THE EFFECT OF SIMULATIONS ON THE DEVELOPMENT OF DIETETIC STUDENTS' PROFESSIONAL COMPETENCIES AND THE ASSOCIATED LEVEL OF ANXIETY

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A thesis submitted in partial fulfillment of the requirements for the

Master of Arts degree in Education to Health Professionals

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ACKNOWLEDGMENTS

This dissertation would not have been possible without the guidance of my thesis supervisor, Pre Giroux. Your advices and contributions as well as your patience, moral support and listening skills allowed me to continue throughout each step. Your boundless energy, and hard work have taught me to never stop myself from going above and beyond, and to never stop believing in myself. Your passion for dietetic education and research is something that I will take with me forever. I will always remember our laughter during our meetings, even after a long day of work, we always find the time to decompressed and enjoy our time together. You are an incredible mentor. Thank you for everything.

I would like to thank my dissertation committee members, Eric Dionne, Katherine Moreau and Nathalie Bélanger, for bringing new insight to my work and helping me progress. Thank you to the Consortium national de formation en santé (CNFS) – Volet Université d'Ottawa for their incredible financial support. They have believed in this research project and the integration of simulations from the beginning. I have been fortunate to have the financial aid of the University of Ottawa for the admission scholarship and SSHRC master scholarship. Financial support has allowed me to focus on developing the skills necessary to be a novice researcher. Additionally, I would like to thank the SSHRC' foreign study supplements program. It allowed me to study in Lyon, France for three months where I have learned how simulations' research is conducted. I had the pleasure to learn in a multidisciplinary team of doctors and nurses in critical care and pediatrics' simulations.

I would also like to thank my family and friends. To my mom and dad, Sylvie Ross and Yvan Rosa, and my sister, Anne-Marie Rosa for your encouragements through each step along the way, for always believing in my potential and for your unconditional love. I always felt your love and support. To my friends, Jessica Guibord, and Maude Groulx-Roy, for our study session since high school, both of you have amazing listening skills, advices, for your help and incredible ability to motivate me and believe in myself. Thank both of you to help me go through all the ups and downs. To my friend, Alexandra Pépin. Since our undergraduate studies together, we have gone through many study sessions, coffee breaks (almost all coffee shops in Ottawa!), and laughter. Your passion for your own research inspires and motivates me every day to continue. In you, I have made a lifelong friend.

ABSTRACT

This research project looked at the development of professional competencies and the anxiety level of dietetic students with the use of four simulations. The research question was: What is the effect of simulations on the learning process of professional competencies and anxiety level of dietetics students? A mixed method convergent design with simultaneous qualitative (individual interviews and focus group discussion) and quantitative (questionnaires and observation of performance indicators) data collection was used. Results showed the median anxiety level of dietetic students (n=14) decreased pre-post simulations. Students' perception of competency learning and their achievement of competency performance indicators both improved pre-post simulations. This research documented how dietetic students perceived their learning process to demonstrate professional competencies with the use of simulations. Those results are helpful for educators to help understand the learning process and development of competencies of students while using simulations, as well as understand the anxiety level of students.

Key words: simulations, dietetic students, professional competencies, anxiety, assessment, education,

Ce projet de recherche portait sur l'apprentissage par simulation, le niveau d'anxiété et le développement des compétences professionnelles d'étudiants en diététique. La question était : Quel est l'effet des simulations sur le processus d'apprentissage des compétences professionnelles et le niveau d'anxiété d'étudiants en diététique? Une méthode mixte convergente avec collecte de données qualitatives (entrevues individuelles et discussion de groupe) et quantitatives (questionnaires et observations d'indicateurs de performance) a été utilisée. Les résultats ont montré que le niveau d'anxiété médian des étudiants (n=14) a diminué pré-post simulations. La perception qu'avaient les étudiants de l'apprentissage des compétences et l'atteinte des indicateurs de performance se sont améliorées pré post simulations. Cette recherche documente comment les étudiants en diététique ont perçu leur processus d'apprentissage des compétences professionnelles avec les simulations. Ces résultats sont utiles aux éducateurs afin de comprendre le processus d'apprentissage du développement des compétences des étudiants à l'aide de simulations, et leur niveau d'anxiété.

Mots clé : simulation, étudiants en diététique, compétences professionnelles, anxiété, évaluation, éducation

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ABBREVIATIONS

AfL = Assessment for learning

BI = Behavioral indicators

CDRE = Canadian Dietetic Registration Examination

CRM = Crisis Resource Management

HPS = Human patient simulation

ICAR = Interprofessional Collaborator Assessment Rubric

ICC = Inter class correlation

ICDEP = Integrated Competencies for Dietetic Education and Practice

IP = Interprofessional

IPS = Interprofessional simulation

LASSI = Learning and Study Skills Inventory

NFPE = Nutrition Focused Physical Exam

OSCE = Objective Structured Clinical Examination

PDEP = Partnership for Dietetic Education and Practice

PEARLS = Promoting Excellence and Reflective Learning in Simulation

PI = Performance Indicators

S = Simulation

SP = Standardized patient

SPSS = Statistical Package for the Social Sciences

STAI = State-Trait Anxiety Inventory

T = Time

TEAM = Team Emergency Assessment Measure

GLOSSARY

Anxiety: A feeling from an unknown source that produces apprehension or fear.

Cognitive load theory: Learning is compromised when the amount of information required exceeds the capacity of working memory.

Competency: A task that is performed in practice that can be carried out to a specified level of proficiency. The performance of a practice competency requires application of a combination of knowledge, skills, attitudes and judgments.

