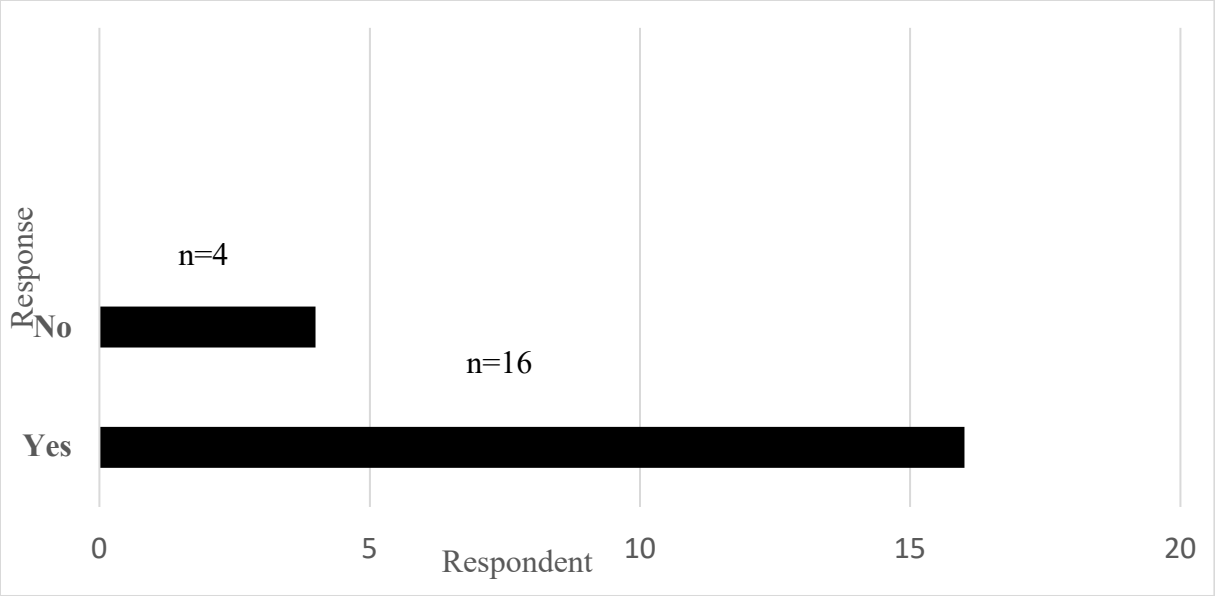

Figure 4. Registered Dietitians' practicing in nephrology in Nova Scotia familiarity with the Behavioural and Environmental diagnostic domain terminology (n=20).

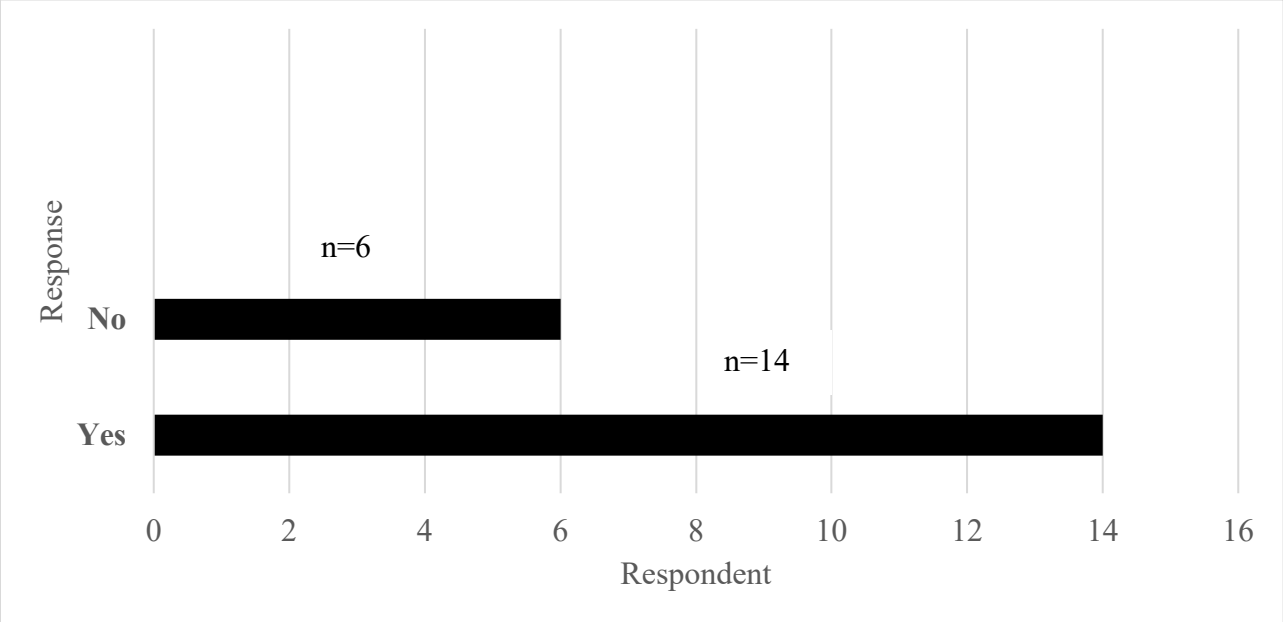

Figure 5. Registered Dietitians' practicing in nephrology in Nova Scotia perception of their utilization of the Behavioural and Environmental domain terminology (n=20).

