Self-perceived competence of third-year nursing students in providing nutrition care to patients.

A Thesis presented in partial fulfilment of the requirements for the degree of

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Abstract

Aim: To assess the self-perceived competence of undergraduate nursing students in providing nutrition care in clinical practice.

Background: Nurses are uniquely positioned to manage patients' primary nutrition care needs across diverse work settings. As the largest group of health professionals, they are essential in nutrition-related chronic disease prevention. Although it is assumed that nutrition care is integrated into nurses' knowledge and clinical skill sets before entering professional practice, the sufficiency of nutrition education within the nursing curricula has yet to be discovered. This study aimed to investigate nursing students' nutrition competence in delivering nutrition care.

Design: Cross-sectional

Settings: Online survey

Participants: All students enrolled in the third year of a Bachelor of Nursing were invited to complete a sociodemographic questionnaire and the validated NUTrition COMPetence tool.

Methods: Competence was assessed across four constructs: confidence in knowledge about nutrition and chronic disease, confidence in nutrition skills, confidence in communication and counselling about nutrition, and attitudes towards nutrition care. A 5-point Likert scale was used to rate confidence for all construct items. Scores for each construct were summed to provide a maximum score of 175. Pearson Chi-squared tests were used to identify associations between the responses.

Results: 108 third-year nursing students completed the survey and reported moderate nutrition competence (114 ± 18.5 out of 175, 65%). Students demonstrated moderate confidence in nutrition knowledge (20.50 ± 4.26 out of 35, 59%), skills (33.47 ± 8.66 out of 55, 61%), counselling and communication (29.43 ± 4.67 out of 45, 65%), and positive attitudes toward nutrition (31.04 ± 6.48 out of 40, 78%).

Conclusions: Although most student nurses had positive attitudes towards nutrition care, they reported low to moderate confidence in their nutrition knowledge, skills, and counselling. This suggests a need for increased nutrition content in the nursing curriculum.

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List of abbreviations

Abbreviation or symbol	Definition
BMI	Body Mass Index
CVD	Cardiovascular disease
DHQ	Dietary habits questionnaire
EAG	Eating and activity guidelines
FBGD-SA	Food-based dietary guidelines South Africa
GP	General Practitioner
HCP	Health care practitioner
MDT	Multi-disciplinary team
MOH	Ministry of Health
NUTCOMP	NUTrition COMPetence
NZ	New Zealand
USA	United States America

USDA-FGP	United states department of agriculture food guide pyramid
X^2	Chi-squared test
±	Plus-minus

Chapter 1: Introduction

1.1 Diet is the major risk factor for chronic diseases.

Diet is the major risk factor for chronic disease prevention and mortality. Notably, according to the 2019 Global Burden of Disease Study, (Institution of Health Metrics and Evaluation [IHME], 2020). Poor nutrition increases the risk of mortality from chronic diseases, such as cardiovascular diseases (CVDs), stroke, type 2 diabetes, and cancers (Bednarczuk & Czekajlo-Kozlowska, 2019; Forouzanfar et al., 2016; Ní Chonaill et al., 2022). Four key modifiable risk factors, unhealthy diet, physical inactivity, tobacco use, and harmful consumption of alcohol, have shown strong links with increased risk of chronic diseases (Beaglehole et al., 2011; World Health Organization, 2011). Four primary diet-related risk factors associated with chronic diseases are salt intake, obesity, raised blood pressure, and increased blood glucose (Global Burden of Disease Collaborative Network, 2020).

1.2 The role of nutrition in chronic disease prevention

Dietary interventions can prevent or reduce chronic diseases (Slawson et al., 2013). This is important because, in New Zealand (NZ), the prevalence of chronic diseases poses a significant and increasing social and economic strain on healthcare systems and society (Hogan S & Song Z, 2022; Ní Chonaill et al., 2022). Cancer and CVD are the leading causes of death, with the highest proportion attributed to ischaemic heart disease, accounting for over half of all cardiovascular disease mortality (Barnes et al., 2022; Dai et al., 2022; Ministry of Health, 2021c). Various studies have shown that nutritional interventions can prevent and reduce the onset of chronic diseases such as type 2 diabetes mellitus and CVD (Ley et al., 2014; Li et al., 2015).

1.3 Nutrition care -the role of health professionals

Nutrition care is an essential aspect of health care practice that aims to improve the dietary behaviours of a patient by applying nutrition knowledge in practice to support patients in managing and preventing chronic diseases (Ball & Leveritt, 2015; Crowley et al., 2019). Ensuring that patients and clients receive appropriate nutrition is crucial for improving healthy eating habits and subsequent health outcomes (Xu, Parker, et al., 2017). It is essential that all healthcare professionals, such as nurses, medical staff and speech and language therapists, can provide adequate nutrition care (Hickman et al., 2015), feel confident to provide nutrition

counselling and recognise when to refer a patient to a dietitian (Ní Chonaill et al., 2022). Nutrition care includes nutrition screening, assessment, planning, evaluating, and monitoring the delivery of evidence-based nutrition care (McClinchy et al., 2015).

1.3.1 Dietitians

Dietitians apply evidence-based knowledge in food and nourishment to promote overall health in individuals and communities in a state of well-being and disease (Howatson et al., 2015) by identifying nutrition problems and assessing a person's nutritional status. Dietitians evaluate an individual's dietary habits and health status to identify risk factors or existing conditions related to chronic diseases (Miriam Theilla et al., 2016; Tappenden et al., 2013; Yalcin et al., 2013). Dietitians then provide counselling and education to encourage patients to make dietary modifications to manage or prevent chronic diseases (Miriam Theilla et al., 2016; Tappenden et al., 2013; Yalcin et al., 2013). For example, they are educating patients with chronic diseases on the importance of balanced nutrition and how food choices impact the development and progression of chronic diseases. Additionally, dietitians customise meal plans and diet prescriptions specific to the needs and medical conditions of patients with chronic diseases, which factor in calorie intake, nutrient balance, and nutrient restrictions to support optimal health (Miriam Theilla et al., 2016; Tappenden et al., 2013; Yalcin et al., 2013). Dietitians regularly monitor patients' progress and adjust the dietary plan where necessary to achieve optimal health outcomes.

Furthermore, dietitians work closely with other healthcare professionals, such as nurses, to create treatment plans for patients with chronic diseases. However, the growing needs of an ageing population and an increased risk of chronic diseases pose challenges due to the limited availability of dietitians and nutritionists (Xu, Parker, et al., 2017). This demonstrates the importance of nurses' role in supporting nutrition among patients with chronic diseases as nurses provide around-the-clock patient care.

1.3.2 The role of nurses in supporting nutrition

Nutrition should be regarded as an essential aspect of patients' fundamental care needs and should be addressed by nurses (Keaver et al., 2018). Nurses have a critical multidisciplinary role as they have the most contact with patients. Nurses often assume the responsibility of nutrition counsellors by conducting nutrition screening, referrals, and providing nutrition

advice to patients, recommendations for diet adjustments and particular diet modifications (Lin et al., 2014; Sargent et al., 2012; Xu, Hall, et al., 2017; Xu, Parker, et al., 2017; Yuste et al., 2021). Nurses have a significant role in administering nutrition prescriptions, for example, oral nutrition supplements and enteral feeding (Boullata et al., 2017). Nurses are also responsible for determining the patient's nutritional status, recognising health changes, identifying nutrition symptoms such as bowels, nausea, and vomiting, detecting potential problems and informing the nutritional support team as required (Döngel et al., 2022). Thus, nurses need the expertise and responsibility to meet patients' dietary needs. Providing nutrition screening and appropriate nutrition advice is essential to improve healthy eating and subsequent health outcomes (Xu, Hall, et al., 2017).

Nurses are responsible for providing essential elements of care, including nutrition, hydration, ensuring sufficient access to nourishment and fluids, and bladder and bowel care to meet patients' fundamental needs. Additionally, nurses are expected to base their practice on the best available evidence and give special consideration to promoting well-being and preventing illness. However, primary, and secondary care nurses often lack sufficient knowledge of nutrition education and their pivotal role in identifying risk factors to improve patients' health outcomes (DiMaria-Ghalili et al., 2014; Murphy et al., 2017). Given the growing connection between diet and diseases, it is recommended that nurses receive nutritional training to ensure they provide accurate information to patients and clients on nutrition-related matters (DiMaria-Ghalili et al., 2014).

The delivery of fundamental care in healthcare practice is receiving increasing attention (Richards et al., 2018; Zwakhalen et al., 2018). The International Learning Collaborative, an organisation established to explore the reasons behind the inadequate provision of fundamental care in healthcare systems, has confirmed that primary care is still inconsistent. In complex healthcare environments, the essentials of care can be neglected due to the pressing demands of acute care, resulting in patients needing to be noticed and nurses feeling reluctant to voice their concerns (Feo & Kitson, 2016; Kitson et al., 2013). Thus, when nursing treatment is inadequate, patients have a negative experience in the healthcare field (Richards et al., 2018; Suhonen et al., 2005). Failure to ensure the quality of nursing care causes patient distress, dissatisfaction, and impacts patient safety. International research has emphasised the frequency and potentially fatal implications of impoverished nursing care (Garling, 2009; Kalisch, 2006).

The deprivation or incomplete nursing care has been recognised as a significant documented link between nurse staffing levels and patient outcomes, including mortality (Aiken et al., 2014; Ball et al., 2014).

1.4 Need for nurses to have improved nutritional knowledge.

Even though nurses are expected to provide nutrition counselling to patients with chronic diseases (Vasiloglou et al., 2019), research has demonstrated a need for more competency in providing nutrition advice among nurses (Keaver et al., 2018). Among the five significant barriers to proper nutritional care in hospitals is the need for nutritional education and knowledge (Thoresen et al., 2008). It is reported that this is due to nurses needing to be trained in the (Chao et al., 2020). To optimise patient care, nurses must have adequate nutritional knowledge (Ní Chonaill et al., 2022)). Lack of nutritional knowledge is the most common cause of insufficient nutritional practice (Nurdan, 2013). The undergraduate curricula of nursing students should include sufficient nutrition education (Parker et al., 2011). Nursing students are not developing the professional skills necessary to provide nutrition care to patients within their undergraduate education. For example, various NZ (Chepulis & Mearns, 2015; Laing et al., 2022) and international studies have found that nurses do not have adequate nutrition knowledge (Bakre et al., 2012; Buxton & Davies, 2013; Miriam Theilla et al., 2016; Mowe et al., 2008; Ní Chonaill et al., 2022; Parker et al., 2011).

1.5 Need for nutrition competence of nurses to deliver nutrition care.

Considering the correlation between diet and disease, it is crucial to enhance the nutrition competence of nurses to deliver adequate nutrition care. Providing accurate information to patients on nutrition issues related to chronic diseases is essential (DiMaria-Ghalili et al., 2014). Due to this requirement, nurses should be aware of their role in providing nutritional support to patients and clients with chronic diseases. Emphasising interprofessional and collaborative work can lead to improved health outcomes for patients. Raising awareness about the significance of multidisciplinary nutritional care is essential for enhancing health outcomes in primary and secondary care settings. In this context, offering nutritional training becomes highly recommended. These training programs should cover nutrition fundamentals and the latest emerging nutritional knowledge. By participating in such training, nurses and other healthcare professionals can deliver evidence-based care that meets their patients' dietary needs more effectively.

The extent of competence among primary health professionals in providing nutrition care remains to be determined in NZ. Some primary health professionals, such as General Practitioners (GPs), dietitians, and nurses, have shown the ability to achieve modest improvements in patients' dietary behaviours and chronic disease management through the nutrition care (Andrews et al., 2011; Ash et al., 2003; Ball et al., 2013). However, a recent meta-analysis of behavioural weight management therapies carried out by primary healthcare providers (such as doctors, practise nurses, dietitians, and nutritionists) raises concerns that the long-term effects may be insignificant due to the incompetence of healthcare providers. (Ball & Leveritt, 2015; Booth et al., 2014). It is crucial to understand the competence of primary health professionals in providing nutrition care and identify factors that contribute to safe and effective practices to promote best-practice healthcare. Consequently, further research is needed to investigate the competence of primary health professionals in delivering nutrition care.

1.6 Measuring nurse's nutrition competence

Assessing the competence of primary health professionals in delivering nutrition care is significantly challenging. The NUTCOMP tool indirectly measures competence and considers the variations in customary healthcare practices among different professional groups. Self-perceived competence is acknowledged as a valid indicator of competence in healthcare professionals, particularly when the specific domains under investigation are clearly defined for instance, the domains of competence in nutrition care encompass nutrition knowledge, skills in providing nutrition care, and attitudes toward delivering nutrition care (Ball & Leveritt, 2015; Davis et al., 2006).

Consequently, researchers developed the NUTrition COMPetence (NUTCOMP) tool, a reliable and validated questionnaire. This tool aims to measure primary healthcare professionals' self-perceived competence in delivering nutrition care to patients with chronic diseases (Ball & Leveritt, 2015). By utilising this tool, investigations can be conducted to assess the competence of primary health professionals in providing nutrition care, ultimately supporting the promotion of safe and effective practices.

1.7 Aim

This study assesses third-year nursing students' knowledge, skills, attitudes, communication, and counselling towards nutrition care in clinical practice.

1.7.1 Objectives

1. To engage 3rd-year student nurses from Massey, Albany, Palmerston North, and Wellington campuses to complete an online NUTCOMP survey and demographic questionnaire.
2. This study assesses third-year nursing students' knowledge, skills, attitudes, communication, and counselling towards nutrition care in clinical practice.
3. To identify areas of improvement for nutrition care within the curriculum for nursing training.