Formative evaluation: Activities undertaken by teachers and by their students in assessing themselves that provide information to be used as feedback to modify teaching and learning activities.

Performance indicator: A performance indicator is a task that can be carried out within an assessment vehicle, successful completion of which provides an indication of the candidate's ability to perform a practice competency.

Simulation: An educational approach that represents a real-world situation in a controlled environment where students act as health professionals with standardized patients.

Standardized patient: The actor, who plays the standardized patient, is specifically trained to interact with the student and enable him to acquire essential skills.

State anxiety: The frequency to which a person feels anxious, is considered a feeling persistent over time.

Validity: The evidence that a study allows correct inferences about the question it was aimed to answer or that a test measures what it set out to measure conceptually.

Reliability: The ability of a measure to produce consistent results when the same entities are measured under different conditions.

Social learning theory: Theory of learning processes and social behaviors which propose that new behaviors are acquired by observing and imitating others.

Theory of cognitive interference: Evaluation anxiety is increase with negative off-task self-dialogue, which can diminish cognitive performance.

Trait anxiety: The magnitude of anxiety experienced during a specific situation. It is an immediate response in anxiety towards a change in a specific environment.

INTRODUCTION

University education in health sciences programs has evolved with innovations and new technologies. Specifically, over the past twenty years there has been a shift in education approach to bridge the gap between theory and practice (Boet, Granry, & Savoldelli, 2013). According to published studies, learning-by doing stimulates the development of critical thinking and self-directed learning (Browne & Freeman, 2000; Gokhale, 1995). Case studies approach, group projects, virtual clinical trials, and simulations are different types educational approaches used in learning-by-doing (Newton, Bettger, Buchholz, Kulak, & Racey, 2015). The use of simulations has been documented more and more in the past few years in scientific literature related to different health sciences education disciplines, such as in medicine and nursing (Levett-Jones & Lapkin, 2013). On the other hand, there is a lack of scientific literatures in the integration and use of simulations in dietetic education. The effect of learning with simulations on the acquisition of competencies related to dietetic practice remains unknown.

In other health sciences disciplines, simulations have been used as a teaching method and more recently as an assessment method (Boet, Jaffrelot, Naik, Brien, & Granry, 2014). Indeed, it appears that when students are placed in a controlled environment situation where they are required to act as the health professional with a patient or manikin in a real-life scenario, they seem to learn different competencies such as technical skills, as well as abilities in communication, counselling, and critical thinking (Levett-Jones & Lapkin, 2013; Shin, Park, & Kim, 2015). However, when students are required to perform in academic settings, they can feel anxious and this might influence the performance (Ignacio et al., 2016). Anxiety, performance and simulations have been studied in nursing and medicine. Yet, there are very few studies on dietetic education and simulations, none of these studies have looked at the potential effect of anxiety.

In view of the lack of current published research, it seems important to explore the effect of using simulations on the acquisition by dietetic students of key entree-to-practice competencies required to safely provide nutrition care, in addition to assessing their level of anxiety since this parameter likely influences performance.

This research project looked at the assessment of professional competencies and perceived level of anxiety with the use of simulations in dietetic students. This thesis by articles contains seven chapters. The first chapter presents the problematic regarding educational approaches in health sciences disciplines, especially in dietetic education. It also raises the importance of looking at anxiety regarding simulations' performance of trainees. The second chapter is dedicated to a review of the literature about the problematic exposed in chapter one. The second chapter also presents a conceptual framework on which this research is based. Additionally, this chapter presents the research objectives and questions. The third chapter outlines the methodology used for this mixed-method research, with details about the population, tools, data collection, and analysis. Chapters four, five and six are the three articles presenting the main results of the research project. Chapter four details the students' perceptions of learning with four simulations throughout a semester. Chapter five displays students' perceived anxiety before and after a series of simulations. The last article in chapter six presents the assessment of entry-level skills necessary for dietetic practice using simulations as an evaluation tool. Chapter seven provides a general discussion related to the main results from all three articles. This chapter also presents the strengths and limitations of this research project and future implications in dietetic practice, research and education. Lastly, a conclusion summarizes the entire research project. References and appendix are at the end of the dissertation.

CHAPTER 1 – THE PROBLEM

1.1 General context

Government recommendations in university education tend to integrate new approaches, such as work-integrated learning to provide relevant experiences before arriving in the workplace (Morneau, 2019). Educators and professors have to adapt to new approaches. That being said, in the past twenty years there has been a shift in the post-secondary education approach, particularly in health professionals' education (Boet et al., 2014). Indeed, teaching methods have focused on authentic learning that bridges the gap between theory and practice rather than the traditional teacher-centered model (Torres & Tritsch, 2013). For competency-based programs, such as several health sciences disciplines, it is important to include learning-by-doing since it promotes the development of critical thinking and self-directed learning. This type of learning can occur using a case study approach, a project approach, a simulation or even a virtual clinical trial approach (Newton et al., 2015). This transformation in university education maximizes the acquisition of practical knowledge while ensuring the safety of patient care (Boet et al., 2013). Simulations are an example of new technologies being incorporated by educators into several Canadian post-secondary programs to enhance learning, particularly for health sciences students (Collange & McKenna, 2013).