RDs perception of their continued use of their nutrition diagnosis was assessed with two statement prompts. As seen in Table 8, the statement "By the time I follow-up with a patient the problem statement is typically resolved or addressed" 55% (n=11/20) of RDs identified "sometimes", 25% (n=5/20) identified "rarely", 15% (n=3/20) identified "often", and 5%

(n=1/20) identified “never”, with “always” not being selected. RDs responded to the statement “I continued to address the most recent nutrition diagnosis and respective intervention I identified”, with 65% (n=13/20) selecting “often”, 20% (n=4/20) selecting “always”, 15% (n=3/20) selecting “sometimes”, with “never” and “rarely” not selected, as seen in Table 8.

Table 8. Register dietitian’s practicing in nephrology in Nova Scotia perception of their continued use of Nutrition Care Process diagnosis in follow-up documentation

Question (N)	**Never *n* (%)**	**Rarely *n* (%)**	**Sometimes *n* (%)**	**Often *n* (%)**	**Always *n* (%)**
By the time I follow-up with a patient the problem statement is typically resolved or addressed (20)	1 (5)	5 (25)	11 (55)	3 (15)	0
I continued to address the most recent nutrition diagnosis and respective intervention I identified (20)	0	0	3 (15)	13 (65)	4 (20)

N = number of respondents; *n*=number of responses

The RD perception of how their planned intervention targeted the NCP diagnosis they identified was also assessed (Table 9). Ninety-five percent (n=19/20) believed their nutrition diagnosis was targeted by their nutrition intervention. 89.5% (n=17/20) believed the signs and symptoms they identified were targeted by their nutrition intervention. Approximately 68% (n=13/20) believed the etiology they identified was targeted by their intervention.

Table 9. Registered dietitians practicing in nephrology in Nova Scotia (N=20) perception of how their intervention directly impacts the three parts of their Nutrition Care Process diagnosis.

Parts of NCP Diagnosis (N)	**n (%)**
Diagnosis	19 (95)
Etiology	13 (68.4)
Signs and Symptoms	17 (89.5)

Respondents perceived barriers to using the B/E domain was assessed, respondents did not have to select any response to this question and fourteen (n=14) responded (Table 10 and Figure 6). Respondents were able to select multiple responses as the options were not mutually exclusive. This means that the percent of each response does not add up to 100% as not all participants selected a response, and some selected more than one response. Approximately 79% (n=11/14) of the respondents identified they "Do not feel comfortable with diagnoses requiring interventions by other health professionals", 42.9% (n=6/14) of respondents identified they are "Unsure of appropriate intervention for diagnosis", 35.7% (n=5/14) of the RDs selected "Unfamiliar with the B/E terms", 7.1% (n=1/14) of the RDs selected "Do not feel comfortable with charting using the NCP format", with 0% (n=0/14) selecting "unfamiliar with how to write an NCP diagnosis".

Table 10. Registered dietitians practicing in nephrology in Nova Scotia (N=14/20) perception of possible barriers to using the Behavioural/ Environmental domain.

Question	**n (%)**
Unfamiliar with how to write an NCP diagnosis	0
Unfamiliar with the B/E terms	5 (36)
Unsure of appropriate interventions for diagnosis	6 (43)
Do not feel comfortable with diagnosis requiring interventions by other health professionals	11 (79)
Do not feel comfortable with using the NCP format	1 (7)