1.8 Thesis Structure

This thesis is divided into four chapters. Chapter One is an introduction to the background of the study. It indicates the aim, objectives, and researchers' contributions. Chapter two is a literature review of the most up-to-date and relevant research on nurses' nutritional knowledge, skills, communication and counselling, and attitudes towards nutrition care. Chapter three is the research manuscript, which includes the abstract, introduction, methods, results, and discussions of findings. The final chapter is chapter four, the concluding chapter that states how the aim and objectives have been acknowledged and the impact the research has on the importance of understanding nurses' nutritional knowledge, skills, communication and counselling abilities, attitudes towards nutrition care, and future research recommendations. The appendices include the NUTCOMP-validated questionnaire, the participant information sheet, and the recruitment advert.

1.9 Researcher Contributions

Table 1.1

Summary of researcher's contributions to the thesis

Author	Contributions to thesis
Dominique Heath **MSc Nutrition and Dietetics Student**	The primary author of the thesis reviewed the literature, collected, and analysed the data, interpreted the results, produced the manuscript and the conclusions
Professor Carol Wham **Primary Academic Supervisor**	Academic Supervisor revised and approved all thesis chapters and the manuscript
Dr Claire Minton **Co-Supervisor**	Co-Supervisor revised and approved all chapters and the manuscript
Dr Karen Mumme Statistician	Statistical guidance and SPSS support

Chapter 2: Literature Review

2.1 Health and Chronic Disease Risk of New Zealanders

Chronic diseases are the largest health challenges in the world (Coad & Pedley, 2020). In NZ, the prevalence of chronic disease is high. It poses a significant and increasing social and economic strain on healthcare systems and society (Hogan S & Song Z, 2022). In NZ, chronic diseases continue to be the cause of more than 85% of deaths each year, dominating the mortality spectrum (Tobias et al., 2006). In 2019, the leading causes of death in NZ were cancer and CVD (ischaemic heart disease and cerebrovascular disease), with the highest proportion attributed to ischaemic heart disease accounting for over half of cardiovascular disease mortality ((Buxton & Davies, 2013; Ministry of Health, 2021a). However, cancer remains the leading cause of mortality in NZ; approximately 25,000 people are diagnosed, and around 9,000 die from cancer each year (Ministry of Health, 2021b). The prevalence of a stroke was 1.5%, estimated to be 63,000 adults (Ministry of Health, 2021c). In 2021/22, the prevalence of ischaemic heart disease in NZ was 4.6%, estimated to be 190,000 adults (Ministry of Health, 2021c). Modifiable risk factors include smoking, lack of physical activity, overweight, high blood pressure, high cholesterol, diabetes mellitus and unhealthy diet (Adams et al., 2019; Ng et al., 2020). For example, an unhealthy diet is generally high in refined sugar, salt, saturated and trans fats, and low in fruits, vegetables (including legumes, whole grain cereals, and nuts), low-fat dairy products, and unsaturated fats from plant oils and seafood (Iriti et al., 2020). Thus, nutrition is critical in treating and preventing chronic diseases (Bold et al., 2020; Calder, 2020; Schaller & James, 2005; Warber et al., 2000).

2.2 Diet as a Risk Factor

Nutrition is suspected to play a role in about 9000 (or 40%) deaths each year (Ministry of Health, 2021a). This number accounts for 85% of deaths from ischaemic heart disease, 70% of deaths from stroke and 6% from certain types of cancers associated with the combined effects of nutrition-related risks attributable to higher than optimal body mass index (BMI) and inadequate intake of fruits and vegetables (Ministry of Health, 2021a). As a result, risk factors related to nutrition rank among the top causes of early mortality in the NZ (Ministry of Health,

2021a), highlighting the significant role nutrition plays in managing, preventing, and treating chronic diseases.

In NZ, an unhealthy diet is considered one of the leading risk factors for chronic disease (Cammock et al., 2021). According to a study conducted in 195 countries, nutrition is an important health determinant and a critical factor in preventing chronic disease (Murray, 2019; Vasiloglou et al., 2019). Nutritional interventions are responsible for lowering dietary risk factors (Bold et al., 2020; Calder, 2020; Chao et al., 2020). For example, strong evidence points to a protective effect of fruit and vegetable consumption on cancer and cardiovascular disease prevention (Tobias et al., 2006). Fruit and vegetable consumption has been shown to protect against ischaemic heart disease and stroke in large prospective cohort studies conducted in the United States of America (USA). Fruits and vegetables are rich in vitamins, minerals, and phytochemicals responsible for their protective properties (Tobias et al., 2006). A United Kingdom study found that four of the six dietary risk factors for chronic diseases—salt intake, obesity, high blood pressure, and high blood sugar—are directly influenced by nutrition, highlighting the importance of nutrition intervention in chronic disease prevention (Kontis et al., 2014). Thus, healthy eating and drinking habits aid in maintaining good health and preventing chronic diseases such as CVD, obesity, and some cancers (Forouzanfar et al., 2016). Nutritional status, nutrient intake, and health conditions are all correlated with dietary practices. High intakes of certain foods or food components are risk factors for developing chronic diseases (Ministry of Health, 2022).

Previous research has mainly focused on the direct associations between macronutrients and chronic diseases Si(Nielsen & Joensson, 2008; Santesso et al., 2012). For example, the consumption of excess carbohydrates can impact the onset of type 2 diabetes by affecting the levels of blood glucose and insulin (Mann & McAuley, 2007). However, emerging research shows a correlation between dietary patterns as a whole and chronic disease as well as (Xu et al., 2016; Xu et al., 2015; Xu, Hall, et al., 2017). For example, the modifiable risk factor systolic blood pressure is a primary marker of salt intake, and total blood cholesterol is a marker of saturated fat intake (Ministry of Health and the University of Auckland, 2003; Stefanogiannis et al., 2005). The analyses of the Burden of Disease projections for 1997-2011(Ministry of Health and the University of Auckland, 2003; Stefanogiannis et al., 2005) demonstrate the significant impact minor modifications in diet-related factors can have on the prevalence of

chronic disease (Ministry of Health and the University of Auckland, 2003; Stefanogiannis et al., 2005). Dietary patterns such as the Mediterranean and DASH diets have been recognised as models of healthy eating for their contribution to good health, with potential benefits for cancer mortality and CVD (Ndanuko et al., 2016; Onvani et al., 2015; Sofi et al., 2008).

In NZ, obesity is the most modifiable risk factor influencing poor health outcomes and reduced quality of life (Ministry of Health, 2015). In 2020/21, one in three NZ adults (34.4%) were obese, up from 31.2% in 2019/20. This is estimated to be approximately 1.5 million NZs (1.4 million adults and 100,000 children) (Ministry of Health, 2021a). Obesity is a key risk factor for chronic diseases such as ischaemic heart disease, ischaemic stroke, and cancer (Ministry of Health, 2015). Diets high in discretionary foods are among the dietary risk factors for obesity and chronic diseases (i.e., energy-dense, nutrient-poor foods high in saturated fat, added sugars and sodium) (Partridge et al., 2020). In NZ, the prevalence of obesity and dietary habits are influenced by food retail environments (Partridge et al., 2020). Thus, the potential causes of the recent increase in obesity in NZ are complex, but it is primarily attributed to the increasingly obesogenic environment (Mackay et al., 2018; Swinburn, 2008). Over the last three decades, there has been a significant increase in the availability and promotion of cheap, energy-dense, nutrient-poor foods and decreased physical activity levels (Ministry of Health, 2015). Healthcare providers must have the knowledge and skills to treat the rising prevalence of obesity and obesity-related morbidity in developing countries (Van den Berg et al., 2012).

2.3 Dietary Habits of the NZ Population

To better understand the NZ population's dietary patterns, a Dietary Habits Questionnaire (DHQ) was developed as a part of the NZ Health Survey in 2018/19 and 2019/20 (Ministry of Health, 2022). According to this study, some NZ adults eating and drinking habits align with the Eating and Activity Guidelines (EAG) for NZ Adults based on scientific research (Ministry of Health, 2022). However, the analysis revealed that some populations were over-represented in less healthy dietary patterns and under-represented in healthy eating habits. In general, females reported having healthier eating habits than men, such as eating the recommended servings of fruits and vegetables, reducing their intake of processed and red meat, removing the fat from red meat, and increasing their consumption of lean meat.

Fruit and vegetable consumption is essential for the prevention of chronic disease; it decreases the risk of developing some cancers, CVD, and obesity. The Ministry of Health (MOH) EAGs recommend at least three servings of vegetables and two servings of fruit daily, with only two-thirds of adults consuming three or more servings of vegetables daily and just under half consuming two or more servings of fruit daily, NZ consumption of fruits and vegetables is currently insufficient (Ministry of Health, 2020; Tobias et al., 2006). The EAGs advise adults to consume less processed meat. Consuming processed meat raises saturated fat and salt intake and is associated with a higher risk of colorectal cancer. According to these findings, almost half of all women (48.2%) and men (48.4%) ate processed meat once or twice a week (Ministry of Health, 2022). Red meat should be consumed at most three times per week, according to the EAGs. High red meat consumption has been linked to an increased risk of heart disease. Over half of adults ate above this guideline (Ministry of Health, 2022). Those who consume red meat were asked how frequently they removed excess fat from red meat before cooking or eating it. The EAGs recommend choosing meat with little visible fat or removing it before cooking it. Meat fat contains saturated fat and eating it has been linked to an increased risk of cardiovascular disease. Women (44.5%) consumed less meat fat than men (58.4%) among those who ate red meat (Ministry of Health, 2022).

Seafood contains iodine, and some fish (oily fish such as salmon, tuna, and mackerel) contain omega-3 fatty acids, which have been linked to a lower risk of heart disease and stroke. Almost three-quarters of NZ adults consume seafood at least once per week, which aligns with the EAGs that recommend consuming some seafood (Ministry of Health, 2022). Additionally, females drank less cordial, fruit juice, and sugar-sweetened beverages, linked to obesity and the risk of developing chronic disease (Ministry of Health, 2022). These dietary habits suggest that for chronic disease prevention, we need to increase fruit and vegetable consumption to 5+ a day, decrease processed meat intake, limit red meat to less than 500g per week, and trim the fat from all meat before consumption. Increase consumption of seafood. Decrease the intake of sugar-sweetened beverages, and make water the first drink of choice (Ministry of Health, 2022).

2.4 Role of Health Professionals in the Management of Chronic Diseases

In managing chronic diseases, the health care professionals' various roles of a Multi-Disciplinary Team (MDT) are required to manage and treat chronic diseases through nutrition

intervention. An MDT's primary duty is to assemble a team of medical experts from various specialities to decide on the best course of treatment for patients (Taberna et al., 2020). Generally, a part of the MDT in NZ hospitals for treating chronic diseases are dietitians, general practitioners (GP), nurses and other allied healthcare professionals (Beckingsale et al., 2016; National Collaborating Centre for Acute Care, 2006). An MDT seeks to provide client-centred, coordinated care and support to populations with healthcare needs.

The dietitian is responsible for implementing the most current evidence-based nutrition interventions based on food composition, psychological and physiological factors that impact dietary choices, and their relationship with developing and treating chronic diseases (Vasiloglou et al., 2019). Due to their expertise in nutrition, dietitians play an essential role in the management of chronic diseases. Food and nutrition are crucial for managing and preventing chronic diseases such as stroke and cardiovascular disease (Beckingsale et al., 2016). Dietitians have specialised nutrition counselling skills for eliciting behaviour change and are competent in the health promotion (Beckingsale et al., 2016). As a part of the multidisciplinary team, the primary responsibility of a dietitian is to provide nutrition education and transform new nutritional knowledge into applicable food skills for a patient or client. Education, revision, and reinforcement are crucial to dietetic interventions within this practitioner-client relationship to help achieve and sustain changes in patients' behaviours. Improving their self-management might help them reduce chronic disease complications (Cant, 2010). Depending on the patient's unique characteristics and illness, the dietitian is responsible for determining the administration route for nutrition support, which may involve oral, enteral, or parenteral nutrition support (National Collaborating Centre for Acute Care, 2006). A dietitian's role is to provide a thorough nutrition assessment and a nutrition prescription by determining the caloric requirements of the patient and the route of nutrition administration. A dietitian prescribes the appropriate feeding regime and monitors the tolerance (Cook et al., 2022). The management of nutrition-related conditions and their comorbidities is successful with dietetic intervention.

The general practitioner's role in treating chronic disease in NZ is essential because they refer patients to dietitians for ongoing nutrition input (Beckingsale et al., 2016). General practice is a form of comprehensive primary care that is individualised, focused on the needs of the patient's family and community, continues over time, and is proactive and reactive. In this

regard, nutrition care is pertinent to every aspect of medical care that general practitioners (GPs) offer, and it plays a significant role in affecting patients' health outcomes. GPs are essential in chronic disease prevention and management in NZ. Depending on the diagnosis, GPs must be able to identify nutritional risk factors to refer a patient to further nutritional input from a dietitian (Crowley, 2015). A GP is a primary healthcare practitioner who is the first line of treatment for the prevention of chronic diseases.