Medical and nursing programs frequently use it as a teaching tool (Levett-Jones & Lapkin, 2013). Human patient simulation (HPS) is an educational approach that represents a real-world situation in a controlled environment where students act as health professionals with standardized patients (SP) (Levett-Jones & Lapkin, 2013). It is now systematically included in medicine and nursing curricula to learn various procedures and skills. It is used to teach non-technical skills such as professional competencies (e.g., communication, critical thinking) and can support the practice of interprofessional skills of future doctors and nurses (Boet et al., 2014). On the other hand, its integration is more recent in dietetic education programs. Indeed, its relevance remains to be demonstrated in this field since there is scarce in scientific literature to support its relevance in dietetics education. Furthermore, simulations are not systematically included in dietetic curricula even if national associations like Dietitians of Canada and the Academy of Nutrition and Dietetics recommend its integration (Dietitians of Canada, 2011a;

Thompson & Gutschall, 2015). Therefore, there is no recension of the use of this learning tool in dietetic education programs in Canada or in any other country. Further, according to a 2016-2017 Dietetic Educators' Annual Report, only four of the eighteen university programs mentioned the integration of simulations into their curriculum (Dietitians of Canada, 2017). Some educators use it for public and population health nutrition, others to replicate the realities encountered in clinical settings (Dietitians of Canada, 2017). Since the use of simulation can vary, it is important to ask how it would be possible to implement simulations in dietetic education curricula. By documenting the effects of learning with simulations on the acquisition of skills, it would help increase its use by educators to support competency-based learning programs.

1.2 Specific context

Training for future dietitians in Canada is offered at the university level. A dietitian's role is "to translate complex scientific data into practical solutions for the purpose of promoting health and helping clients manage particular health problems such as diabetes, heart diseases, cancers, food allergies and obesity" (Les Diététistes du Canada, 2016). There are different types of university programs across the country to educate dietetic trainees for them to gain the knowledge, judgment, and competencies to become a registered dietitian. The programs with integrated academic and practical curriculum represents the only education option where all the students admitted to the baccalaureate in dietetics complete an internship in the different environments necessary for practice (e.g. clinical nutrition, public and population health and food service management). After completing their mandatory practicum placements, these students are able to register for the Canadian Dietetic Registration Examination (CDRE). This type of curriculum that incorporates hands-on training is offered in all post-secondary programs in Quebec, New Brunswick, British Columbia, Alberta, Saskatchewan and at the University of Ottawa in Ontario. Knowing that, at the University of Ottawa, all the students enrolled in the program will do their mandatory practicum placements and will be able to register for the entry-level examination to the profession with the completion of the internship, it is essential to prepare them for their entry into practice. To do so, students must develop practice competencies at entry-level proficiency as defined by the Integrated Competencies for Dietetic Education and Practice (ICDEP) of the Partnership for Dietetic Education and Practice (PDEP) (Partnership for Dietetic Education and Practice, 2013). This unincorporated collaborative inter-organization's mission is to "bring

together dietetic professionals, educators and regulatory sectors together to work on issues to advance education and practice." It is the partnership of the Alliance of Canadian Dietetic Regulatory Bodies, Dietitians of Canada and dietetic educators. As defined by PDEP, an entry-level dietitian must "perform relevant competencies in a manner consistent with generally accepted standards in the profession, without supervision or direction, and within a reasonable timeframe" (Partnership for Dietetic Education and Practice, 2013 p.2).

The learning of practical competencies cannot be achieved with only traditional teaching strategies, since students must be able to translate their knowledge into actions (Leigh, 2008). As a matter of fact, PDEP recommends the use of various teaching methods such as simulations (Partnership for Dietetic Education and Practice, 2019). Simulations have been introduced in 2012 at the University of Ottawa as part of the Honours Bachelor in Nutrition Sciences to enhance teaching and learning of professional competencies. In other disciplines at the Faculty of Health Sciences, simulations have been used to practice professional skills, however, little is known about the acquisition of competencies specific to dietetic practice with simulations.

1.2.1 Simulations-based learning

In the first place, simulations have gradually been introduced into the curriculum of certain disciplines to improve the training of students in various health related programs. Simulation is defined as an activity that represents a real-world situation in a controlled environment where students act as health professionals and interact with a SP (Levett-Jones & Lapkin, 2013). The actor who plays the SP is specifically trained to interact with the student and enable the student to acquire practical essential skills. Simulation could serve as a tool to improve the transition between theoretical notions and practice in order for dietetic students to be ready for practicum placements. Training of future dietitians should cover competency development for conditions where the patient is at higher risk of complications or where the health professional is frequently exposed to the condition (Chatalalsingh, 2014; Chiniara et al., 2013).

Dysphagia, support nutrition (enteral or parenteral) and diabetes represent conditions identified by registered dietitians in Ontario where nutritional intervention appears to be riskier for the patient's health (Chatalalsingh, 2014). Training is essential, specifically for providing complex care where an interprofessional approach is required such as for these conditions. The

majority of future dietitians will work in the health sector which includes hospitals and long-term care. According to Dietitians of Canada's survey, approximately 45% of dietitians work in this type of health facility (Dietitians of Canada, 2011b). In addition, dysphagia is a high-risk condition for nutrition intervention (Chatalalsingh, 2014). It is therefore important to prepare dietetic students to meet the demand for dysphagia-specific care as this will be a condition that most clinical dietitians will face during their career.