n = number of responses

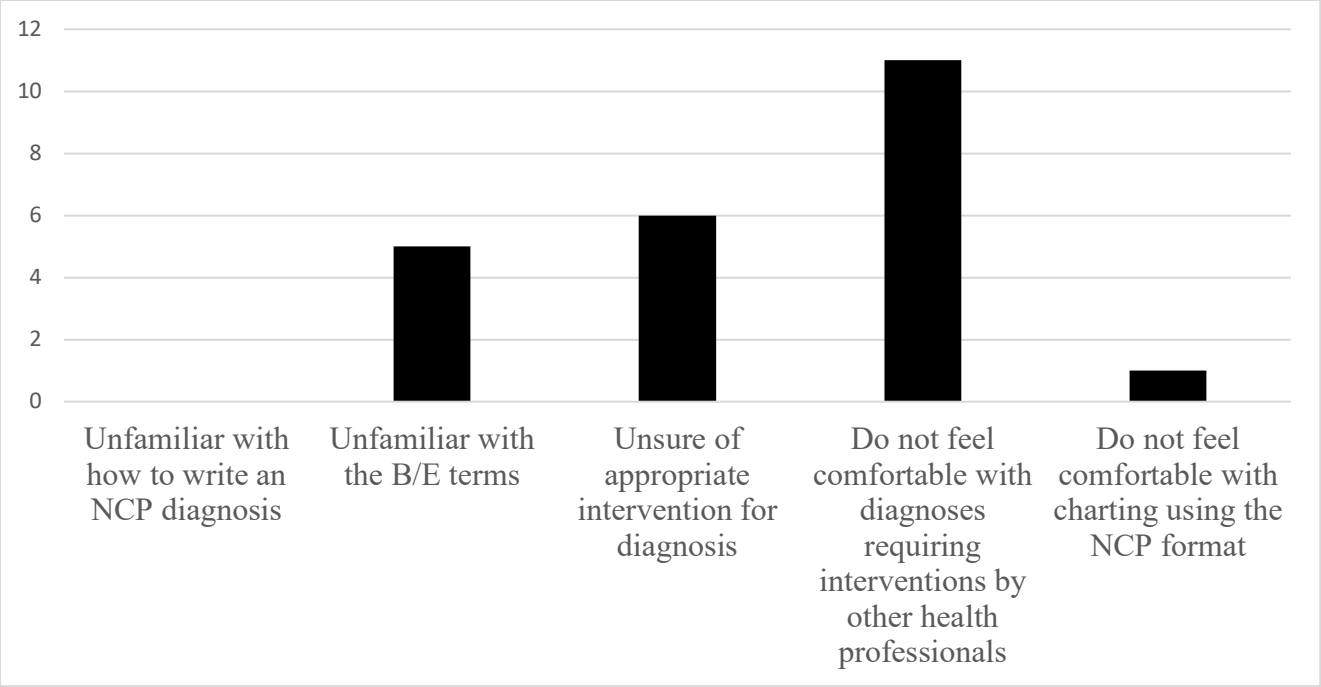

Figure 6. Registered dietitians practicing in nephrology in Nova Scotia identified barriers to using the Behavioural/Environmental Diagnosis (n=14/20).

5.0 Discussion

5.0 Discussion

Through this project, RDs perceived and actual use of the B/E diagnostic domain in medical charting was explored, specifically those working in nephrology outpatient clinics in Nova Scotia. The objectives of this study were met with the application of two survey methods. The first objective, to capture and describe RDs' use of the B/E diagnostic domain and SDoH in their medical charting, was completed using a chart audit to examine the utilization of the B/E diagnostic domain. In addition, the type of charting platform was also assessed to see if it affected the use of the B/E domain. The second objective, to examine RDs perceptions of their use of SDoH and the B/E diagnostic domains in their nutrition care/practice, was met by analyzing data collected in a questionnaire that was distributed to RDs working in nephrology outpatient clinics in NS.

5.1 Chart Audit

Of the 41 charts without an identified nutrition diagnosis, 21 lacked any diagnosis entry; therefore, "no nutrition diagnosis identified" was selected during the audit. In retrospect, a separate option such as "does not use NCPT" could have more precisely captured the distinction of charts where no nutrition diagnosis was entered. Aurélien et al. (2024) shared that chart reviews often reveal documentation that does not conform to NCPT standards, leading to underreporting of nutrition diagnoses [95]. A number of the RD chart notes did not follow the ADIME method or structure on Renal Insight. Alternatively, the chart notes that identified "no nutrition diagnosis" in My Nephrology, reflected an intentional decision by the RD to select it as a set diagnosis. This finding indicates that the presence of the dropdown menus in My Nephrology correlates with more frequent utilization of specific diagnostic domains. In the My Nephrology results, we saw intake being used more frequently and a marked reduction in chart notes with no nutrition diagnosis, suggesting that the charting platform software design can directly influence documentation practices. A statistically significant relationship between the charting platform software used and the type of NCP diagnosis used was found, as had been anticipated. Sutton et al. (2020) found that when clinical decision support tools are embedded in decision-support tools there was improved coding compliance: in many places in the world the

nutrition diagnosis is a coded piece of information [96]. As Electronic Medical Records (EMRs) become further developed and used, there are opportunities for national standardization of the terms incorporated, allowing for them to be incorporated into all RDs charting practices [97]. It is important for RDs to be involved along with the other members of the interprofessional team when the systems are being developed, to ensure the EMR tools support the use of NCP and NCPT [98]. Rossi et al. (2014) shared that the implementation of an electronic system over a paper-based resulted in improvements in patient outcomes as well as in the efficiency of implementing NCP [99].

The B/E domain was used in 22% of the charts, and although there are 19 B/E diagnosis in the eNCPT 2023 edition, two were identified by the primary investigator in the charts reviewed during the audit. This aligns with the Lovëstam et al. (2016) findings that RDs use the B/E domain less often as they felt the language associated with the B/E domain as harsh and offensive to patients [16]. Swan et al. (2019) also found that RDs limited their use of the B/E domain as they considered the language supporting the B/E domain judgemental and derogatory [11]. This stems the question if the RDs writing the audited chart notes felt the same way as the RDs surveyed in both research studies? Is this causing them to avoid the other diagnoses of the B/E domain? “Intake of unsafe food” is one of the B/E diagnoses, this diagnosis prompts the RD make judgements about what is safe and unsafe. Depending on the RDs cultural knowledge this could lead to their personal perspectives causing them to further oppress a group of people [30]. Some may see the B/E domain of the NCP as type of structural ableism, if it is not used with knowledge and awareness of their biases around equity, diversity, inclusion and accessibility. Lack of awareness can perpetuate interlocking systems of oppression such as racism, colonialism, and transphobia [30]. It is imperative that RDs have the opportunity and are included in education opportunities to deepen their understanding of the ways racism, colonialism, and ableism play a role in the health care system and the role they can play in preventing it from being continued [100]. At Nova Scotia Health, the RDs recognized the need for an equity, diversity, inclusion, and reconciliation journal club to help their ability to think critically about these topics and improve the support they provide to patients they serve. I was one of the main RDs who supported and assisted with planning and implementing this initiative on a provincial level.