In nutrition care, a nurse's role is equally as important as a dietitian's and a GP's. However, the range of practice for NZ nurses vary depending on their level of nursing education. For instance, the registered nurse's scope of practise states, "Registered nurses use nursing knowledge and complex nursing judgement to assess patient needs, deliver care, counselling and assist patients in managing their health (Nursing and Midwifery Council, 2015). In addition to providing interventions that necessitate a significant amount of scientific and professional knowledge, expertise, and decision-making, they also provide comprehensive assessments to develop, implement, and evaluate an integrated healthcare plan. This occurs in various contexts in collaboration with people, families, Whānau, and communities (Ministry of Health, 2017; Nursing and Midwifery Council, 2015). Research indicates that patients benefit from positive health outcomes through personalised nutrition counselling and interventions implemented by a dietitian (Rüfenacht et al., 2010; Singh et al., 2008). This is paired with the significance of the nurse's role in reinforcing and directly facilitating these nutrition interventions for hospitalised patients (Vasiloglou et al., 2019). Nurses also play a significant public health role in the prevention and management of obesity and the development of dietary-related chronic diseases due to their close client contact (Blake & Harrison, 2013; Borchardt, 2000). Thus, nurses' comprehension of the importance of nutritional status may allow for earlier intervention and nutritional status improvement. Furthermore, a study suggests that nutritional outcomes may be enhanced with further collaboration between dietitians and nurses as they're both responsible for the daily providers of nutrition care (Johansen et al., 2004).

Registered nurses have an essential role in nutrition care with patients with chronic diseases, for example, keeping food, bowel and fluid charts and monitoring all nutrition-related symptoms such as nausea and vomiting (Döngel et al., 2022). Moreover, they oversee daily feeding monitoring. As a result, nurses play an essential role in nutrition administration. Oral, enteral or parental nutrition, assuring they have the correct diet code, helping to open any

packaging, assisting with feeding and drinking (Vasiloglou et al., 2019), and maintaining food charts of the patient's nutritional intake at each meal are all roles that nurses play in oral nutrition. Nurses' role in enteral and parental feeding of patients includes insertion and removal of a nasogastric tube, daily monitoring of the nasogastric tube securements, placement and sites, administering the appropriate feed (Richards, 2017), obtaining feed pumps, educating patients and families and monitoring patients' weight.

Nurses contribute significantly to chronic disease management as professionals in the MDT (Forbes & While, 2009; Halcomb et al., 2008). They demonstrate that nurses are in the best position to assess the patient's nutritional status and ensure that the proper steps are taken to optimise nutritional intake for each individual as they are the patient's primary caregiver (Fletcher & Carey, 2011). Since nurses are the largest group of health professionals (DeCola et al., 2012; Duffield et al., 2014; Polat et al., 2016), they are ideally positioned to manage and support patients' basic nutrition care needs when treating and managing chronic diseases (Volkert et al., 2019); (Chao et al., 2020). Nurses are an important part of the team that provides direct patient care and can influence positive behaviour changes that improve the effectiveness of nutritional interventions (Vasiloglou et al., 2019). Thus, nurses' understanding of the significance of nutritional status may enable earlier intervention and improve nutritional status before hospital admission. To deliver appropriate therapeutic care while a patient is hospitalised, nurses are expected to identify and manage the patient's health issues (Kim & Choue, 2009), including the management of nutrition interventions.

Nurses are expected to provide nutrition counselling to people with chronic diseases in community settings worldwide (Vasiloglou et al., 2019). However, nursing registration scopes of practice assume that nutrition care has already been included in nurses' knowledge and clinical skill set before starting professional practice (Nursing and Midwifery Council, 2015); (Ministry of Health, 2017). Competence 2.7 of the scope of practice of registered nurses states that nurses are to "Provide health education appropriate to the needs of the health consumer within a nursing framework" (Nursing Council of New Zealand, 2020). This suggests a gap between nursing students' undergraduate nutrition education and the nutrition care they are expected to apply in their clinical practice as graduates (Chao et al., 2020; Scammell, 2017). After registration, Nutrition education programmes are necessary to increase nurses' confidence and willingness to provide nutrition care (Chao et al., 2020; Vasiloglou et al., 2019).

Therefore, undergraduate curricula for nursing students should include sufficient training on lifestyle modification and efficient diet advice (Lee et al., 2017). Despite the importance of nutrition in leading a healthy lifestyle, nursing students may not be developing the professional skills necessary to provide nutrition care to patients within their undergraduate education (Parker et al., 2011). This is of particular concern because nurses' future roles would aim to assess patients' nutritional state and needs.

2.5 Nurses' Nutrition-related Knowledge, Attitudes, and Skills

In NZ, chronic diseases dominate the mortality spectrum (Pearce & Longhurst, 2021). Chronic disease prevention and treatments are more likely to succeed if nurses have a high level of nutrition literacy and can apply this knowledge (Shriver & Scott-Stiles, 2000; Zhu et al., 2011). In NZ, nurses need a strong foundation in nutrition knowledge, attitudes, and skills for providing nutrition support and managing chronic diseases (Fletcher & Carey, 2011). There is limited research in NZ that has investigated nutrition knowledge among nurses. Nurses have a significant role in the treatment and prevention of chronic diseases. They may be proficient in conducting nutrition-related treatments and tasks put in place and prescribed by dietitians, such as monitoring fluid balance, administering oral nutrition supplements, enteral and parental nutrition, keeping track of patients' food charts, and monitoring bowel motions. Therefore, nurses must have a good understanding of why specific nutrition interventions are implemented. Evidence of nurses' nutrition knowledge, skills and attitudes comes from various surveys in various countries, including NZ. For example, the self-perceived confidence in nutrition knowledge, skills, and attitudes of third-year nursing students at Auckland University in NZ was recently investigated. It highlighted a need for more nutritional education among nurses (Laing et al., 2022). Further studies have been conducted in NZ, Australia, Denmark, Sweden, Norway, South Africa, China, Turkey, Korea, Greece, and Ghana to investigate nutrition knowledge, skills, personal eating behaviours and self-perceived confidence in nutrition knowledge, attitudes and skills summarised in Table 2.1.

Table 2.1

Studies ***investigating nurses' nutrition-related knowledge, attitudes, and skills***

Authors	Country	Sample size	Variables measured	Findings	Type of study	Survey instrument
Laing et al. (2022)	NZ	68 nursing students	Self-perceived confidence in nutrition knowledge, skills, and attitudes	Students had positive attitudes towards nutritional care (mean score SD 35.2 3.4, out of 40), with 81% feeling that more nutritional education is required. Participants conveyed a moderate level of confidence in their nutritional knowledge and skills (20.2 3.4 out of 35 and 31.5 5.9 out of 50). 81% felt they would benefit from further nutrition education.	Cross-sectional survey	Validated Questionnaire
Chepulis and Mearns (2015)	NZ	160 1-4th year nursing students	Nutrition knowledge	The mean- 52.5%-nutrition knowledge scores are low. Intervention-60.5%. Even those in the intervention group have significant knowledge gaps.		Questionnaire
Mowe et al. (2008)	Nurses and doctors in Denmark,	4512	Self-reported knowledge in nutrition practice	Lack of nutrition knowledge was the most common cause of insufficient nutritional practice. 25% found it difficult to identify patients needing nutritional therapy, 39% lacked		

	Sweden, and Norway			methodologies to identify malnourished patients, 53% found it difficult to determine the patients' energy requirements, and 66% lacked national clinical nutrition recommendations. According to 28%, insufficient dietary practice can lead to difficulties and a longer hospital stay. Those who said their nutritional knowledge was good had better nutritional practices and nutrition education increased nutrition knowledge.		
Parker et al. (2011)	South Africa, Cape Town	223 practising health professionals, including 149 nurses, 61 doctors, and 13 health promoters and 199 final year nursing students, 327 final year medical students	Evaluating primary-care health professionals' and final-year students' knowledge and practices regarding the role of diet, physical activity, and smoking cessation (lifestyle modification) in the management of chronic diseases.	Amongst the health professionals 6% scored the desired nutrition score of 80% or higher, 6% scored poor and 48% had good nutrition scores. Amongst the students only 3% score the desired nutrition score or higher, 5%, 37% and 55% had scores ranging from poor to moderate to good.	Comparative, multi-centred cross sectional, descriptive quantitative study	validated by Talip et al.
Martin et al. (2014)	Australia	181 practice nurses	The approaches of nurses on the provision of nutrition care for chronic	89% of nurses had positive attitudes towards nutrition care and said it was critical to discuss nutrition with patients, 61% lacked confidence in their practices and if they were effective in	Cross-sectional	Online survey

			disease management and nutrition specific skills	enhancing patients' adherence to dietary advice. 98% said that more nutrition education will help them in their roles as nurses.		
Laing and Crowley (2021)	China, Turkey, Korea, NZ, Greece, Ghana, and South Africa	10 studies	Undergraduate nurses' nutrition knowledge and nursing students eating patterns	Nursing students don't learn enough about nutrition to become competent to give patients good nutrition care and nursing students eating and health behaviours indicated a gap in their nutrition knowledge.	Integrative review	
(Stefano et al., 2023)	International	23 studies	Nursing students	Nursing students lacked nutrition knowledge and poor nutritional self-care. Nutrition education increased the students nutrition knowledge.	Systemic review	
Lee et al. (2017)	China	40 nursing students	Nursing students nutrition knowledge and weight control methods before and after receiving an 8 hour workshop based on nutrition	Nutrition knowledge was assessed through body-related perspectives and weight-control behaviours. 7.9% of the participants were underweight, 78.9% were at a healthy weight, 7.9% were overweight, and 5.3% were obese. However, almost two-thirds of the participants were unhappy with their current body size (43.6% were only slightly unhappy; 20.5% were extremely unhappy). 50 % of the individuals thought they were either slightly (35.0%) or excessively (15.0%) overweight for their present body size. The 24 people who practised weight control frequently utilised the following	Education intervention	Questionnaire

				undesirable weight loss strategies: laxatives or diuretics (91.7%), saunas or spas (87.5%), and a one-food diet (79.2%). Additionally, the healthy weight education programme increased the participants' nutrition knowledge by 24 points, from 117 points (pre-test) to 141 points (post-test).		
Yfanti et al. (2011)	Greece	506 nursing students	Nutrition knowledge	479 people, (94.7%), correctly identified poor nutrition as a risk factor for chronic diseases. 312 people were unaware that wheat rusk has fewer calories per 30g than wheat bread. 364 students (68.4%) knew what the Mediterranean diet pyramid was. 307 (60.7%) students thought eating two eggs per day causes blood cholesterol levels to rise significantly. 331 students (65.4%) were familiar with Body Mass Index (BMI).	Descriptive cross-sectional qualitative survey	Close-type questionnaire
(Van den Berg et al., 2012)	South Africa	161 undergraduate nurses	Nutrition knowledge and eating practices.	Most participants did not consume the recommended amounts of the various food groups. For vegetables (97.5% ate 3 servings per day), fruits (42.2% ate 2 servings per day), and dairy (92.6% ate 2 servings per day), whereas 78.3% consumed 4 servings of sugar or sweets per day. Few reported daily intakes of vegetables (12.4%), fruit (23.6%), fruit juice (21.2%), or milk (15.6%), while the majority claimed daily	Descriptive cross-sectional	structured interviewer-administrated questionnaires

				consumption of margarine, oil, or fat (68.3%), sugar (59.0%), and bread (55.9%). Less than 50% of people were aware of the recommended daily recommendations for fruits, vegetables, dairy, starchy foods, and meat or meat alternatives.		
(Bakre et al., 2012)	Nigeria, Northern Ireland, United kingdom, North Dakota, Washington, & Australia	15 studies on nurses	Nutrition Knowledge	Nurses have inadequate nutrition knowledge in general additionally, in chronic diseases, older adults. Few practising nurses can attend nutrition education outside of their career. Although, nurses have favourable attitudes towards nutrition care and perceive nutrition an important part of patient care they do not prioritise it due to lack of time and nutrition knowledge. Furthermore, new graduates have a better understanding for nutrition then experienced nurses.	Meta-analysis	Questionnaire
(Buxton & Davies, 2013)	Ghana 166 nursing students 3rd-4th years Cross-sectional	166 nursing students Identify the nutritional knowledge of nursing students	Nutrition Knowledge Nutritional knowledge survey. Self-administered questionnaires not validated about nutritional knowledge	The nursing students had a below-average average score of 8.95 ± 2.01 (44.8%). The nutrition knowledge of 3.6%, 62.7%, and 33.7% of nursing students was good, adequate, and inadequate. Few students show good percentages of nutritional knowledge (3,6 % of total sample)	Cross-sectional	Self-administered questionnaire

(Ní Chonaill et al., 2022)	Ireland	94 nursing and medical students	Nutrition knowledge in the treatment and prevention of chronic diseases	Low nutrition knowledge scores ranging 22.5%-58.7%	Cross-sectional	Nutrition-related chronic disease knowledge survey

2.6 New Zealand studies

Using the NUTrition COMPetence (NUTCOMP) validated questionnaire, a study was undertaken on 89 third-year nursing students at Auckland University to identify gaps in nutrition education (Laing et al., 2022). NUTCOMP assesses self-perceived nutritional knowledge skills, attitudes, and confidence in nutrition counselling (Ball & Leveritt, 2015). The results from this study demonstrated that participants had a moderate level of confidence in their knowledge and skills in nutrition. All the participants agreed that nurses must be capable of providing basic nutritional care. For example, suppose a nurse can identify a patient's nutritional risk. In that case, they should have the confidence and skills to provide basic nutrition education until the dietitian can assess a patient.

Moreover, 81% of participants felt they would benefit from further nutrition education. In addition, the study revealed three themes concerning nutritional care: the significance of the cultural and familial context, a team approach, and proper placement in the nursing curriculum. To provide nutritional care in clinical practice, undergraduate nurses felt they needed more nutrition education (Laing et al., 2022). This study's findings point to improvements necessary for the nutritional education component of the undergraduate nursing curriculum in NZ.