Furthermore, it is relevant to note that health professionals will greatly influence a patient with dysphagia (Garus, Vanderkooy, & Eisenbraun, 2015). In addition, the College of Dietitians of Ontario identifies speech-language pathologists, occupational therapists, physiotherapists, nurses and registered dietitians as having an important role in interprofessional (IP) collaboration in the delivery of care for patient with dysphagia (Alliance canadienne des organismes de réglementation des diététistes, 2019). For the safety of patients, future health professionals must understand the importance of IP collaboration and communication and how to integrate those in their practice. This type of team approach can increase patients' satisfaction, reduce health care costs and increase job satisfaction (de la Tribonnière & Gagnayre, 2013). Each health professional practices under the supervision of a provincial or national organization and each of these defines the primary roles of stakeholders. There is an overlap of expertise in IP dysphagia management. This overlap provides complementary patient care and facilitates collaboration and communication among health professionals (Alliance canadienne des organismes de réglementation des diététistes, 2019). Dietitians play an important role in developing collaboration with members of the interprofessional care team as well as establishing the nutritional treatment plan with the patient. A difficulty in clinical placements is that students will not see the same types of patients with the same conditions.

Given the circumstances of practicum placements in different environments (eg. rural vs urban hospitals, long-term care facilities), students could lack homogeneity in experiences, thus mastering different competencies (Isaacson & Stacy, 2009). For dietetic programs, this context offers the opportunity to include interprofessional simulations to learn the basics competencies related to IP dysphagia management. The use of such teaching methods thus ensures homogeneity in students' learning experience of essential skills for entry to practice. In addition, it is paramount for all health professionals to know each other's role and know how to work as a

team for the well-being of their patients. Lastly, the Academy of Nutrition and Dietetics supports the importance of integrating simulations into dietetic curriculum to target important competencies such as professional practice, communication and collaboration, and nutrition care (Chiniara et al., 2013; Thompson & Gutschall, 2015).

1.2.2 Assessment with simulations

It is has been adequately demonstrated in the medicine and nursing education research that the use of simulations allows to acquire techniques or professional attitudes; however the evaluation of these performance indicators is not widespread in all disciplines (Boet et al., 2013). Simulation was first used by medical programs as a learning tool, and then several educators saw the opportunity to use it as an assessment tool (Boet et al., 2014). In nursing programs, simulations are mostly used for teaching and learning strategies (Gore, Van Gele, Ravert, & Mabire, 2012; Hovancsek et al., 2009; McGarry, Cashin, & Fowler, 2014; Roh, Kim, & Kim, 2014; Willhaus, Burleson, Palaganas, & Jeffries, 2014). The use of simulation for assessment came later on. This type of assessment has been employed with students in paramedical care, medicine and nursing (Boet et al., 2014). Authentic assessment in real-life scenarios provides an overview of the student' learning and an opportunity to give feedback on the student' performance (Bosco & Ferns, 2014) during the debriefing conversation. Assessment where the intention is to adapt teaching to students' learning outcomes, is called a formative assessment (Bloom, Hastings, & Madaus, 1971). It can be done in many ways: proactive, retroactive and interactive (Stobart, 2008). Retroactive assessment is the most frequently used (Ninomiya, 2016). It aims to identify the learning difficulties of the student and the professor can adjust the teaching strategies (Black & Wiliam, 2010). This type of assessment has been critiqued because professors will not always adjust to learners' level of competence (Ninomiya, 2016). Formative evaluation is often used like a summative evaluation without a given score, rather than as the real intended use of formative evaluation. To provide an effective formative assessment, the learner must be included in the process as suggested by the interactive evaluation (Ninomiya, 2016). This type of formative evaluation is based on the Assessment for learning (AfL), which allows to initiate a dialogue between the teacher and the learner to help him become an independent learner (Ninomiya, 2016). AfL allows to engage students in metacognitive process to think about their performance, to engage the students' motivation and cooperation and to ensure an adaptation of teaching and

learning to attain learning outcomes (Laveault & Allal, 2016). When this strategy is well executed, as AfL details, formative assessment is beneficial for students because they feel involved in their learning experience.

Until this project, in the University of Ottawa's Honours Bachelor in Nutrition Sciences, simulation had been used as a practice tool to stimulate the development of professional practice competencies. However, it would be relevant to use simulations to also assess students' performance. This evaluation can be done using an evaluation grid of performance indicators with a rating scale. This type of grid, called a rubric, is recommended to evaluate learning objectives against outcome measured, such as performance indicators. If used repeatedly, assessment results can tell us about the progression of students' performance (Monaghan, Jones, Haddad, & Ineck, 2005). In addition, evaluation with a rubric improves the quality of feedback given to students because it identifies low scores on competencies, thus helping educators in providing a specific feedback (Holmboe, Sherbino, Long, Swing, & Frank, 2010; Schuwirth & Van der Vleuten, 2011).

Evaluating students' performance using an observer' judgement and a rubric of performance indicators has different benefits (Mctighe & Ferrara, 1996; Monaghan et al., 2005) This assessment documents students' progress, offers feedback and a chance for students to improve during the discussion after the simulation (Monaghan et al., 2005). In other words, the use of simulation and the assessment of students' performance help documenting their progress towards the practice of dietetics competencies before going on their clinical practicum placement. By evaluating their progress, students receive personalized feedback that allows them to work on specific and concrete elements. In addition, the assessment of the performance during the simulations can be done based on the judgment of the observer. However, in general, performance assessment can cause anxiety among students.

Despite the advantages of this type of learning activity, students can experience anxiety about the practice and the evaluation during simulations (Ignacio et al., 2016). They can also experience anxiety during their clinical practicum placement which can affect their performance (Ignacio et al., 2016). In nursing programs, it seems that self-confidence increases after simulations which could allow the students to be better prepared and experience less anxiety before going into clinical training (Laschinger et al., 2008). Since there is no scientific literature

on the subject, it is questionable whether dietetic students' self-confidence and anxiety are improved by the use of simulations. Especially since this teaching approach is not commonly used in dietetic education programs, learners do not know this type of assessment and are not expecting it. This might also influence their anxiety levels regarding the practice with simulations.