When interpreting data for the SDoH, most of the charts identified a specified nutrition diagnosis, and therefore the charts where B/E domain was identified were assessed to see which SDoH they best aligned with. As previously mentioned, when the primary investigator used no nutrition diagnosis identified they would also comment if the diagnosis "no nutrition diagnosis identified" was used and leave the section blank when nothing was stated. When identifying the possible SDoH, one chart that did not include a diagnosis, the primary investigator noted that the RD's note had commented on the patients "decreased mobility", "hypotension", and "high potassium", the primary investigator extrapolated that the decreased mobility could be classified as a "Structural Conflict" for the patient, classifying it as a SDoH. Ozieh et al. (2021) reviewed the cumulative effects of SDoH on mortality in CKD and patients living with diabetes highlighted the importance of identifying adverse SDoH early. Incorporation of a tool to screen for social determinants in clinical practice is identified as a significant requirement for early identification of SDoH [33].

The analysis of the diagnoses demonstrated that the majority of the B/E diagnosis aligned with the SDoH "education", with 20.9% of the charts identifying patients with limited nutrition knowledge. In the comment section of the chart audit table the primary investigator recorded that for many of these B/E, educational diagnosis were due to a new diagnosis of CKD or progression of the disease to kidney failure requiring dialysis. Lower education levels are associated with less than optimal transition from CKD to kidney failure [73]. However, even highly educated patient may lack the nutrition-specific knowledge at the time of a new diagnosis [101].

At the beginning of this study, I was curious if we would see a significant difference in the utilization of the terminology between these programs, as the My Nephrology program utilizes drop-down lists, and Renal Insight allows free-hand text. Although we did not see this with the clinical or B/E domains, the utilization of the intake domain and no nutrition diagnosis was significantly different across platforms. In My Nephrology, a substantially higher use of the intake domain and a significantly lower use of the no nutrition diagnosis was identified. This could be due to the fact that My Nephrology requires more intention in its use, and the clinician would have to pick no nutrition diagnosis. With Renal Insight, however, they would have to type their diagnosis out and state that no nutrition diagnosis was identified. Vanderhout et al. (2025)

showed that there is potential for electronic charting to improve quality of care and patient safety, but it depends on how well the healthcare provider is able to integrate it into their routine [102]. When implementing speech recognition technology for EMR systems, the PARiHS frameworks was used to help implement the use of the new technology: Lo et al. (2022) concluded that there was immense value in applying a well-established implementation framework when introducing new technology [103]. The design of the electronic note templates can reduce variability in documentation and assist clinicians in providing detailed documentation [104].

5.2 Questionnaire

The majority of RDs believed that NCP was effective in enhancing communication between RDs, but the responses were divided when assessing the effectiveness NCP has on patient care outcome, with most being neutral or believing it was moderately effective. Research by Swan et al. (2019) has shown that NCP can improve communication and collaboration between RDs [11]. Research has shown that when RDs are provided with adequate education about NCP and opportunities to practice using it, there is a reported improvement to patient care outcomes [106,107]. Following the PARiHS framework would be useful to apply when designing interventions to improve RDs understanding, comfort, and use of NCPT [103].

Although 80% of the RDs reported being familiar with the B/E domain, 70% identified that they use the B/E domain, which aligns with the research demonstrating that RDs have identified the B/E domain as more challenging to use than the other domains [14,108]. Lövestam et al. found that RDs thought some of the B/E terminology was harsh and avoided using it [16]. This prompts the question if these RDs know of the updated synonyms for the B/E domain? As previously mentioned, the synonyms were created to make the diagnosis more patient-centered language [109]. Nearly 69% of RDs felt confident designing an intervention to support the nutrition diagnosis they identified. Although when the intervention included other members of the interprofessional team 79% of the RDs who answered the question (55% total) felt that uncomfortable and that it was a barrier to using the B/E domain. This demonstrates the need for interprofessional education and further education for RDs around how NCPT promotes and

strengthens communication with health professionals about nutrition [83]. Research has suggested that a framework should be developed to help with the coordination between organizational support and RDs to assist with advocacy [110,111]. A thorough understanding of the SDoH is required to assist in developing an ethically responsible practice that will help improve the health and quality of life of the community [104].

5.3 Comparison of the Chart Audit and Questionnaire

As described above, the chart audit showed that the RDs used NCPT most of the time (87.7%); 21 charts did not have a nutrition diagnosis identified. In the questionnaire, 89.7% of the RDs identified that they are familiar with NCPT and 80% reported that they use it. When assessing the utilization of the B/E domain, 22% of the charts audited used the B/E domain, and 70% of the RDs identified that they use the B/E domain. A direct comparison is not possible, as the chart audit represents a snapshot in time; however, a notable discrepance exists between the actual frequency of B/E utilization and the perceived frequency of utilization of the domain. It is not possible to identify if the RDs who participated in the questionnaire were the same RDs who completed the chart notes that were audited, as we did not ask what the years they worked in nephrology we are unable to draw any conclusions. Although the chart audit does indicate that RDs perception may not be representative of the reality. This has been seen in past research where RDs perception of teaching people living with diabetes the glycemic index to help with blood sugar control was not representative of reality of implementing glycemic index education [112].