Among undergraduate nursing students in the Bay of Plenty region of NZ, researchers assessed the degree of nutrition knowledge between those who received nutrition education and those who did not by evaluating their nutrition knowledge using an internal assessment survey. The decision to use an in-house survey was influenced by the absence of published and validated nutrition tools specifically designed to assess the nutrition knowledge imparted in nursing curricula (Carbone & Gibbs, 2013; Chepulis & Mearns, 2015). For this study, some participants received 8 hours of nutrition education, and others received none. Participants then completed a nutrition survey where participants answered nutrition-related questions such as how often they used nutrition labels, how well they understood health claims on food packaging and their knowledge of the major food nutrient groups (Chepulis & Mearns, 2015). The findings were compiled to identify important nutrition content and knowledge gaps for delivery in an updated undergraduate nursing curriculum (Chepulis & Mearns, 2015). The average overall score for nutrition knowledge was 55%. However, Chepulis and Mearns

(2015) reported that individuals who received nutrition education obtained higher total nutrition knowledge scores.

Significant gaps in nutrition knowledge were discovered in the undergraduate nursing students who completed the survey and had yet to receive nutrition education (Chepulis & Mearns, 2015). The knowledge gaps identified were not being able to read or interpret the nutrition information on food labels, how to identify the main ingredient in a food product and not knowing the definition of basal metabolic rate (BMR) (Chepulis & Mearns, 2015). These results demonstrate a need for nutrition knowledge because they are deemed skills someone should be able to do if they have a good understanding of nutrition. Thus, additional studies may be required to guide curriculum changes in nutrition teaching in NZ undergraduate nursing programme. The low level of nutrition literacy found in the Bay of Plenty study (Chepulis & Mearns, 2015) is consistent with previous studies conducted on nursing students' nutrition literacy in Denmark, Sweden, Norway, and South Africa (Mowe et al., 2008; Parker et al., 2011).

2.7 International Studies

A survey of doctors and nurses in Denmark, Sweden, and Norway to investigate nurses' self-reported nutritional knowledge, attitudes and skills. Mowe et al. (2008) about various aspects of nutritional practice. The questionnaire included 16 statements about self-perceived attitudes towards nutritional knowledge, 12 statements about nutrition-related consequences, and four questions about nutritional therapy knowledge. Participants scored their self-perceived nutrition knowledge, their interest in nutrition counselling and how applicable they found nutrition counselling on a scale of 1 (inadequate/lowest/not relevant respectively) to 10 (very good/great interest/very appropriate). 26% agreed that it was challenging to identify undernourished patients, 39% lacked nutritional assessment skills, and 60% agreed that it was challenging to organise a programme on nutrition. Furthermore, subjects who reported their nutrition education was good (answered 8-10 on a scale of 1=inadequate to 10=very good) had a greater understanding of the implications of optimal nutrition. Finally, the respondents were asked to rate their nutritional knowledge, interest in nutrition and how relevant they found nutrition counselling on a scale of 1 (lowest) to 10 (highest). The study revealed that a lack of nutritional knowledge was the most common cause of insufficient nutritional practice and nutrition education increased nutrition knowledge (Mowe et al., 2008). Moreover, 25% could

not identify patients needing nutritional treatment, 39% lacked techniques for identifying malnourished patients, 53% had difficulty calculating the patients' energy requirements, and 66% were unaware of national clinical nutrition guidelines (Mowe et al., 2008). To maximise the treatment of patients' nurses must have adequate nutrition knowledge and counselling capabilities.

A study conducted in South Africa aimed to assess the knowledge and practices of public-sector primary-care health professionals and final-year nursing students in the role of nutrition, physical activity, and smoking cessation (lifestyle modification) in the management of chronic diseases of lifestyle in the public health-care sector (Parker et al., 2011). This study assessed nutrition knowledge using a self-administered knowledge questionnaire validated by Talip et al. (2003). The questionnaire was comprised of local case studies based on obesity, diabetes and hypertension (Parker et al., 2011). Based on the validated questionnaire, 80% was the desired nutrition knowledge score. Although 24% of nursing students thought their knowledge base for lifestyle modification using nutrition techniques was excellent, just 1% of these students scored higher than the desired 80%. In addition, 58% of nursing students regarded their nutrition knowledge as good, yet only 36% received satisfactory scores. More than 60% of nursing students had low or mediocre scores (Parker et al., 2011).

Similarly, nutrition knowledge related to chronic diseases was assessed by two studies (Burke & Mellor, 2014; Ní Chonaill et al., 2022). The study by (Ní Chonaill et al., 2022) assessed 94 nursing and medical students' nutritional knowledge related to cancer prevention using a nutritional knowledge questionnaire comprised of 3 constructs: maintaining a healthy weight, BMI assessment, and dietary recommendations in cancer prevention. The nursing students had low nutritional knowledge, with mean scores ranging from 11.5% to 58.7%. Additionally, The study by (Burke & Mellor, 2014) used a self-administered questionnaire to assess the nutritional knowledge of 110 undergraduate nursing students. Conversely, most of the nursing students had competent nutrition knowledge.

A meta-analysis of 15 studies conducted in Nigeria, Northern Ireland and the United Kingdom evaluated nurses' knowledge of nutrition and revealed that, in general, registered nurses lacked nutrition knowledge (Bakre et al., 2012). The studies included in the study specifically assessed nurses' nutrition knowledge. The results concluded that nurses need more nutritional

knowledge, especially when assessing the nutritional status of patients, and nurses require nutrition education to be incorporated into the undergraduate curriculum. For example, three of the studies conducted questionnaires on nurses from North Dakota (Lindseth, 1990), Washington (Crogan et al., 2001) and Australia (Schaller & James, 2005), which identified that the general nutrition knowledge score among nurses was low with an average between 60% and 65%. Furthermore, five of the studies included in the meta-analysis concluded that nurses require nutrition education and the best way to incorporate this is into their undergraduate curriculum (Endevelt et al., 2009; Kowanko et al., 1999). It was revealed that nurses don't have the opportunity to attend nutrition education outside their professions as nurses (Lindseth, 1997). However, a study on 600 nurses revealed that nutritional knowledge is associated with age and nurses' nutrition knowledge diminishes unless nutrition education is implemented throughout nurses' careers (Endevelt et al., 2009). Overall, this meta-analysis demonstrates the necessity for incorporating nutrition education into the nursing curriculum. To close the gap impacting nurses' nutrition knowledge to enhance the patient care (Bakre et al., 2012).

Nurses' nutrition care knowledge and attitudes are critical for practical patient nutrition assessment and interventions. This was demonstrated in a cross-sectional survey that investigated Australian practice nurses' perceptions of providing nutrition care for chronic disease management using a modified version of a previously validated questionnaire to assess physicians' attitudes towards providing nutrition care in the practice (McGaghie et al., 2001) [Nutrition in patient care survey]. There were three sections of the survey, and participants were asked to answer each item about the provision of nutrition care to patients with chronic diseases: nurses perceived importance of nutrition-related behaviours in the practice workplace, nurses' perceptions of their roles in terms of physical activity, dietary health promotion, counselling and motivational interviewing capabilities (Martin et al., 2014). Overall, practice nurses regarded nutrition care as vital to chronic disease management. Practice nurses also felt that providing nutrition care to patients with chronic disease or risk factors for chronic diseases was an important part of their role (Martin et al., 2014). Responding practice nurses believed it was critical to perform a variety of skills when providing nutrition care. These nutrition-related practices include evaluating a patient's diet, particularly macronutrients, major food groups, and alcohol consumption; counselling patients on dietary-related behaviour; and calculating body mass index to measure body weight status (Martin et al., 2014). The findings indicate that practice nurses perceive many necessary skills and

positive attitudes towards providing nutrition care; however, additional education is required to improve their self-perceived effectiveness (Martin et al., 2014).

An integrative review revealed from a series of studies that nursing students need more nutrition knowledge to develop the professional capacity to provide patients with effective nutrition care (Laing & Crowley, 2021). Nutrition knowledge in nurses is important because nurses need to identify the nutritional risk factors associated with chronic diseases such as obesity, high blood pressure and high intakes of salt and sugar. Nurses should be able to identify chronic disease risks in a patient. Coupled with understanding basic nutrition interventions and the confidence in their skills to administer basic nutrition strategies to prevent chronic diseases from developing and slow them from progressing. If nurses had the skills to identify chronic disease risks and implement dietary changes in patients with chronic disease, it would decrease the burden of chronic diseases. This integrative review emphasises the need to reassess nutrition education in undergraduate nursing programmes and develop innovative approaches to incorporate nutrition education into the curriculum more effectively (Laing & Crowley, 2021). Similar results were derived from an integrative review that investigated nursing students' nutrition knowledge from 23 different studies and concluded that nursing students investigated lacked nutritional knowledge (Stefano et al., 2023). This finding is congruent with four studies outlined in the integrative review (Buxton & Davies, 2013; Lee et al., 2017; Van den Berg et al., 2012; Yfanti et al., 2011).

Another study assessed the nutritional knowledge of 166 nursing students from Ghana using a self-administered general nutrition questionnaire; the nursing students gained a low mean score, indicating poor nutrition knowledge (Buxton & Davies, 2013) Similarly, three studies found limitations in nursing students' nutrition knowledge, such as fragmented nutrition knowledge and a lack of food composition knowledge (Lee et al., 2017; Van den Berg et al., 2012; Yfanti et al., 2011). Nursing school students at the Yanbian University of Science and Technology in China received a one-day healthy weight control education workshop on healthy eating practices and basic nutrition for healthy weight control (Lee et al., 2017). The participants were tested on their nutrition knowledge before and after the workshop by completing a questionnaire on their weight control methods and nutrition knowledge on weight control methods: (1) diet therapy for weight control, (2) exercise therapy for weight control, and (3) principles of weight control. According to the results of this study, the nutrition

education workshop increased the participants' nutrition knowledge regarding weight control strategies (Lee et al., 2017). The total score of participants' nutrition knowledge increased significantly from 117 in the pre-test to 141 points in the post-test (Lee et al., 2017). Demonstrating a gap in nutrition knowledge before education is provided and the requirement for nutrition education in nurses. The study by Yfanti et al. (2011) assessed the nutritional knowledge of 506 nursing students from TEI of Lamia through eight closed-type questions on topics such as body mass index (BMI) and the food pyramid. Only 60% of students knew the correct answer to the questions, apart from one where 95% of students understood that poor nutrition is a risk factor for developing chronic diseases (Yfanti et al., 2011).

Similarly, the study by (Van den Berg et al., 2012) analysed 166 student nurses' nutrition knowledge by conducting structured interviews with participants; nutrition knowledge was recorded using the United States Department of Agriculture Food Guide Pyramid [USDA-FGP] (McGuire, 2011) and the food-based dietary guidelines for South Africa (FBGD-SA) (Vorster HH, 2012) were asked about the most frequently eaten food group, the least frequently eaten food group, the recommended number of daily servings from each food group, foods with high fat, sugar, and fibre content, foods with low fat, sugar, and fibre content, and foods high in vitamin C and beta carotene (Van den Berg et al., 2012). Students with an overall score of more than 50% on the knowledge questionnaire were considered knowledgeable, while those with less than 50% were considered less knowledgeable. Students were also asked to identify where they got their nutrition information from (Van den Berg et al., 2012). Almost two-thirds of the participants (65.4%) received an overall score of more than 50% on the nutritional knowledge questionnaire and were classified as knowledgeable, while 34.6% received an overall score of less than 50% and thus, deemed as not knowledgeable (Van den Berg et al., 2012). The nutritional knowledge questionnaire determined that most participants did not know the daily recommended number of servings of fruit and vegetables (Van den Berg et al., 2012). Nutrition information plays a significant role in fostering better eating behaviours and increasing understanding of dietary guidelines, positively linked to increased nutrition knowledge.

The relevant studies above have demonstrated apparent gaps in the nutritional knowledge of nurses worldwide. This is concerning because nursing students' future responsibilities include assessing patients' dietary needs, such as identifying undernutrition linked to elderly frailty and

supporting patients' healthy eating habits to prevent and treat chronic diseases. This skill set is required to meet public health goals for decreasing chronic disease incidence. For example, they advise patients on improving their immune response and identify patients who need referrals for specialised nutrition care.

2.8 Investigative studies using NUTCOMP

Several cross-sectional studies in Australia, Ireland and Saudi Arabia utilised the validated NUTCOMP tool to investigate competencies encompassing nutrition knowledge, skills, counselling, and attitudes. Among these studies were examinations of 195 undergraduate and postgraduate medical students from 20 Australian medical schools (Bredhauer et al., 2022), 557 pharmacists (Kelly et al., 2022), 206 Health Care Practitioners (HCP) and 90 primary care physicians (Al-Gassimi et al., 2020). The collective findings from these studies reveal a common theme of lack of nutrition competency observed in Australian medical students (Bredhauer et al., 2022), Irish pharmacists (Kelly et al., 2022), Saudi Arabian Physicians (Al-Gassimi et al., 2020), Irish nurses, GPs, Medical students and Allied Health Professionals (pharmacists, physiotherapists, occupational therapists, and healthcare assistants) (Keaver et al., 2018). While participants demonstrated moderate overall nutrition scores, they exhibited moderate confidence in their nutrition knowledge and lower confidence in nutrition skills. However, they consistently expressed positive attitudes towards the significance of nutrition in the healthcare field (Al-Gassimi et al., 2020; Bredhauer et al., 2022; Keaver et al., 2018; Kelly et al., 2022).