1.2.3 Anxiety and learning

Originally, studies that assess students' level of anxiety during school performance began being published in the 1980s in the Unites States (Depreeuw, 1984; Hembree, 2008; Morris, Davis, & Hutchings, 1981). These studies focused mainly on describing the profile of anxious students and identifying causes and influences, when writing an exam (Depreeuw, 1984; Hembree, 2008). More recently, researchers have shown that anxiety among students appears to negatively affect their academic performance when it exceeds an acceptable level (Cassady & Johnson, 2002; Ignacio et al., 2016). This phenomenon can be partly explained by the cognitive load theory. It suggests that learning is compromised when total loads exceeds the capacity of working memory, for example if students are required to perform during a simulated activity (Schlairet, Schlairet, Sauls, & Bellflowers, 2015). Loads could represent the amount of information required for working memory. According to Fraser and al. (2012), nursing students with little clinical experiences tend to have higher cognitive loads during their first simulation, thus compromising the learning experience (Fraser et al., 2012). In the same vein, the theory of cognitive interference partially explains the association between assessment anxiety and decreased performance (Coy, O'Brien, Tabaczynski, Northern, & Carels, 2011). Other elements can also influence performance anxiety. For example, the efficiency and effectiveness in which a student will do the task is influenced by performance anxiety experienced by a student (Eysenck & Calvo, 1992). Also, when facing an evaluation, some individuals are more anxious due to negative thoughts (Northern, 2010). In addition, according to Cassady (2010), it seems that more anxious students see their academic performance reduced compared to less anxious students with the same level of knowledge and preparation before an exam (Cassady, 2010). In fact, memory, anxiety and learning are narrowly related (Al-Ghareeb, Cooper, & McKenna, 2017). Therefore, it is necessary to explore the reality experienced by the students during simulations because, as reported by several dietetic supervisors of students in clinical practicum, one of their main weaknesses is their

level of anxiety (Gibson, Dart, Bone, & Palermo, 2015). Anxiety can negatively influence students' performance, as reported by dietetic supervisors or positively influence their performance as explained by Yorkes-Dodson law (Yerkes & Dodson, 1908). This law describes how anxiety has a positive impact on performance up to a certain level.

If school performance is negatively influenced by anxiety, it is possible to think that it will also have a negative influence on patient care. In addition, if the simulation serves as an assessment method for students, it is important to assess students' level of anxiety, which can influence their performance. Research in the field of dietetics on the effect of simulation and anxiety is undeveloped. It is relevant to have a better understanding of anxiety levels in dietetic students to improve student's learning experience.

In view of a lack of current published research on learning with simulations in dietetics and the anxiety it may cause, it seems important to explore the effect of using simulations on the acquisition of the key competencies required to safely provide IP dysphagia care through simulations among dietetic students, in addition to assessing their level of anxiety since this parameter would influence their performance.

CHAPTER 2 – LITERATURE REVIEW AND CONCEPTUAL FRAMEWORK

Considering the identified issue, it is relevant to present the concepts and the latest scientific literature on the use of simulations in education of future health professionals. The following literature review focuses on dietetic education programs with simulation, competency assessments, and the level of anxiety related to learning with simulation. The review of the literature on the influence on anxiety outlines research in the health sciences, as there appear to be very little studies done in dietetics so far.

2.1 Simulation in education

First, HPS is based on various learning theories. One of them, Kolb' learning cycle, explains that learning is built on previous knowledge and is developed with hands-on experience, like simulations (Kolb, 1984). This progression occurs during successive simulations. The student is guided to transform his knowledge throughout the activity during the prebriefing, the simulated activity itself, the debriefing, and when the activity is repeated (Jeffries, 2012; Newton et al., 2015). During the debriefing session, an observer questions students on the situation and on possible solutions which makes them compare previous knowledge with the new concepts in order to transform the thought patterns (Kolb, 1984; Rutherford-Hemming, 2012). In addition, when students are exposed to multiple simulations on a similar topic, it allows them to apply these new thought patterns and reshape them.

When simulations are interprofessional, the role of other health professionals can be incorporated in the scenario. Social theory supports the relevance of incorporating interprofessional simulations (IPS) into five objectives (Pottier, 2013). First, the social theory encourages small group collaboration. Secondly, it encourages real-time interactions to promote problem-solving skills (Pottier, 2013). This theory proposes to develop opportunities that allow reflection, and cooperative learning within a team. Finally, the main objective of this theory is to develop group decision-making skills and accountability for these decisions (Pottier, 2013). IPS thus makes it possible to integrate several objectives from social theory. Besides, if simulation is used as a tool to do performance assessment, it is relevant to represent an authentic situation, i.e a real-life setting situation where the student applies his competencies and knowledge, such as a simulation (Khamis, Satava, Alnassar, & Kern, 2016). In light of the theoretical concepts

supporting simulations, it is relevant to know what the scientific literature has demonstrated regarding learning outcomes with its utilization among dietetic students and other health science students.