The RDs who completed the questionnaire are from across the province and were not asked which EMR platform they have used; it would be interesting to assess which platforms the RDs had used and if there was a difference in their perceived utilization of the NCPT. Most, if not all, the RDs who answered the questionnaire would have used Renal Insight. It is interesting to note that 21 of the 30 no nutrition diagnosis were instances where NCPT and ADIME were not used. Eighty-five percent of respondents identified that they use ADIME in their nutrition charting, which aligns with proportion (87.7%) of charts in which ADIME formatting was observed. It was hypothesized that when the ADIME formatting was incorporated in the EMR platform, that

it would result in NCPT being used consistently. As observed in this study, having the ADIME format incorporated into the platform in My Nephrology led to less frequent use of the no nutrition diagnosis than in Renal Insight. However, the drop-down option or prompts did not have an impact on the utilization of the B/E domain, with it being used equally across both programs. Utilizing implementation processes like the PARiHS framework has been shown to mitigate challenges related to documentation burdens, and is considered advantageous for guiding education [103].

There is a growing body of evidence highlighting that it is crucial that RDs understand and assess the SDoH. Zamora et al. (2022) shared that some countries such as Australia are focusing on SDoH as a key competency to ensure all RDs can "recognize multi-factorial and interconnected determinants influencing nutrition and health" [113]. They also explored the competency of the SDoH among RDs practicing in the United States and shared that there is a need for continued education to increase understanding and uptake of the SDoH [113]. Additional translation and application of the SDoH are required, especially from other health programs, including nursing and social work. RDs knowledge of the SDoH is crucial given their role in advocacy for patients to address food insecurity [114]. The knowledge base of RDs begins at the postsecondary level with further experience over their practicum program. Interestingly, similar gaps in knowledge were found when RDs were surveyed about their understanding of the determinants of food-security [114]. Further evidence-based research should be conducted in the field of dietetics to better understand how the SDoH can be incorporated into dietetics curriculum and in continued education programs for RDs. This approach can support RDs addressing the SDoH, in collaboration with members the interprofessional team [113].

The NCPT B/E domain creates standardized language for the SDoH that are related to nutrition and that a RD can play a role in developing an intervention to treat or mitigate [83]. With the integration of this into the documentation software, as we saw with the My Nephrology platform, clinicians can identify and develop a plan to support patients experiencing SDoH. When the utilization of the SDoH was assessed among other practitioners, EMRs were found to be highly advantageous in conducting research and assessing SDoH diagnoses [115]. Research shows that

further development of standards for utilization of SDoH can improve documentation and coordination for interventions [115]. Nursing has recommended a screening tool to help clinicians recognize the SDoH across numerous domains and to standardize data collection, which assists with addressing health inequities through patient care [116]. RDs need to be included in the research process to help with knowledge translation, similarly RDs were included in this research to help inform how education around NCPT can be improved [113].

5.4 Strengths and Limitations

A reliable sample size of 172 medical charts was achieved during the chart audit. These medical charts are owned by patients with an average age of 64 years of age, ranging from 50-78 years of age, reflective of Tonelli et al. (2020), who identified that the average age of dialysis patients is between 45-64 years old [92]. Lui et al. (2021) found that the age of patients living with CKD is advancing, more patients experience regression of their CKD, which has a positive impact on patient care and increasing longevity [93]. Patients are being followed longer in clinics and mortality is more affected by frailty than by CKD [93]. With improved longevity, nutrition diagnoses are becoming more complex, and nutrition quality of life is a key outcome requiring ongoing assessment and attention [94].

When compiling the results of the chart audit, it would have been beneficial for there to be an additional column to identify when the ADIME format was being used. An additional option under the NCP domains, “No Domain Identified”, and then for the B/E domain to have an additional option of, “Not Applicable”. This would have helped identify if RDs are using the ADIME format and the primary investigator could have added a comment to what domain it was most similar to maintaining a clear understanding of what was included in the chart.

A limitation to the chart audit was that the primary investigator only included nine of the possible 19 B/E diagnosis in the MS Excel™ spreadsheet although, there were no comments by the primary investigator that the RD used a B/E diagnosis that was not listed. The primary investigator focused on the most frequently observed diagnoses to ensure feasibility within the

audit time frame as this was intended as a preliminary analysis with the plan to expand to all 19 in future audits.

Twenty RD's completed the questionnaire, while it was approximated that 30 RD's would receive it. With changes in email addresses, it was received by 28. Ideally 80% (n=22) of the RD's would have completed the survey, but this sample size is considered representative of this local RD population. This is a very niche practice area, and although there have been new positions in the last few years there are 16 RD positions across the province for outpatient nephrology. Although, the primary investigator included RDs who had practiced in nephrology from 2015-2023 but had retired and moved to other positions, to capture a larger sample size. Vasileiou et al. (2018) demonstrate that a sample size is justified when it meets the research design requirements and when the researcher is transparent when proposing why their sample size is small [105]. Although this was a quality assurance project, we were able to recruit a representative sample of RDs, as this is a niche area of practice with so few working in the nephrology in Nova Scotia.

The questionnaire method in general limits the information respondents can provide, especially when compared to interview or focus group methods. In this questionnaire, fixed responses are derived from close-ended questions, as respondents' choices are limited. Another limitation with this thesis and common to questionnaires is the questionnaire does not allow the primary investigator to build a rapport with the respondents. This project was slightly unique in that the primary investigator was also a participant in the study and works with many of the respondents and therefore indirectly has a rapport with the respondents. The time frame the questionnaire was circulated was an additional limitation, as this is a thesis project with a set deadline, although the questionnaire was circulated for longer than initially projected. As explained in the methods, it had to be collected over a shorter period of time than a typical questionnaire would be.