These findings indicate a requirement for nutrition education to be incorporated into the curricula of Health Care Practitioners, including nurses. Moreover, these Health Care Practitioners acknowledged the need for further nutrition education (Bredhauer et al., 2022; Keaver et al., 2018; Kelly et al., 2022). In contrast, a cross-sectional study of 142 Personal Trainers in Australia using the NUTCOMP tool (Barnes et al., 2016). The study investigated associations between demographic variables, competence scores, and associations between constructs scores and found that Australian personal trainers exhibit a high level of confidence in providing nutrition care to clients (Barnes et al., 2016). Notably, participants confident in their nutrition knowledge also exhibited confidence in their skills and demonstrated favourable attitudes towards nutrition care. The prevalence of positive attitudes and the consideration of nutrient-specific advice within their practice scope underline the importance of education and

experience in fostering confidence and competence in nutrition care among healthcare professionals in large fields (Barnes et al., 2016).

2.9 The NUTCOMP Questionnaire

The NUTCOMP questionnaire was developed in Australia to assess primary health professionals' self-perceived competence in providing nutrition care to MCD patients. “Competence is defined as an individual's ability to complete a specific task and consists of three components: knowledge, skill, and attitude” (Ball & Leveritt, 2015). The survey was developed in four stages: (1) scope and structure preparation, (2) questionnaire item development, (3) pilot study, and (4) test-retest reliability. The execution of stage one was to conduct a narrative literature review on the self-perceived competence of primary healthcare professionals, and stage two was to develop the questionnaire based on the information retrieved in stage one. Stage three was a pilot study conducted on 118 primary healthcare professionals (dietitians, and speech and language therapists [SLT]) to investigate the questionnaire's internal consistency and concurrent. Stage four was a test-retest pilot conducted on 33 primary health professionals (GPs, dietitians, practice nurses, exercise professionals, diabetes educators and physiotherapists) to see how well the questionnaire produces the same results when used repeatedly in the same situation with the same participant's (Ball & Leveritt, 2015).

When developing nutrition survey tools, validity and reliability must be considered. The process used to establish the validity of the NUTCOMP tool was extensive, involving a literature review, examination of current competency frameworks, consultation with an expert reference group, and feedback from many primary health professionals. The results from stage one combined two out of the five possible constructs, which resulted in four constructs being validated (1): Confidence in Nutrition Knowledge and chronic disease (2); Confidence in Nutrition Skills (3); Confidence in Nutrition Communication and Counselling (4); and Attitudes Toward Nutrition Care. The stage three results resulted in dietitians scoring substantially higher in each construct than the SLTs. This demonstrates good concurrent validity because the questionnaire can distinguish between two groups with varying levels of perceived competence in providing nutrition care. Stage five demonstrated a very high test-re-test reliability because the questionnaire can produce the same results when repeated in the same situation multiple times (Ball & Leveritt, 2015). The final pool of 35 questions across

four constructs demonstrated good internal consistency, could differentiate between two groups with theoretically different self-perceived competence and had very high test-retest reliability. As a result, the findings of this study indicate that the NUTCOMP questionnaire is a tool that can be used confidently to assess primary health professionals' self-perceived competence in providing nutrition care to patients with chronic diseases.

The tool possesses construct validity, content validity, face validity, high internal consistency, good concurrent validity, and extremely high test-retest reliability. The NUTCOMP questionnaire helps assess primary health professionals' self-perceived competence (Ball & Leveritt, 2015). Any healthcare professional who attempts to improve a patient's dietary intake, whether to prevent or manage lifestyle-related conditions, is referred to as providing nutrition care. It is critical to measure and understand current area-specific competency and attitudes to initiate and improve the delivery of nutrition information in the clinical care (Keaver et al., 2018). Rather than focusing on a single condition or state, such as obesity, a broad variety of questions may be relevant in this area. The survey also includes demographic and educational questions to investigate relationships between these characteristics and Nursing students' self-perceived competency to provide nutrition care. The study will differ from the rest of the studies because the validated NUTCOMP questionnaire measures the knowledge of third-year nursing students' nutrition knowledge.

2.10 Summary

Chronic disease causes a considerable health burden in NZ; chronic diseases are responsible for over 85% of deaths per year (Tobias et al., 2006), which can be avoided mainly through nutrition intervention (Bold et al., 2020; Calder, 2020; Crowley, 2015). Obesity is the most significant precursor in the development of chronic disease. Obesity is attributable to a diet high in saturated fats, sugar and sodium (Partridge et al., 2020) and a diet insufficient in fruit and vegetables (Tobias et al., 2006). The Dietary Habits Questionnaire revealed that NZ adults generally have a high intake of unhealthy eating habits that do not align with the Ministry of Health (2022) Eating and Activity Guidelines. The varied roles of health care professionals in a Multi-Disciplinary Team (MDT) in the management of chronic diseases are necessary to manage and treat chronic diseases through dietary intervention. In NZ, an MDT comprises dietitians, nurses, general practitioners, and other allied healthcare professionals (Beckingsale et al., 2016; National Collaborating Centre for Acute Care, 2006). The findings have revealed

significant gaps in the nutritional knowledge of nurses worldwide and a lack of research regarding nurses' nutrition knowledge in NZ. This is concerning because nursing students' future responsibilities include assessing patients' nutritional needs, such as identifying undernutrition linked to elderly frailty, supporting patients' healthy eating habits to meet public health goals for reduced noncommunicable disease incidence, giving patients advice on how to improve their immune response, and identifying patients who require referrals for specialised nutrition care. The reliable and validated NUTCOMP questionnaire will assess nurses' self-perceived competence in providing nutrition care to patients with chronic diseases.

This research will contribute to raising awareness of the vital role of nurses in providing nutritional support to patients and clients. It will highlight the importance of interprofessional collaboration in improving health outcomes and recommend strategies for enhancing nurses' knowledge and training in nutrition. Ultimately, this study aims to ensure evidence-based care that meets patients' nutritional needs and improves their overall health. In conclusion, nurses ensure that patients and clients receive adequate nutrition. However, there are knowledge gaps and a need for interprofessional collaboration to improve health outcomes. This study aims to address these issues and provide recommendations for enhancing nurses' knowledge and training in nutrition, thereby delivering better evidence-based care.

Chapter 3: Manuscript

3.0 Abstract

Highlights

- Undergraduate nursing students in NZ may need more nutrition knowledge and skills but have positive attitudes towards providing nutrition care to patients.
- Using the validated NUTrition COMPetence tool, nursing student scores for confidence in nutrition knowledge and skills were positively correlated.
- To support their roles in providing patient care, undergraduate nursing students believe they would benefit from further nutrition education.
- Findings suggest the need for nutrition education to be integrated into the nursing curriculum.

3.0 Abstract

Aim: To assess the self-perceived competence of undergraduate nursing students in providing nutrition care in clinical practice.

Background: Nurses are uniquely positioned to manage patients' basic nutrition care needs across diverse work settings. As the largest group of health professionals, they have an essential role in nutrition-related chronic disease prevention. Although it is assumed that nutrition care is integrated into nurses' knowledge and clinical skill sets before entering professional practice, the sufficiency of nutrition education within the nursing curricula is unknown. This study aimed to investigate nursing students' nutrition competence in delivering nutrition care.

Design*: C*ross-sectional

Settings: Online survey

Participants: All students enrolled in the third year of a bachelor's in nursing were invited to complete a sociodemographic questionnaire and the validated NUTrition COMPetence tool.

Methods: Competence was assessed across four constructs: confidence in knowledge about nutrition and chronic disease, confidence in nutrition skills, confidence in communication and counselling about nutrition, and attitudes towards nutrition care. A 5-point Likert scale was used to rate confidence for all construct items. Scores for each construct were summed to provide a maximum score of 175. Pearson Chi-squared tests were used to identify associations between the responses.

Results: A total of 108 third-year nursing students completed the survey and reported overall moderate nutrition competence (114 ± 18.5 out of 175, 65%). Students demonstrated moderate confidence in nutrition knowledge (20.50 ± 4.26 out of 35, 59%), skills (33.47 ± 8.66 out of 55, 61%), counselling and communication (29.43 ± 4.67 out of 45, 65%), and positive attitudes toward nutrition (31.04 ± 6.48 out of 40, 78%).
Conclusions: Although most student nurses had positive attitudes towards nutrition care, they reported low to moderate confidence in their nutrition knowledge, skills, and counselling. This suggests a need for increased nutrition content in the nursing curriculum.

Keywords
Nursing student; Nutrition; Knowledge; attitudes; skills; Chronic disease

3.1 Background

Nutrition is critical in treating chronic diseases such as type 2 diabetes and heart disease (Ní Chonaill et al., 2022). Nurses are uniquely positioned to manage and support patients' basic nutritional needs across diverse work settings and cultures (Chepulis & Mearns, 2015; Laing & Crowley, 2021; Lin et al., 2014; Polat et al., 2016; Sargent et al., 2012; Sofi et al., 2008; Xu, Parker, et al., 2017). As key members of the multidisciplinary team, nurses are responsible for taking care of patients' nutritional needs, which is commonly implemented by a dietitian (Arroyo et al., 2008). Nurses are also present 24/7 and are the first to assess a patient's nutritional status. In hospitals, this can include identifying feeding difficulties, dehydration, and malnutrition (Volkert et al., 2019). As nurses spend the most time with a hospitalised patient, they can closely monitor oral intake and body weight, which, when compromised, can contribute to longer hospital stays and an increased risk of mortality (Döngel et al., 2022; Theilla et al., 2015).

Moreover, nurses are important in managing and preventing chronic disease (Sargent et al., 2012). In community settings, nurses provide nutrition counselling to individuals with chronic diseases (Chao et al., 2020; Vasiloglou et al., 2019) and are involved in health and nutrition promotion to promote healthy lifestyles. To undertake these roles proficiently, nurses need confidence in nutritional knowledge and skills (Döngel et al., 2022). Furthermore, nurses also have a key role in nutrition care in a hospital setting; for example, they provide basic nutrition

information about patient appetite, dietary intake, bowel movements, hydration and weight (Keaver et al., 2018).

Nursing students' nutrition knowledge was previously reported in an integrative review of ten studies, where it was found that nursing students lacked sufficient nutrition knowledge to develop the capacity to provide adequate nutrition care to patients (Laing & Crowley, 2021). In a study that investigated the nutrition knowledge of 197 undergraduate nursing students where one group received no nutrition training while the second group received eight hours of nutrition training, the results indicated a low mean overall nutrition knowledge score, with notable improvement among students who received nutrition training (Chepulis and Mearns (2015).

For nurses to undertake the critical role of nutrition care in promoting health and managing chronic disease, comprehensive nutrition education in undergraduate nursing programmes is important to bridge the theory-practice gap (Calder, 2020). Evidence suggests that international nurses need to receive adequate nutrition education to care for patients with chronic diseases or to provide effective nutrition care to patients (Laing & Crowley, 2021).

Further studies have highlighted that nurses would benefit from nutrition education in their undergraduate training to aid in their roles as nurses in the future. In Australia, 98% of 181 nurses reported that nutrition education would help them provide proficient nutrition care to patients as nurses (Martin et al., 2014). In China, a study of 40 nursing students aimed to identify nutrition knowledge after the participants received a one-day healthy weight education program that covered essential topics such as healthy eating practices, nutrition basics, principles of healthy weight control, and information on unhealthy weight control methods and nutrition knowledge of participants increased post-nutrition education (Lee et al., 2017).

Additionally, a study investigated doctors' and nurses' self-reported knowledge and attitudes regarding nutritional practice in Denmark, Sweden, and Norway, focusing on the guidelines set by the European Society of Parenteral and Enteral Nutrition (Mowe et al., 2008). A questionnaire was distributed to 6000 doctors and 6000 nurses, focusing on those working in units where nutritional problems are common. Results indicated a significant gap between reported attitudes and actual nutritional practices, highlighting a potential lack of knowledge. This study emphasises the importance of addressing this knowledge gap to enhance nutritional

care. It suggests that improved education and knowledge can positively impact nutritional practices, urging the need for continuous education programmes in general nutrition and nutritional support techniques for healthcare professionals (Mowe et al., 2008).

Despite the need, nursing registration scopes of practice in NZ appear to assume that nutrition care is already integrated into nurses' knowledge and clinical skill set before entering professional practice (Ministry of Health, 2017; Nursing and Midwifery Council, 2015; Nursing Council of New Zealand, 2020) This suggests there may be a misalignment between nursing students' undergraduate nutrition education and the nutrition care they are expected to provide as clinical practice graduates (Chao et al., 2020; Scammell, 2017). Therefore, this study aimed to investigate third-year nursing students' knowledge, skills, counselling, communication, and attitudes towards nutrition care in clinical practice and identify improvement areas within the nursing undergraduate curriculum.

3.2 Methods

3.2.1 Design

An online cross-sectional survey was undertaken using a validated questionnaire NUTCOMP tool (Ball & Leveritt, 2015) to assess the self-perceived nutrition knowledge, skills, attitudes, and counselling and communication and attitudes of third nursing students across three university campuses.

3.2.2 Participants and Setting

All students enrolled in the third year of a bachelor's degree in nursing (n=166) were invited to complete an online survey by email invitation. Nurses were located at three North Island university campuses (Auckland, Palmerston North, and Wellington). The email invitation provided a participant information sheet, and consent was presumed upon starting the survey. An incentive to win one of three supermarket vouchers was included in the invitation. The minimum sample size was calculated to be 109 participants to detect an effect with a confidence interval of 95±5% margin of error.