In terms of students' perception, several studies have found that simulation is appreciated by dietetics students (Beshgetoor & Wade, 2007; Farahat et al., 2016). Besides, according to studies in dietetic, there was no difference between the use of SP and real patients on the acquisition of communication skills (Gibson & Molloy, 2012; Schwartz, Rothpletz-Puglia, Denmark, & Byham-Gray, 2015). Also, in focus group discussions after simulations, students (n = 10) reported improving their counselling and communication skills with the activity (Henry, Duellman, & Smith, 2009). Although these results are relevant, it is important to interpret them prudently due to the small sample size. At the university of Central Michigan University, students reported a significant increase in empathy in a pre-post survey when participating in a simulation with a SP who had gestational diabetes (Heuberger, 2010). A recent abstract revealed that simulations were often used to practice working with the Nutrition Care Process, precisely Nutrition diagnosis and Nutrition assessment (Buchholz, Hendrickson, et al., 2018). Two abstracts from different universities have reported the use of simulation to practice enteral nutrition formula adjustments (Lewis, 2014; Roos, Beverly, & Michelle, 2017). A recent study used simulations part of Objective Structured Clinical Examination (OSCE) to enhance learning of the Nutrition Focused Physical Exam (NFPE), a full-body examination to assess the patient' nutritional status (Tyler, 2017). Sixteen students participated in this study, 88% of them felt more confident in providing the NFPE after the simulation (Tyler, 2017). Participants also reported that they were satisfied with the realism of the activity (Tyler, 2017). Bould and Naik (2013) published a literature review on the future of simulation research, and suggested that compared to traditional non-interventional teaching, simulation is more beneficial for learning of competencies (Bould & Naik, 2013).

Accordingly, based on written answers on open-ended questions after the activity dietetic students (n = 16) mentioned that simulations allowed them to improve their counseling skills and their patient-centered approach (Gibbs, George, Barkley, & Meyer, 2015). In addition, in their study Gibbs et al. (2015) showed that dietetic students' clinical judgment improved after participating in a simulation. To obtain these results, they have assessed clinical judgment by

analyzing nutrition notes written in medical record after a HPS (Gibbs et al., 2015). Although, competency assessments with the use of simulation are not widespread in dietetics, few studies have tried to objectively measure skills, for example, for IP dysphagia management. This type of research was studied in Australia by Miles et al. (2016) in a speech language pathology program with dietetic students within an IPS approach (Miles, Friary, Jackson, Sekula, & Braakhuis, 2016). As mentioned earlier, when a patient has dysphagia, the dietitian' involvement has been showed to reduce health complications, such as malnutrition and aspiration pneumonia. This study assessed dysphagia care using IPS since this condition is treated with an interdisciplinary team (Miles et al., 2016). In light of the above, it is relevant to identify the use of interprofessional simulations that integrate dietetic professionals since it represents more the reality of the workplace. By presenting an IP situation to dietetic students, such authentic assessment could better predict the attainment of the competencies required for their future practice.

2.1.1 Interprofessional simulation (IPS)

IPS is comparable to traditional simulation, but incorporates more than one discipline into the scenario (Eliot & Kolasa, 2015). In other words, the interprofessional simulations' scenario must integrate the role of various health professionals. It is not necessary for students from other disciplines to be present, health professionals can participate in the simulation in order to represent other disciplines. Few researchers have examined such subject (Boet et al., 2014). In 2013, an abstract about the use of IPS in a dietetic program was published in the Journal of Academy of Nutrition and Dietetics (D'Apice et al., 2013). Students who had participated in IPS perceived their learning outcomes significantly higher than the group who only participated in a traditional lab activity without IPS (D'Apice et al., 2013). Two other abstracts published in 2018, respectively, concluded that IPS could help the students understand their own weaknesses and help increase confidence in providing interprofessional care (Getty & Thiagarajah, 2018; Smith, Hsiao, Clark, & Boothby, 2018). IPS seems to enhance students' understanding of the role of different health professionals (Holthaus et al., 2015). It is important to have other disciplines present to ensure these positive learning outcomes. As reported in Holthaus et al. (2015), compared to IPS with students from different disciplines, IPS with only nursing students who played the role of other discipline did not show the same positive outcomes on understanding of

IP roles. As well as enhance students' understanding of their own role in the interdisciplinary care team (Gibbs et al., 2015; Holthaus et al., 2015), which is beneficial knowing that one of the barriers to interprofessional communication is the lack of understanding of their role and that of other team members (Holthaus et al., 2015). In addition, according to Holthaus and al. (2015) IPS increases appreciation towards teamwork (Holthaus et al., 2015), which is important to provide a healthy workplace (Eliot & Kolasa, 2015). To obtain those results, researchers used a pre-post mixed method approach with questionnaires and focus group discussions after simulations (Holthaus et al., 2015). Furthermore, it has been noted by some researchers that simulation could promote the acquisition of different competencies necessary for dietetic practice (e.g, knowledge related to nutrition care, clinical reasoning, communication, etc.) (Gibbs et al., 2015; Holthaus et al., 2015; Miles et al., 2016). Considering that the multidisciplinary approach is put forward in hospital environments, it is important to focus on the acquisition of interprofessional skills and attitudes, as well as the evaluation of these competencies in order to document progress in their learning.

2.1.2 Simulation and competency development

Therein, it is suggested that by allowing the application of clinical competencies during a simulation exercise, students would be better prepared for their clinical practicum placement. The Partnership for Dietetic Education and Practice in Canada (PDEP) identifies in ICDEP five broad areas of competency. Each competency area includes a list of practice competencies with performance indicators (PI). A competency is defined as "a task that is performed in practice that can be carried out to a specified level of proficiency. The performance of a practice competency requires application of a combination of knowledge, skills, attitudes and judgments." (Partnership for Dietetic Education and Practice, 2013, p.2). Each competency defines academic and practice performance indicators to facilitate assessment. "A performance indicator is a task that can be carried out within an assessment vehicle, successful completion of which provides an indication of the candidate's ability to perform a practice competency" (Partnership for Dietetic Education and Practice, 2013, p.3). By evaluating the achievement of performance indicators, it is possible to determine the attainment of practical competencies.