In the questionnaire it would have been beneficial to add, "select all that apply" to the question that they could choose more than one response as this question had a limited number of responses, and it is unclear if this is representative of their beliefs or if they just selected what they thought. In addition, it would have been beneficial to ask a demographic question to the

RDs, identifying which health care zone they work in to see if the sample size was representative of across the entire province or if it the participants were from one region. It would have been interesting to see if the region of practice also plays a role on the RDs responses. The questions in the questionnaire were broad and additional detailed questions would be required to see if the RDs are lacking an understanding how NCPT is applicable to their understanding of the SDoH and supporting the patient in the SDoH [117]. Since the group the questionnaire was being distributed to was small, it was agreed upon by the thesis committee that completing a face, content, and construct validation could indirectly influence the cohort answering the questions since it would be the same group of people using the tool. This is another example of why this project was classified as a quality assurance study rather than a research study. For future research this questionnaire should go through more rigorous assessment to be validated.

For future research, the questionnaire could incorporate questions addressing the RDs perspective on the education they have received. This could be a two-part question, including an open-ended part so the RDs can include pertinent information around their education [118]. Expanding this research nationally across Canada would further increase our understanding of RDs perception of NCP and NCPT. The larger sample size would allow for a more rigorous assessment of the questionnaire using face, content, and construct validity prior to its distribution. Casting the questionnaire across Canada would allow for a more comprehensive understanding of RDs perception of their use of NCP, NCPT and the B/E domain. Additionally, this can help inform job aides and how Dietitians of Canada and provincial colleagues can help improve the use of the model if the need is founded [106].

6.0 Conclusion and Significance/ Implications for Dietetic Practice

6.0 Conclusion and Significance/ Implications for Dietetic Practice

The findings of this study will inform future practice and research, which is a main goal of survey studies. The chart audit showed that NCP diagnosis terminology was used in 87.7% of the charts, with the clinical domain being used most frequently, followed by the no nutrition diagnosis, then the B/E domain and finally the intake domain. The majority of RDs, identified that they are using NCPT when charting. Eighty percent of RDs identified that they are familiar with the B/E domain but 70% identified that they use it when developing a nutrition diagnosis. When asked about the barriers to using the B/E domain, most identified that they felt uncomfortable with using a diagnosis that required other health professionals for the intervention. Some RDs identified that they felt unsure about an appropriate intervention for a B/E diagnosis, and some identified they were unfamiliar with the B/E domain terms, but one RD shared that they did not feel comfortable charting with the NCP format.

Examining the use of the NCP and NCPT, and specifically the implementation of the B/E diagnostic domains, will assist with creating recommendations for methods to improve the uptake of effective use of B/E domain diagnoses in nutrition assessment and intervention. Understanding RDs current application of the NCP and NCPT will enhance subsequent research questions, job aides and education. Job aides are tools or resources that provide concise information or instructions to help employees complete work tasks efficiently and effectively. They can include reference guides, flowcharts, or other resources (both print or digital) [119]. Findings will also help to inform the development and implementation of related, internal to NSH educational events, and will assist in the assessment of whether further implementation efforts to encourage use of the NCP and NCPT are needed. A structured on-boarding process that includes information including education and resources supporting the use of NCP and NCPT would be beneficial to RDs to ensure consistency of utilization in practice. In 2024 education modules were added to the NCP website, these could be used to support RDs understanding and utilization of NCP [120]. Furthermore, providing continuous education opportunities to RDs would be beneficial to improve the utilization and comfort with the B/E domain and the use of NCP model.

The results of this study will be integrated within Nova Scotia withing the next year. The primary investigator has been invited to present the results of this project at the provincial clinical dietitian quarterly meeting. The primary investigator is hopeful the results will help inform the on-boarding process on a provincial level to limit the barriers identified in the questionnaire.

Future research in this area would benefit in examining the demographic of individuals included in the chart audit [121]. It would give more specific information around which populations are experiencing the SDoH. An additional step to create a more inclusive study would be to screening the demographic during the random selection of charts to audit to ensure non-white race patients are also being included, which may impact racial representation [121].

The primary investigator identified that perception may not be representative of reality, as the RDs estimated using the B/E domain more frequently than was reflected in the audited chart. It is imperative that RDs have a holistic understanding of the SDoH to be able to assist in addressing them, especially in a collaborative approach [4,10]. It is important for RDs to include the SDoH in their charting, especially for patients from vulnerable populations, as this can facilitate the creation of appropriate interventions and foster enhanced collaboration within the interprofessional health care team. Understanding barriers to the effective use of B/E diagnostic domain can inform the structuring of support and training designed for RDs by managers and educators. Further studies examining RDs familiarity with the SDoH and the role it plays in patient lives are needed. Enhancing RDs' comfort with the SDoH, and consequently the B/E domain, is likely to improve the interprofessional team support provided to patients. *"…health inequities must be addressed, corrected and require a long-term commitment and more than one approach"* [122].