3.2.3 Data Collection

The email invitation provided an anonymous link to an online survey of the NUTCOMP tool using Qualtrics software and a participant information sheet. The online survey included a seven-item demographic questionnaire to collect information on the nurse's gender, age, ethnicity, and previous nutrition education and training. The survey was estimated to take

approximately 15 minutes to complete. Survey data was collected over a three-month timeframe from June to August 2023.

To maximise response rates, the Dillman Method was applied (Dillman, 2011). An initial email was sent to all third-year nursing students, and non-respondents were sent a second invitation email seven days later. For non-respondents, a third email was sent four weeks after the initial invitation, reiterating the importance of participation. Additionally, class advocates promoted the survey on Facebook, using their established connections. This was important because some students may have overlooked or missed the email invitation and were more likely to notice a Facebook post shared by their classmates. The study was approved by the Massey University Human Ethics Committee (Southern A) – OM1 23/07.

The NUTCOMP tool was developed to assess primary healthcare professionals' self-perceived confidence in delivering nutrition care to patients with chronic disease and was validated in Australia (Ball & Leveritt, 2015). The validation of NUTCOMP was comprised of four steps (1): preparation of scope and structure (2); development of questionnaire items (3); a pilot study (4) and test–retest reliability to ensure construct validity, content validity, face validity, internal consistency, concurrent validity and test–retest reliability (Ball & Leveritt, 2015).NUTCOMP has been used internationally to assess the nutrition competence of student nurses, nurses, GPs, medical students, pharmacists, physiotherapists, occupational therapists and personal trainers (Al-Gassimi et al., 2020; Barnes et al., 2016; Bredhauer et al., 2022; Keaver et al., 2018; Kelly et al., 2022). The 35-item NUTCOMP tool is divided into four constructs: Confidence in Knowledge about Nutrition and Chronic Disease, Confidence in Nutrition Skills, Confidence in Communication and Counselling about Nutrition, and Attitudes towards Nutrition Care. A Likert scale of 1-5 scale (not confident at all =1; not very confident =2; somewhat confident = 3; very confident =4; and extremely confident = 5) is used to score agreement with the statements within the constructs. Scores are totalled for each construct, i.e., a total of 35 for construct one, confidence in knowledge about nutrition and chronic disease, 55 in construct two, confidence in nutrition skills, 45 in construct three confidence in communication and counselling about nutrition and 40 in construct four attitudes towards nutrition care for a maximum score of 175.

3.2.5 Statistical analysis

Data analysis was conducted using SPSS software™. The average nutritional knowledge, skills, communication counselling and attitude competence scores were calculated and summed to provide a mean score for each construct. An overall score was then produced by summing the average knowledge, skills, communication/counselling, and attitude construct scores (range 35 to 175) and presented as the total number, percentage, and mean ± standard deviation (SD) out of the highest possible score. The data was tested for normality using Kolmogorov-Smirnov and Shapiro-Wilk tests, histograms, and box plots.

Pearson's Chi-square tests were performed to investigate relationships between total scores for each construct (knowledge, skills, communication and counselling, and attitudes). To assess the association between constructs, responses were collapsed into three categories (1 for not confident, 2 for somewhat confident and 3 for very confident) to maintain a minimum count of 20% in all cells to comply with the Chi-square test assumptions. Pearson product-moment correlations were used to assess the strength of the relationships between the constructs. Independent t-tests were used to establish if a previous role in healthcare increased a nursing student's knowledge, skills, communication, counselling, and attitudes towards nutrition care. The statistical significance level was set at $p<0.05$.

3.3 Results

A total of 108 (67.5%) third-year nursing students completed the survey. Most respondents were female (n=97, 90%), and most participants agreed they would benefit from further nutrition education (n=70, 65%). Participant characteristics and previous nutrition education training are reported in Table 3.

Table 3 Participant Characteristics and Previous Nutrition Education

Characteristics	n (%)
Sex	
Females	97 (89.8)
Males	7 (6.5)
Age	
≤24 years	80 (76)
25-34 years	16 (15)
35-44 years	9 (9)
Ethnicity	
NZ European	82 (75.9)
Māori	9 (8.3)
Samoan	1 (0.9)
Tongan	2 (1.9)
Chinese	2 (1.9)
Indian	6 (5.6)
Prefer not to say	2 (1.9)
Other	12 (11.1)
Feel a need for further Nutrition Education	
Agree	82 (82)
Disagree	18 (18)
Previous Role in Healthcare	
Yes	41 (42)
No	57 (58)
Previous Nutrition Education	27 (28)
Would benefit from Further Nutrition Education	
Yes	94 (95)
No	5 (5)

Table 2 describes the participants' nutrition competence scores and the associations between constructs. Participants reported moderate nutrition knowledge with a mean score of 20.50 ± 4.26 out of 35 (59%), skills with a mean score of 33.47 ± 8.66 out of 55 (61%) and counselling

and communication with a mean score of 29.43 ± 4.67 out of 45 (65%). Positive attitudes with a mean score of 31.04 ± 6.48 out of 40 (78%). The mean overall mean score of self-perceived nutrition knowledge was 114 ± 18.48 out of 175 (65%).

Table 4 NUTCOMP construct and overall scores and associations between constructs.

Construct	**N**	**Mean (SD)**	**% out of the maximum score**	**Associations with other constructs[a]**	**Strength of associations**
Confidence in knowledge about Nutrition and Chronic Disease *(Maximum 35)*	84	20.50 (4.26)	59%	Counselling[b] Attitudes[c] Skills[d]	Skills[h] Counselling[I]
Confidence in Nutrition Skills *(Maximum 55)*	78	33.47 (8.66)	61%	Knowledge[d] Counselling[e] Attitudes[f]	Knowledge[h] Counselling[j] Attitudes[k]
Confidence in Communication and Counselling about Nutrition *(Maximum 45)*	75	29.43 (4.67)	65%	Knoweldge[b] Attitudes[g] Skills[e]	Knowledge[I] Skills[j] Attitudes[L]
Attitudes Towards Nutrition Care *(Maximum 40)*	72	31.04 (6.48)	78%	Skills[f] Counselling[g]	Skills[k] Counselling[L]
Total Score *(Maximum 175)*		114 (18.48)	65%		

SD, Standard Deviation

a

Only significant Chi-squared results were reported.

b

There was an association between counselling and knowledge ($X^2 = 60.802a$, $P < .001$). Participants who were not confident in nutrition knowledge were less likely to be confident in nutrition counselling (knowledge 30%, counselling 15%). Conversely,

participants who were very confident in counselling were less likely to be very confident in knowledge (counselling 43%, knowledge 26%). Participants who were somewhat confident in their knowledge were more likely to be somewhat confident in counselling (knowledge 44%, counselling 43%).

c

There was an association between attitudes and knowledge (X^2 = 197.01, P<0.01). %). Participants who were not confident in their nutrition knowledge were less likely to be not confident in their nutrition Attitudes (Knowledge 30%, Attitudes 11%); participants who were somewhat confident in their nutrition knowledge were less likely to be somewhat confident in their nutrition Attitudes (Knowledge 44%, Attitudes 23%). Conversely, participants who were very confident in their nutrition attitudes were less likely to be very confident in their nutrition knowledge (attitudes 66%, knowledge 26%).

d

There was an association between knowledge and skills (X^2 = 27.17, P <.001). Participants who were very confident in their skills were less likely to be very confident in their knowledge (Knowledge 26%, skills 36%). Conversely, the somewhat confident participants had lower nutrition skills than nutrition knowledge (Knowledge 44%, Skills 31%), and those who were not confident were the same in both skills and knowledge (Knowledge 30%, Skills 33%).

e

There was an association between skills and counselling (X^2 = 71.24, P <0.01). Furthermore, participants who were not confident in their nutrition skills were less likely to be confident in their nutrition counselling (Skills 33%, Counselling 15%). Conversely, somewhat confident participants had lower nutrition skills than counselling (Skills 31%, Counselling 43%). Participants who were very confident in their nutrition counselling were less likely to be confident in their nutrition skills (Counselling 43%, skills 41%).

F

There was an association between skills and attitudes (X^2 = 149.08, P <0.01). Participants who were not confident in their nutrition skills were less likely to be not confident in their nutrition attitudes (skills 33%, attitudes 11%), and participants who were somewhat confident in their skills were less likely to be somewhat confident in

their attitudes (skills 31%, attitudes 23%). Conversely, participants who were very confident in their attitudes were less likely to be confident in their skills (attitudes 66%, skills 36%).

g

There was an association between counselling and attitudes (X^2 = 74.34, P <0.01). Participants who were not confident in their nutrition counselling were more likely to be not confident in their nutrition attitudes (counselling 15%, attitudes 11%). However, participants who were somewhat confident in their counselling were less likely to be somewhat confident in their attitudes (counselling 43%, attitudes 23%). Conversely, those very confident in their attitudes were less likely to be very confident in their counselling (attitudes 66%, counselling 43%).

H

There was a strong positive correlation between skills and knowledge (r= [0.70], p <0.01),

I

There was a strong positive correlation between knowledge and counselling (r= [0.51] p <0.01).

J

There was a strong positive correlation between skills and counselling (r= [0.61], p <0.01).

K

There was a strong positive correlation between skills and attitudes (r= [0.37], p <0.02).

L

There was a strong positive correlation between attitudes and counselling (r= [0.45] p <0.01)

3.4 Discussion

Overall, this investigation indicated nursing students lacked nutrition competency. Despite being somewhat confident in their nutrition knowledge, skills, and counselling, the students had positive attitudes towards nutrition care. Using the NUTCOMP tool, comparable levels of nutrition competency have been found among health care professionals (HCPs) such as Australian medical students, physicians in Saudi Arabia, Irish pharmacists, Irish nurses, General Practitioners, Medical students and Allied Health Professionals (pharmacists, physiotherapists, occupational therapists, and healthcare assistants) (Al-Gassimi et al., 2020; Bredhauer et al., 2022; Kelly et al., 2022) suggesting that further nutrition education is needed in health professional curriculums (Keaver et al., 2018).

Most nursing students reported moderate confidence in knowledge about nutrition and chronic disease (59%). Similarly, a meta-analysis of 15 studies globally indicated nurses do not have adequate nutritional knowledge of chronic disease to prioritise it in their care (Bakre et al., 2012). Moreover, a study on self-reported nutrition knowledge among nurses and doctors in Sweden, Denmark, and Norway found that a prevalent cause of inadequate nutritional practice was a lack of nutrition knowledge (Mowe et al., 2008). This included challenges such as an inability to identify patients requiring nutritional therapy, a lack of methodologies to identify malnutrition, difficulties in determining nutritional energy requirements, and providing nutrition recommendations. Conversely, individuals with higher self-perceived nutrition knowledge demonstrated more confidence in their nutrition skills (Mowe et al., 2008). Findings from the current study, alongside other studies focused on nurses and HCPs, consistently indicate that sufficient knowledge of nutrition is essential to developing skills to provide effective nutrition care.

We found a moderate level of confidence in nutrition skills (61%) among the nursing students. However, two key areas of the NUTCOMP questionnaire had the lowest scores: firstly, the ability to formulate a meal plan for individuals (64%) and secondly, keeping up to date with peer-reviewed evidence in nutrition and chronic disease (61%). This is not surprising considering nurses are not currently taught how to formulate meal plans, and this is not an expectation as part of their practice (Nursing Council of New Zealand, 2020). Similarly, nurses are not required to stay up to date with evidence-based nutrition research for chronic disease

treatment and prevention. Nursing students scored highest in the nutrition skills construct for interpreting an individual's biological data (e.g., blood pressure, cholesterol levels) against reference ranges and maintaining a non-judgemental attitude in discussions with patients/clients about the food they eat (64% and 68%, respectively). Higher confidence in these items has also been reported among pharmacists (Kelly et al., 2022). These proficiencies may be attributed to the inclusion of biochemistry in their undergraduate degrees (Nursing Council of New Zealand, 2020). This highlights the merit of including these aspects of nutrition skills in the curriculum. The findings, along with others focused on nurses and HCPs, indicate that nurses may lack sufficient nutrition knowledge to develop the necessary skills for providing effective nutrition care (Keaver et al., 2018).

Scores for confidence in communication and counselling about nutrition were moderate (65%). Under the communication and counselling construct, nursing students reported the most confident responses for "maintaining a non-judgmental attitude in discussions with patients about the food they eat" (68%) and the lowest confidence for "clearly describe what patients can expect from their discussions with you about food nutrition" (84%) and "working with patients to identify possible ways to improve the food they usually eat "(70%). Globally, there is an expectation for nurses to provide nutrition counselling, particularly to individuals with chronic disease (Vasiloglou et al., 2019). In Australia, a survey that focused on the counselling and motivational interviewing capabilities of nurses found that the provision of nutrition care to chronic disease patients or those at risk was integral to professional responsibilities, and nurses emphasised the importance of counselling patients on dietary-related behaviours (Martin et al., 2014). While it is recognised by the NZ Nursing and Midwifery Council that nurses play a vital role in delivering nutrition care, providing counselling, and supporting individuals in effectively managing their health Nursing and Midwifery Council (2015), this cannot be realised until nurses gain sufficient confidence in nutrition knowledge and skills.