On the other hand, since clinical environments are increasing their expectations of trainees, it is essential to train students to professional practice of care during university courses (Kaddoura, Vandyke, Smallwood, & Gonzalez, 2015). Some researchers have attempted to assess the development of competencies for dietetic practice through the use of IPS (Buchholz, Vanderleest, MacMartin, Prescod, & Wilson, 2018; Gibbs et al., 2015; Holthaus et al., 2015; Miles et al., 2016; Tyler, 2017). As mentioned earlier, Miles (2016) focused on acquiring knowledge about dysphagia care using simulation as a learning method. The study was done using vignettes as an assessment tool (Miles et al., 2016). The results showed that the participants significantly increased their knowledge between the first evaluation (vignette 1) and the last one (vignette 3) after a series of three simulations on the same day (Miles et al., 2016)

In another vein, clinical reasoning seemed to have increased among dietetic students with the use of IPS (Gibbs et al., 2015; Miles et al., 2016). According to another study it seems that communication skills remain unchanged as a result of pre-post simulation questionnaires practice (Gibbs et al., 2015). This result is surprising since IPS is intended to be used as an exercise for verbal and non-verbal communication between the patient and the health professional. However, the researchers explained that there was no significant difference before and after the simulation since the students already perceived themselves as very competent in communication before the workshop (Gibbs et al., 2015). In a recent study, dietetic students in a master program at the University of Kansas (n = 16) were video recorded during a simulation, and two observers independently assessed students' performance afterward (Tyler, 2017). The raters used a checklist developed by the *Academy of Nutrition and Dietetics* specifically designs for Nutrition Focused Physical Exam (Tyler, 2017). The NFPE is a physical examination of the patient that assesses his nutritional status by observing signs of malnutrition, nutrient deficiency or toxicity (Litchford, 2013). Significant improvements were observed in two of the seven assessment categories (muscle exam and subcutaneous fat exam) (Tyler, 2017). Scores on overall performance were significantly improved according to one observer, but not the other. According to researchers, inter-rater reliability was met (Cohen kappa = 0.78) (Tyler, 2017). As mentioned earlier, due to the small sample size, results have to be interpreted cautiously. It appears common for research in dietetic simulations to report small samples. In a recent abstract, at the University

of Guelph, Ontario, simulations with SP were used to assess competencies. Researchers developed an evaluation tool based on PDEP' ICDEP' performance indicators (Buchholz, Vanderleest, et al., 2018). According to their results, students improved their communication and nutrition-care related competencies (Buchholz, Vanderleest, et al., 2018). In short, only few researchers have shown that IPS is beneficial for the development of certain competencies necessary for professional practice of a future dietitian. Some results are contradictory in terms of competency acquisition, which is why it is important to develop an optimal approach that documents the progression of students in achieving these indicators. Some studies have assessed competencies taking into account only students' perspective. However, as demonstrated by Horacek et al. (2007) students tend to overestimate their progress compared to an observation assessment by a registered dietitian during a simulation (Horacek, Salomón, & Nelsen, 2007). Thus, the observation assessment of student performance is relevant to ensure progression of training.

2.2 Assessment for learning with simulations

Performance assessment using SP simulations to observe competencies is only beginning to appear in some areas, such as medicine (Blew, Muir, & Naik, 2010). Performance assessment relies on evaluating complex knowledge and competencies in a real context where they are used effectively (Marzano, Pickering, & McTighe, 1993). It can be done by an alternative or authentic evaluation (Khamis et al., 2016). Authentic assessment occurs when the student is put in a situation where he can perform mental tasks (Wiggins, 1990). The student must be in a situation where he has several priorities to handle and opportunities to demonstrate his judgment and take the right actions, as he would in a real-life settings (Wiggins, 1990). Offering authentic assessment ensures relevant learning experiences for students and could empower them to take control in their learning (Bosco & Ferns, 2014). Evaluation based on the judgment of the observer using a criterion-referenced grid is recommended by various research studies (Bray, Schwartz, Odegard, Hammer, & Seybert, 2011; Ilgen, Ma, Hatala, & Cook, 2015; Jepsen, Østergaard, & Dieckmann, 2014; Marfeo, Ni, Chan, Rasch, & Jette, 2014; Monaghan et al., 2005; Swanson, Norman, & Linn, 1995). Assessment during or after simulation, offers the possibility of enriching students' learning. Indeed, the feedback offered during the debriefing session is individualized to them and specific to the actions recently taken. In addition, the

demonstration of competencies in a controlled environment, such as a simulation, helps to ensure that students have adequate practice prior to applying them in providing patient care in clinical practicum placement (Leigh, Stueben, Harrington, & Hetherman, 2016). It is important to note that in dietetics, it seems that there are no validated tools developed for performance assessment during simulations. Performance assessments can be formative or summative (Boet et al., 2014). Formative evaluation is more often used with simulations (Boet et al., 2014). In education, it is defined as "activities undertaken by teachers and by their students in assessing themselves that provide information to be used as feedback to modify teaching and learning activities" (Black & Wiliam, 2010 p.82).