7.0 References

7.0 References

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8.0 Appendices

Appendix A – Behavioural/Environmental Diagnostic Domain

Knowledge and Beliefs (1)

Actual knowledge and beliefs as related, observed, or documented

- Food and Nutrition Knowledge Deficit*
- Unsupported Beliefs/Attitudes About Food or Nutrition Related Topics (use with caution)
- Not Ready for Diet/Lifestyle Change
- Self-Monitoring Deficit
- Disordered Rating Pattern
- Limited Adherence to Nutrition Related Recommendations
- Undesirable Food Choices

Physical Activity and Function (2)

Actual physical activity, self-care, and quality of life problems as reported, observed, or documented

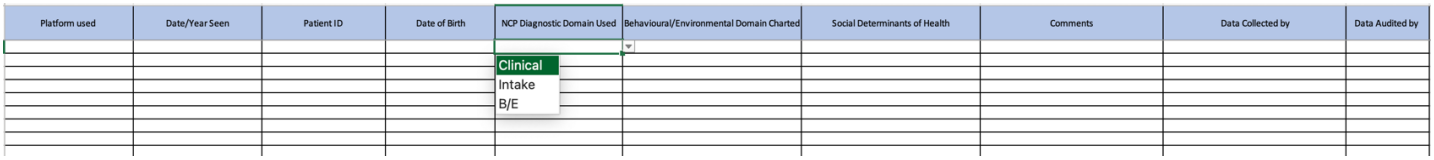
- Physical Inactivity
- Excessive Physical Activity
- Inability to Manage Self Care
- Impaired Ability to Prepare Foods/Meals
- Poor Nutrition Quality of Life
- Self-Feeding Difficulty

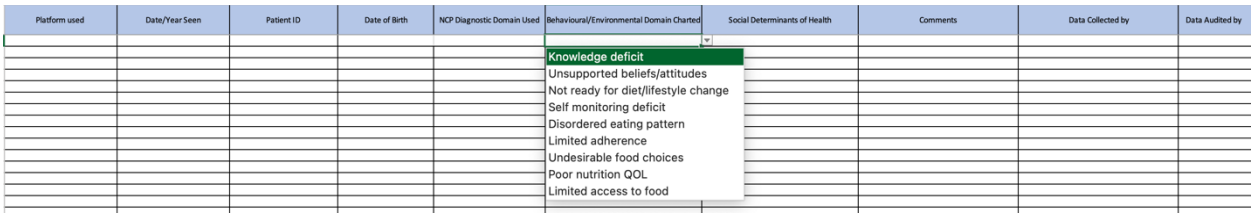
Food Safety and Access (3)

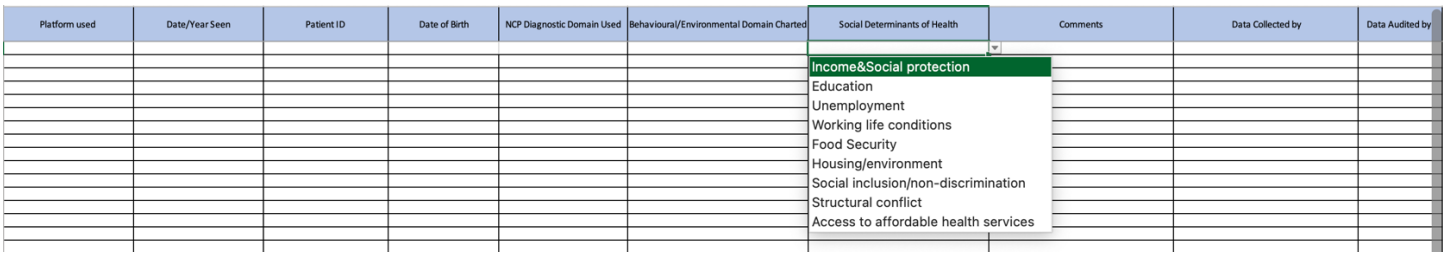
Actual problems with food safety or access to food, water, or nutrition related supplies

- Intake of Unsafe Food
- Limited Access to Food
- Limited Access to Nutrition Related Supplies
- Limited Access to Potable Water

Appendix B – Chart Audit Tables







Appendix C - Process for Data Collection

Renal Insight * Organize layout using “Medical Record #”

1. Top centre of page select the following:
   Modality: Hemodialysis In-Centre (Randomly select 35 patients)
   Grouping: All
   Institute: All

   Modality: CCPD (Randomly select 20 patients)
   Grouping: All
   Institute: All

   Modality: Pre-Dialysis (Randomly select 35 patients)
   Grouping: All
   Institute: All

   Modality: CAPD Home (Randomly Select 20 patients)
   Grouping: All
   Institute: All

2. Screen patient: Click on the “music note”/progress note, click the down arrow by Discipline, confirm Dietitian is listed.
   - When patient has been selected, add to excel spread sheet list more then
   - *Confirm patient encounter is not the same from My Nephrology

3. To see all notes in InSight click down arrow for Period and click “All”.

4. Randomize patients in an excel spreadsheet and pick 86 to include.

5. Using Chart Audit Table add patient using randomized number.

Chart Audit Table:

Renal Insight			
Pt ID	MRN	Name	Modality

My Nephrology

1. Once opened from link

2. Click “Search by Modality”
   Modality: Predialysis (Randomly select 35 patients)
   Location: Clinic
   Care Provider: Leave as “Please Select”

   Modality: Hemodialysis (Randomly select 20 patients)
   Location: In Center Unit * NO PEI
   Care Provider: Leave as “Please Select”