Most (78%) participants in this study demonstrated positive attitudes toward nutrition care. Nursing students scored the highest responses firstly for "it is important that all individuals usually eat healthy foods regardless of age, body weight and physical activity levels" (78%), and secondly for " I must encourage my patients to seek support from their health professionals if I am unable to meet their nutrition-related needs" (78%). The challenge, therefore, does not appear to lie in nurses' attitudes toward nutrition or their perceived role in providing nutrition

care. Instead, nurses need to be equipped with adequate knowledge and skills in nutrition. Similarly, a previous study in NZ found that 89% of nurses had positive attitudes towards nutrition care (Laing et al., 2022). Furthermore, a cross-sectional online survey was conducted in Australia and investigated the perceptions of 181 nurses on the provision of nutrition care for chronic disease management. Overall, the nurses had favourable attitudes towards providing nutrition care and felt they had an important role in providing nutrition care (Martin et al., 2014). Using the NUTCOMP survey, nurses in Ireland also have positive attitudes towards nutrition care, especially compared to other HCPs (Keaver et al., 2018).

In this study, we found that participants who were very confident in their nutrition skills were less likely to be confident in their nutritional knowledge. This suggests the crucial role of nurses in reinforcing and facilitating nutritional interventions in hospitalised patients (Johansen et al., 2004) and in taking responsibility for promoting well-being, with nutrition being one of the fundamentals of care (Patience, 2016). Although nurses are encouraged to develop the skills necessary to perform their nutrition-related roles, they may be compromised without sufficient nutrition knowledge.

We also found that nursing students who were not confident in their knowledge of nutrition were less likely to be confident in their knowledge of nutrition communication and counselling. Among physicians in Saudi Arabia, inadequate nutrition knowledge was also found to be the main reason for a lack of confidence in the field of nutrition counselling (Al-Gassimi et al., 2020). These results reinforce the importance of nurses having high confidence in their nutrition knowledge as it will lead to greater competence in delivering nutrition skills and counselling to patients with chronic diseases.

Our research findings indicated that only 28% of participants reported receiving prior nutrition education. Alongside the limited exposure to nutrition education in the curriculum, this suggests a gap in the acquisition of nutrition knowledge by nurses. Notably, a significant majority (95%) of nursing students expressed a desire for further nutrition education. This underscores the perceived need for a more comprehensive approach to nutrition education within the nursing programme. Currently, the Bachelor of Nursing curriculum provides five weeks of nutrition education in the first year, which may not sufficiently equip students to

delve into nutrition-related contexts in the second year, such as managing chronic conditions, enteral nutrition, and promoting nutritional health for disease prevention.

Similarly, as students' progress to the third year, the nutrition focus shifts towards acute illnesses, including Total Parenteral Nutrition. In a previous NZ study, 81% of nursing students perceived a need for further nutrition education (Laing et al., 2022), suggesting that the curriculum needs to be broadened. Similarly, 98% of practice nurses in Australia reported that more nutrition education would help them in their role as nurses and increase their confidence in providing nutrition care to patients (Martin et al., 2014).

Nurses express greater self-perceived confidence in nutrition-related skills already integrated into their undergraduate degree. Therefore, augmenting nutrition-based education and skills would further amplify nurses' self-perceived knowledge and, consequently, their confidence in delivering enhanced nutrition care to patients with chronic diseases.

3.5 Limitations & Strengths

This study has several limitations. Firstly, individuals who chose to participate in the study may have had a particular interest in nutrition. Additionally, most participants reported having completed a certificate, other non-degree, or a degree outside their undergraduate nursing degree, including some nutrition content. This prior interest may have biased the results; however, the length and complexity of the courses reported are unknown. Finally, this study relied on self-reporting, and individuals may have reported socially desired outcomes rather than a true reflection of their skills and attitudes. The study's strength lies in using the validated NUTCOMP 35-item questionnaire, which ensured an accurate assessment of nursing students' self-perceived nutrition knowledge., skills, ability to counsel and communicate with patients about nutrition, and attitudes towards nutrition care. The NUTCOMP tool, validated within the target population of HCPs, instils confidence in concluding the study results (Ball & Leveritt, 2015).

3.6 Conclusions

While student nurses had positive attitudes towards the importance of nutrition care in treating and preventing chronic diseases, evidence suggests that nutrition competency among nursing students is lacking. Inadequate nutrition training in the current nursing curriculum in NZ contributes significantly to the gaps in nutrition knowledge observed. This study demonstrates the need to incorporate nutrition education into the nursing curriculum to better equip future nurses in the nutrition care of patients and their key role in preventing and treating chronic diseases.

Credit **authorship contribution statement**

Dominique Heath: Conceptualization, methodology, software, investigation, formal analysis. **Carol Wham:** Conceptualization, supervision, formal analysis, writing – review & editing. **Claire Minton:** supervision, formal analysis, writing – review & editing. **Karen Mumme:** Data curation.

Declaration of competing interest

The authors report no actual or potential conflicts of interest.

Chapter 4: Conclusion and Recommendations

4.1 Achievement of Aims and Objectives

The research aimed to determine third-year nursing students' self-perceived competence in nutrition knowledge, skills, attitudes, and communication and counselling in clinical practice.

We successfully engaged 108 out of a pool of 166 potential participants, and we required 109 participants to demonstrate a statistical power of 95% and 5% significance. The NUTCOMP-validated questionnaire identified significant knowledge gaps in nutrition knowledge. The nursing students had a low to moderate self-perceived confidence in nutrition knowledge, skills, communication, and counselling. We determined that increased nutrition knowledge is required to increase nurses' nutrition skills, communication, and counselling abilities.

4.2 Research Impact

The study results provide valuable insights into nursing students' nutrition knowledge, skills, and attitudes towards nutrition care to patients, specifically chronic diseases. The current study highlights significant gaps in NZ nursing students' nutritional knowledge and skills. The findings of this study can be used to support the integration of nutrition education into the NZ nursing curriculum. Prioritising comprehensive nutrition care significantly contributes to the effectiveness of preventing and treating chronic diseases. Conversely, increased confidence in nurses' nutrition knowledge and skills may lead to better patient outcomes.

Our findings highlighted nurses' positive attitudes towards nutrition care. In this study, the positive attitudes exhibited by nurses toward nutrition care underscore a high level of motivation and a genuine desire to expand their knowledge in this crucial aspect of patient care, particularly in the context of chronic diseases. Recognising the significance of nutrition care in their roles in treating and preventing chronic diseases, these positive attitudes serve as a strong foundation. While the nurses acknowledge the importance of nutrition care, it is essential to note that possessing positive attitudes alone does not necessarily equate to possessing the requisite knowledge and skills for effective implementation. However, this positive disposition sets a promising stage for further development. Understanding that nurses have the desire to

recognise the importance of nutrition care suggests a heightened likelihood of their receptivity to nutrition education as part of their training. Integrating nutrition education into nursing curricula can harness this positive attitude, ensuring that nurses comprehend the importance of and acquire the necessary knowledge. This, in turn, establishes a rationale for acquiring the expected nutrition-related skills of nurses. The evidence gleaned from this study aligns with global trends, demonstrating that nurses who have undergone nutrition education exhibit higher self-perceived confidence in their skills and knowledge. Consequently, these empowered nurses are more likely to engage in nutrition-related care processes and adhere to established protocols, thereby contributing to improved health outcomes for patients with chronic diseases.

4.3 Strengths

A strength of the study design was using a reliable and validated tool. Nutrition is an important aspect of non-communicable disease prevention and treatment by nurses as a part of the multidisciplinary team. It was important to use a valid and reliable tool to improve the delivery of nutrition care. NUTCOMP is designed to measure self-perceived competence in nutrition knowledge, skills, attitudes, communication, and counselling (Ball & Leveritt, 2015). It is a useful tool for assessing the self-perceived competence of primary health professionals, including nurses. The tool has a high test-retest reliability (L. E. Ball & M. D. Leveritt, 2015).

To our knowledge, this is the second NZ study to investigate nursing students' nutrition knowledge using the NUTCOMP tool. The first NZ was conducted on 68 nursing students in NZ, which employed a cross-sectional survey design and utilised the NUTCOMP-validated questionnaire, yielding findings comparable to our research. Regarding confidence levels, participants demonstrated a moderate level of assurance in their nutritional knowledge and skills. Additionally, the students exhibited positive attitudes towards nutritional care. The results underscore a prevalent positive attitude towards nutritional care among the participants, with a noteworthy majority acknowledging the imperative need for additional education in nutrition. However, the study also revealed discernible gaps in nutrition knowledge and skills among nursing students in NZ. This highlights an area that necessitates attention and intervention to enhance the educational preparation of nursing students in nutritional care.

In previous international NUTCOMP cross-sectional studies conducted in Australia, Ireland, and Saudi Arabia, the validated NUTCOMP tool assessed competencies encompassing

nutrition knowledge, skills, counselling, and attitudes. These studies encompassed 195 undergraduate and postgraduate medical students from 20 Australian medical schools (Bredhauer et al., 2022), 557 pharmacists (Kelly et al., 2022), and 206 HCPs and 90 primary care physicians (Al-Gassimi et al., 2020). The collective outcomes consistently highlight a prevalent theme of inadequate nutrition competency, observed across diverse healthcare professionals in different countries, including Australian medical students (Bredhauer et al., 2022), Irish pharmacists (Kelly et al., 2022), and Saudi Arabian Physicians (Al-Gassimi et al., 2020), as well as Irish nurses, GPs, medical students, and Allied Health Professionals (Keaver et al., 2018). Despite participants demonstrating moderate overall nutrition scores, they exhibited moderate confidence in nutrition knowledge and lower confidence in nutrition skills. Nevertheless, a consistent positive attitude towards the significance of nutrition in the healthcare field was observed (Al-Gassimi et al., 2020; Bredhauer et al., 2022; Keaver et al., 2018; Kelly et al., 2022).

These findings underscore the imperative need for integrating nutrition education into the curricula of Health Care Practitioners, including nurses. Furthermore, Health Care Practitioners across different regions acknowledged the necessity for additional nutrition education (Bredhauer et al., 2022; Keaver et al., 2018; Kelly et al., 2022). Investigating the nutrition knowledge of nurses is particularly important in NZ because nurses have a fundamental role in providing nutrition care to patients with chronic diseases (Arroyo et al., 2008). Furthermore, nurses' nutrition knowledge and attitudes are key in patient nutrition assessment and intervention (Boaz et al., 2013). Research about nurses' nutritional knowledge in NZ is lacking. Hence, this study adds valuable information about nurses' nutrition knowledge in NZ.

Another strength was the high response rate to the NUTCOMP questionnaire (84%). The high response rate can be attributed to a combination of factors. For example, there is an incentive to win a $100 countdown voucher in the draw. Furthermore, the Dillman method was used to increase the response rate. As per the Dillman method, an initial compelling email was sent, including the invitation, the Participant Information Sheet (PIS), and the anonymous link to the survey (Dillman, 2011). Seven days after the initial email was distributed, a reminder email was sent to all non-respondents. Then three weeks, seven weeks, and ten weeks after the initial invitation email, another email with the survey link, PIS and invitation was sent out.

4.4 Limitations

Firstly, participants who chose to participate in the study may have had an interest in nutrition, which may have skewed the results and led to bias. The questionnaire focused on nutrition knowledge, and the demographic questions sought further information on their nutrition education. Hence, participants were cognizant that the study focused on nutrition, potentially influencing their response. This awareness might have contributed to some individuals abstaining from the questionnaire, possibly due to a perceived deficiency in nutrition knowledge. The reluctance to participate could be attributed to feelings of embarrassment concerning their nutritional understanding, introducing an element of non-response bias. This may have resulted in a sample over-represented by individuals who self-perceive a good understanding and confidence in nutrition knowledge and skills.

Furthermore, a significant majority (95%) of participants reported they had previously completed a certificate, other non-degree or a degree that included some nutrition content. While this is a potentially influential factor, there is no further information on what these courses were and how much nutrition content was included. It would have been beneficial to ask the participants what course they completed and what nutrition content was included in the course to understand better if that influenced their nutrition knowledge scores. The lack of information limited the opportunity to investigate the results further. For example, we could not conduct a subgroup comparison that could have been identified if participants had taken a more in-depth nutrition course; nutrition scores varied among those with less nutrition education. This would provide valuable insights into previous nutrition education, knowledge, and skills.

Additionally, there were limitations in the data collection method, which relied on self-reporting. Thus, individuals may have reported socially desired outcomes rather than a true reflection of their nutrition skills and attitudes. For example, participants may have rated their nutrition knowledge and skills higher to compel themselves as having higher nutrition knowledge and skills or lower than they self-perceived to align with the research goals. Overall, this may have resulted in bias, and the results may not clearly represent the nutrition knowledge among nurses.

4.5 Conclusion and Recommendations for Future Research

The results of this study have indicated gaps in nursing students' confidence in their knowledge of nutrition and their skills in communication and counselling. However, nursing students have positive attitudes towards nutrition care which identifies motivation for increased nutrition education. These nutrition gaps indicate that nursing students are not learning the tools to be able to provide effective nutrition care to patients with chronic disease as students, and nurses entering the workforce without a dietitian input. Therefore, the study has provided evidence that further nutrition education is required in the nursing curriculum. the confidence in the knowledge of basic nutrition concepts, food and nutrient interactions, and the role of foods and nutrients in chronic disease development and prevention were low to moderate.

More research is needed on nurses and nursing students to understand better their role in nutrition care, their nutrition knowledge, and how this impacts their ability to deliver appropriate nutrition care.

- In subsequent research endeavours, it would be advantageous to inquire about nursing students' perceptions regarding the nutrition-related roles they envision for themselves as future nurses. This exploration aims to capture their perspectives before transitioning into the nursing workforce, shedding light on how they perceive their roles in providing fundamental nutrition care. Acquiring insights into nursing students' current views serves as a foundational step, instigating a heightened need for additional research into the realm of nutrition education for nursing students. Moreover, this understanding advocates for the incorporation of nutrition components into the nursing curriculum in the future
- Another suggestion for future research is to include other NZ universities and Polytechnique undergraduate nursing students in the study to gain a better representation of nursing students nationally.
- A future recommendation would be to add a nutrition course to the undergraduate nursing curriculum which introduces the nursing students to the basic concepts of nutrition, educates the students about their nutrition role as a nurse and teaches basic practical counselling skills.

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Appendices

Appendix One: Participant information sheet

PARTICIPANT INFORMATION SHEET

Student

Title: Self-perceived competence of third-year nursing students in providing nutrition care to patients.

Lead researcher:

Dominique Heath, MSc Human Nutrition and Dietetics student, Massey University, d.heath@massey.ac.nz, [redacted]

Supervisor:

Prof Carol Wham, Professor of Public Health Nutrition, Massey University

Co-Supervisor:

Dr Claire Minton, Director of Bachelor or Nursing and Senior Lecturer, Massey University

Ethical Approval:

This project has been reviewed and approved by the Massey University Human Ethics Ohu Matatika 1, Application OM1 23/07. If you have any concerns about the conduct of this research, please get in touch with A/Prof Louise Brough, Chair, Massey University Human Ethics Ohu Matatika 1, telephone 06 356 9099 ex 84575, email humanethics1@massey.ac.nz.

WHAT IS THE PURPOSE OF THE STUDY

The purpose is to assess 3rd year nursing students' knowledge, skills, and attitudes towards the nutrition care of patients. This study will help establish how prepared nurses are to provide nutrition care and identify improvement areas. This can help inform the curriculum for nursing training in the future.

As nurses are the largest health professional group, they are ideally positioned to provide nutrition care and support patients to understand the impact of nutrition care on their health

WHAT WILL MY PARTICIPATION IN THE PROJECT INVOLVE?

Professor Nicolette Sheridan, head of the School of Nursing at Massey University will invite all third-year nursing students from the Auckland, Wellington, and Palmerston North campuses to complete an online validated

nutrition competence (NUTCOMP) questionnaire. Participants will go into a draw to win one of three $100 countdown vouchers.

The NUTCOMP questionnaire has thirty-five questionnaire items related to confidence in nutrition care and seven questions seeking demographic characteristics and educational background. Questions will take 10 to 20 minutes to complete. The questions are answered anonymously online on a web-based platform called Qualtrics. Participants will not be identifiable to the researchers. To participate in this survey simply click the link in the invitation email and you will have 30 days to complete it. To go into the draw to win a countdown voucher please email Dom Heath at d.heath@massey.ac.nz at the completion of the survey and state what campus you're from in the body of the email.

WHAT ARE THE POSSIBLE BENEFITS AND RISKS OF THIS PROJECT?

The findings will assist both nurses and patients. This research will contribute to the curriculum development of the nursing programme and enhance the clinical practice of nurses. Patients will gain from enhanced nutrition care for their health.

Participation is voluntary, and if you choose not to participate in the study it will not prejudice your studies.

It is not anticipated that there will be any physical or psychological risks for participants. If the questions should trigger any psychological harm, you can contact Massey Student Counselling Services for support.
Auckland campus student health and counselling centre:
Free call or email studenthealth.auckland@massey.ac.nz +64 9 213 6700
Palmerston North student health and counselling centre: studenthealth.manawatu@massey.c.nz +64 6 350 5533
Wellington student health and counselling centre: Studenthealth.welington@massey.ac.nz +64 4 979 3030
Need to talk? Free call or text **1737** any time for support from a trained counsellor.

WHAT ARE THE COSTS FOR THOSE WHO PARTICIPATE IN THE PROJECT?

Participants will not incur any costs. Respondents will be entered into a draw for a chance to win one of three $100 countdown vouchers.

WHAT ARE MY RIGHTS?

You are under no obligation to accept this invitation. If you decide to participate, you have the right to:

- You can decline to respond to questionnaire items throughout the survey.
- withdraw from the study at any time, however, once answers are submitted online data cannot be retracted. But you can skip answering questions and choose not to submit it online.
- you will be given access to a summary of the project findings when it is concluded.
- Have access to deidentified results of the study.

WHOM DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns, or complaints about the project at any stage you can contact:

Name: Dominique Heath, MSc Nutrition & Dietetics Student, Massey University, Albany
Position: Primary researcher
Telephone number: [redacted]
Email: D.Heath@massey.ac.nz

Name: Prof Carol Wham, Professor of Public Health Nutrition, Massey University
Position: Main supervisor
Telephone number: [redacted]
Email: C.A.Wham@massey.ac.nz

Name: Dr Claire Minton, Director of Bachelor of Nursing, and Senior Lecturer, Massey University
Position: Co-supervisor
Telephone number: +64 6 9518340
Email: C.Minton@massey.ac.nz

Appendix 2: Email invitation

You are invited to complete a survey for 3rd Year Nursing Students in Providing Nutrition Care to Patients

Be into win one of three $100 Countdown Vouchers!

- Online survey takes 10-20 minutes to complete.
- Please see the attached participant information sheet
- Please contact Dom MSc Human Nutrition & Dietetics Student for further details via:
  email: d.heath@massey.ac.nz
  or mobile: [redacted]

Appendix 3: NUTCOMP Questionnaire

Survey to 3rd-year Nutrition Students in Providing Nutrition Care to Patients

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Start of Block: Consent

1 You have been asked to complete this online survey. This questionnaire contains 7 demographic questions and 35 questions about your confidence in nutrition care.

I have read and understand the information sheet. I have been given sufficient time to consider whether to participate in the study. I understand participation is voluntary and that I may withdraw at any time.

- ○ I agree to participate in this study under the conditions set out in the information sheet (1)
- ○ I do not agree to participate in this study (2)

Skip To: End of Block If You have been asked to complete this online survey. This questionnaire contains 7 demographic que... = I do not agree to participate in this study

End of Block: Consent

Start of Block: Section one: Demographic questions

Q1 What is your Gender?

- ○ Female (1)
- ○ Male (2)
- ○ Gender Diverse (3)

Q2 What is your age range?

- ○ 24 years or younger (1)
- ○ 25-34 years (2)
- ○ 35-44 years (3)
- ○ 45-54 years (4)
- ○ 55-64 (5)
- ○ 65 years or older (6)

Q3 Which ethnicity do you strongly identify with? (choose as many as you need)

- [ ] New Zealand European (1)
- [ ] Māori (Please state what Iwi you affiliate with) (2)

_____

- [ ] Samoan (3)
- [ ] Cook Island Māori (4)
- [ ] Tongan (5)
- [ ] Chinese (6)
- [ ] Indian (7)
- [ ] Prefer not to say (please state) (8)

_____

- [ ] other (please state) (9)

_____

End of Block: Section one: Demographic questions

Start of Block: Section two: Previous Nutrition and Education and Training

Q1 I feel I need further nutrition education to support my current role

- ○ Strongly disagree (1)
- ○ Disagree (2)
- ○ Agree (3)
- ○ Strongly agree (4)

Q2 Have you had a previous role in healthcare

- ○ Yes (please state) (1) _____
- ○ No (4)

Q3 Which of the following best describes your previous nutrition education?

- ○ I have completed a Certificate or other non-degree course that did not include nutrition content (1)
- ○ I have completed a Certificate or other non-degree course that included some nutrition content (2)
- ○ I have completed a Certificate or other non-degree course that was predominantly focused on nutrition (3)
- ○ I have completed a degree that did not include any nutrition content (4)
- ○ I have completed a degree that included some nutrition content (5)
- ○ I have completed a degree that was predominately focused on nutrition (6)
- ○ None of the above (7)

Q4 Do you agree that you would benefit from more nutrition education to support you in your role?

- ○ Yes (1)
- ○ No (2)

End of Block: Section two: Previous Nutrition and Education and Training

Start of Block: Section three: Confidence In knowledge about Nutrition and Chronic Disease

Q1 Please rate how confident you are in your knowledge of...

	Click to write Column 1				
	Not Confident at all (1 point) (1)	Not Very Confident (2 points) (2)	Somewhat Confident (3 points) (3)	Very Confident (4 points) (4)	Extremely Confident (5 points) (5)

1. How different body systems are affected by foods and nutrients (1)	○	○	○	○	○
2. How foods and nutrients influence the development and management of chronic disease (2)	○	○	○	○	○
3. How an individual's body composition (including size, shape, weight) can impact on the development of chronic disease (3)	○	○	○	○	○

4. The New Zealand Ministry of Health Eating and Activity Guidelines, including number of recommended serves of food groups and serving sizes for different ages and genders (4)	○	○	○	○	○
5. Guidelines for the nutrition-related management of specific chronic diseases (including type 2 diabetes and cardiovascular disease) (5)	○	○	○	○	○
6. How foods and nutrients interact with medications (6)	○	○	○	○	○

7. The most recently published peer-reviewed evidence regarding nutrition and chronic disease (7)	○	○	○	○	○

End of Block: Section three: Confidence In knowledge about Nutrition and Chronic Disease

Start of Block: Section two: Confidence in Nutrition Skills

Q2 Please rate how confident you are in your ability to...

	Click to write Column 1				
	Not Confident at all (1 point) (1)	Not Very Confident (2 points) (2)	Somewhat Confident (3 points) (3)	Very Confident (4 points) (4)	Extremely Confident (5 points) (5)

1. Interpret data about height, weight and body composition against reference ranges (1)	○	○	○	○	○
2. Interpret an individual's biological data (e.g. blood pressure, cholesterol levels) against reference ranges (2)	○	○	○	○	○
3. Collect information on the food that an individual usually eats (e.g. diet history, food frequency questionnaire) (3)	○	○	○	○	○

4. Use the New Zealand, Ministry of Health Eating and Activity Guidelines to evaluate the appropriateness of an individual's food intake (4)	○	○	○	○	○
5. Determine appropriate food or nutrition goals for an individual with chronic disease (5)	○	○	○	○	○
6. Formulate a meal plan for an individual with chronic disease (6)	○	○	○	○	○
7. Recommend changes in food choices for an individual with chronic disease (7)	○	○	○	○	○

8. Monitor and evaluate changes over time regarding the food an individual usually eats (8)	○	○	○	○	○
9. Maintain clear and concise records regarding the nutrition-related assessment and advice you provide to individuals (9)	○	○	○	○	○
10. Access the most recently published peer-reviewed evidence regarding nutrition and chronic disease (10)	○	○	○	○	○
11. Provide nutrition care that results in improvements in the food that an individual usually eats (11)	○	○	○	○	○

End of Block: Section two: Confidence in Nutrition Skills

Start of Block: Section three: Confidence in Communication and Counselling about Nutrition

Q3 Please rate how confident you are in your ability to..

	Click to write Column 1			
	Not Confident at all (1 point) (1)	Not Very Confident (2 points) (2)	Somewhat Confident (3 points) (3)	Very Confident (4 points) (4)

1. Clearly describe what patients/clients can expect from their discussions with you about food or nutrition (1)	○	○	○	○
2. Check a patient's/client's understanding of the influence of food and nutrients on their health (2)	○	○	○	○
3. Work with patients/clients to identify possible ways to improve the food they usually eat (3)	○	○	○	○
4. Demonstrate genuine empathy to patients/clients about their food-related experiences and goals (4)	○	○	○	○
5. Maintain a non-judgemental attitude in discussions with patients/clients about the food they eat (5)	○	○	○	○

6. Communicate with clients about food and nutrition using culturally appropriate language (6)	○	○	○	○
7. Consider how personal, social, cultural, psychological, and economic factors may influence the foods that a patient/client eats (7)	○	○	○	○
8. Identify individuals who need additional support from other health professionals or services regarding the food they eat (8)	○	○	○	○
9. Communicate with other health professionals about the discussions you've had with patients/clients regarding food (9)	○	○	○	○

End of Block: Section three: Confidence in Communication and Counselling about Nutrition

Start of Block: Section Four: Attitudes Towards Nutrition Care

Q4 Please rate your agreement with the following statements...

	Click to write Column 1				
	Not Confident at all (1 point) (1)	Not Very Confident (2 points) (2)	Somewhat Confident (3 points) (3)	Very Confident (4 points) (4)	Extremely Confident (5 points) (5)

1. It is important that all individuals usually eat healthy foods regardless of age, body weight and physical activity levels (1)	○	○	○	○	○
2. If the topic arises, it is important that I encourage my patients/clients to eat healthy foods (2)	○	○	○	○	○
3. It is important that I take every opportunity possible to encourage my patients/clients to eat healthy foods (3)	○	○	○	○	○
4. Encouraging my patients/clients to eat healthy foods is an effective use of my professional time (4)	○	○	○	○	○

5. Providing specific nutrition recommendations to my patients/clients that can assist with managing their chronic disease is an effective use of my professional time (5)	○	○	○	○	○
6. Encouraging my patients/clients to eat healthy foods is within my scope of practice (6)	○	○	○	○	○
7. Providing specific nutrition recommendations to my patients/clients that can assist with managing their chronic disease is within my scope of practice (7)	○	○	○	○	○

8. It is important that I encourage my patients/clients to seek support from other health professionals if I am unable to meet their nutrition-related needs (8)	○	○	○	○	○

End of Block: Section Four: Attitudes Towards Nutrition Care