   Modality: Hemodialysis (Randomly select 20 patients)
   Location: Satellite Clinic
   Care Provider: Leave as “Please Select”

   Modality: Peritoneal Dialysis (Randomly select 35 patients)
   Location: Patients Home
   Care Provider: Leave as “Please Select”

3. Screen patient:
   a. Randomly select patients name – cross reference Renal Insight random selection to prevent selecting the same patient based on MRN.
   b. On left hand side of screen click “Nutrition Consults” (Under Ancillary Information)
   c. If patient has an encounter choose any of the consults by clicking “More…”

4. Randomize patients in an excel spreadsheet and pick 86 to include.

5. Using Chart Audit Table add patient using randomized number

Chart Audit Table:

My Nephrology			
Pt ID	MRN	Name	Modality

Appendix D – Questionnaire

Questionnaire

Dietetic Charting and the Effects the Social Determinant of Health
This survey is part of a research project called "Exploring renal nutrition intervention effectiveness in addressing nutritional diagnoses in the behavioural and environmental domain: Striking a balance between clinical outcomes and social determinants of health".
Through this survey we are looking to collect information on renal dietitians charting processes. You will be asked questions about your current practice and perceived barriers.
Before you complete this survey, please read the following paragraphs about consent. Please reach out to our research coordinator if you have any questions, at **msvu.ca or msvu.ca.**

Consent Form

Voluntary Participation:
Your participation in this questionnaire is strictly voluntary. You can stop participating at any time by closing your internet browser. Starting the questionnaire will represent consent to participate.

Confidentiality:
All information you provide during this study is confidential and anonymous. Your answers to this questionnaire will be protected and we will not collect or store identifying information, such as your name, email address or IP address. Responses will only become available to the research team once you click on the "submit" button. The collected data will be stored on a password protected hard drive on Mount Saint Vincent University server for five years, after which the data will be destroyed. Note that, once submitted, you will not be able to withdraw the data, because it is anonymous and cannot be linked back to a unique user, and what you have completed will be included in study.
Only the research team will have access to study data. The de-identified research data may be published in scientific journals, presented at scientific conferences, used for other analysis related to the project or to develop new projects. Your confidentiality will be protected to the extent permitted by the applicable laws.

Potential benefits and risks of the study:
There are no direct benefits to you as a participant. Perhaps a gift card to be given to participants? The questionnaire finding may support further education to support dietitians in this field, which can have a positive impact on patient outcomes. Potential risk associated with the questionnaire is possible discomfort with answering some questions. You may refuse to answer or skip any question.

Participant's Rights:
Consenting to participate in this questionnaire indicates that you have agreed to take part in this research and for your responses to be used. In no way does this waive your legal rights nor release the investigator(s), sponsors, or involved institution(s) from their legal and professional responsibilities.
This information will only be used for this research and will not be share for any other uses.
Your participation is greatly appreciated.
If you have any questions at any time during or after the study about the research you may reach out to Primary investigator, Laura Gosine, at .

Research Team Members:
Laura Gosine - Primary Investigator
Dr. Shannan Grant - Thesis Supervisor
Dr. Karthik Tennankore - Committee Member
Dr Sarah Hewko - Committee Member
Dr Jennifer Brenton-Peters - Committee Member

Glossary/Keywords:
ADIME - An acronym for a form of medical charting; Assessment, Diagnosis, Intervention, Monitoring and Evaluation.
NCP - Nutrition Care Process - designed to improve the consistency and quality of nutrition care. Includes specific terminology to used
Behavioural/Environmental - A sub-domain of NCP diagnostic charting. Includes terminology addressing nutritional findings and/or problems identified that relate to knowledge, attitudes/beliefs, physical environment, access to food, or safety. Please see chart below for all terms included.

Do you follow ADIME formatting when charting?

○ Yes ○ No

reset

Do you utilize NCP terminology when charting?

○ Yes ○ No

reset

How effective do you believe NCP charting is in:

	Not at all effective	Low effectiveness	Slightly effective	Neutral	Moderately effective	Very effective	Extremely effective
Patient care outcomes	○	○	○	○	○	○	○
Communication between dietitians	○	○	○	○	○	○	○

reset

reset

Please respond to the following statements regarding nutrition diagnosis:

	Never	Rarely	Sometimes	Often	Always
By the time I follow-up with a patient the problem statement is typically resolved or addressed.	○	○	○	○	○
I continue to address the most recent nutrition diagnosis and respective intervention I identified.	○	○	○	○	○

reset

reset

Does your planned intervention directly target the problems you identified in the:

	Yes	No	
Diagnosis	○	○	reset
The etiology	○	○	reset
The signs and symptoms	○	○	reset

Are you familiar with the B/E domain diagnostic terminology?

○ Yes ○ No

reset

When creating a nutritional diagnosis, do you use the behavioural/environmental domain terminology in your nutritional diagnosis?

○ Yes ○ No

reset

What are some barriers to you using NCP behavioral/environmental diagnostic domains in your charting?

- ☐ Unfamiliar with how to write an NCP diagnosis
- ☐ Unfamiliar with the B/E terms
- ☐ Unsure of appropriate intervention for diagnosis
- ☐ Do not feel comfortable with diagnoses requiring interventions by other health professionals
- ☐ Do not feel comfortable with charting using the NCP format

Submit