Although criticized, when formative evaluation is done properly, as assessment for learning (AfL), it can help the student improve his/her current performance with the feedback received and identify areas of improvement in the learning process (Black & Wiliam, 1998; Boet et al., 2014). It can also enhanced students' motivation to attain learning outcomes and engage them in metacognitive process allowing them to think about their performance (Laveault & Allal, 2016). Formative assessment has been critiqued because it is mostly used to know where the student is in the learning process without adjusting the teaching or without giving feedback (Ninomiya, 2016). Formative assessment, or AfL, should be used to motivate students in their learning process and help them see their progress (Stiggins, 2005). Summative evaluations are not widely used with simulations as an assessment tool. This is mostly due to the lack of validated tools for evaluation and the difficulty to ensure inter-rater reliability in one single assessment (Nunnink et al., 2014). However, such validated tools could help assign a score to a performance which inform about students' learning (Boet et al., 2014). When assessing competencies, the reliability and validity of the tools should be demonstrated before using them. To measure reliability is to demonstrate consistent measure and validity is a method to make sure it assess the intended feature (Elfrink Cordi, Leighton, Ryan-Wenger, Doyle, & Ravert, 2012).

In the field of dietetics, some researchers have evaluated competencies by evaluating written notes to assess clinical judgment or by assessing the knowledge acquired with pre-post questionnaires (Gibbs et al., 2015; Miles et al, 2016). Others have developed a specific validated tool to evaluate communication during a meeting with a patient (Whitehead, Langley-Evans, Tischler, & Swift, 2014). This tool is used to assess dietitians' practice in the workplace; yet the

tool was not designed for students. In other areas of the health sciences, several tools have been developed to evaluate student performance during simulations. In critical care medicine, a lot of different tools have been developed to assess non-technical skills based on Crisis Resource Management (CRM). In a critical review in 2015, researchers have identified 23 different assessment tools for non-technical skills in critical care (Jepsen, Spanager, Lyk-Jensen, Dieckmann, & Østergaard, 2015). The Ottawa global rating scale (GRS) and the Team Emergency Assessment Measure (TEAM) are the most widely used validated tools (Kim, Neilipovitz, Cardinal, & Chiu, 2009; Cooper & Robyn, 2014). Validity is "the evidence that a study allows correct inferences about the question it was aimed to answer or that a test measures what it set out to measure conceptually" (Field, 2014, p.885). Construct validity of the interpretation of content of the Ottawa GRS and TEAM has been demonstrated (Cooper & Cant, 2014; Kim et al., 2009). Construct validity is defined as "the overall quality of the measurement operations used to transform the constructs in a research hypothesis into the variables in a research study" (Cherulnik, 2001, p.451). These tools are only suitable for critical care medicine. There are also a lot of tools developed to assess surgical skills of future surgeons (Bilgic et al., 2018). Another example in medicine is that researchers worked to develop a grid used by the SP to evaluate the three dimensions of a clinical examination (Pottier, Castillo, Boet, le Pabic, & Hardouin, 2016). The tool was created so that the actor, after a training given by educators, is able to assess the competencies of students during a consultation. In nursing, Todd et al. (2008) developed a competency-based performance tool (Todd, Manz, Hawkins, Parsons, & Hercinger, 2008). The tool is relevant for nursing simulation. Further, Adamson and al. in 2013, identified twelve tools available to use for competence-based simulation assessment (Adamson, Kardong-Edgren, & Willhaus, 2013). It is precisely important to explore the tools that have been satisfactorily validated in simulations assessment in other areas of health. This allows to take into consideration the steps for the development of specific tools for dietetics.

Although developing reliable and validated tools is important, the way in which faculty members assess students is also an important factor. There is no consensus on the matter. Ratings during live observations or afterwards with video recordings are both reported in the literature. A recent pilot study at the University of Southern California concluded that the two ratings (live and video recordings) are not equivalent when assessing the same simulation (Lie, Richter-Lagha, & Ma, 2018). Authors suggested that video raters are typically expert trainers and may

apply stricter scoring standards compared to observations from live raters (Lie et al., 2018). Additionally, in this pilot study, live observations were made by multiple faculty members and ratings from video recording were made from one observer. This difference could have impacted the reliability of ratings. In another recent study, the observations made from video recordings of simulations had higher reliability than that of live observations (Mete & Brannick, 2017). Besides, live observations implied that a rater must be present during the simulation. Thus affecting students' anxiety level (Levett-Jones, Gersbach, Arthur, & Roche, 2011; Nielsen & Harder, 2013). According to one study, when the assessor stays still during the simulation, his presence is easily forgotten (Levett-Jones et al., 2011). Consequently, students reported overcoming their anxiety level related to the presence of an observer (Levett-Jones et al., 2011).

To conclude, simulation is a learning method that provides an opportunity to employ knowledge and skills related to professional practice. With this method, researchers have worked to develop assessment tools to measure learning outcomes with criterion-referenced grid. On the other hand, researchers have examined the relationship between anxiety, performance and evaluation, and the theory of cognitive interference. Therefore, it is relevant to look at the association between these different factors (eg. self-confidence, skills) as well as the influence of anxiety on the assessment of performance in learning by simulation.

2.3 Anxiety among students

Anxiety can be experience by students, during a test or when asked to perform a certain task. Anxiety has been studied for several years in the student population. It is a feeling from an unknown source that produces apprehension or fear (Mosby, 2009). Trait anxiety is a feeling persistent over time (Smith, Hogewood, Etheridge, Britt, & Vance, 2018). State anxiety, however refers to an immediate response to a change in a specific environment (Morris et al., 1981; Smith, Hogewood, et al., 2018). It comes in two forms, either by an increased physiological response (emotivity) and a self-critical reflection (worries) (Eysenck & Calvo, 1992; Sarason, 1961). The main physical manifestations of situational anxiety are increased heart rate, dizziness, nausea and a feeling of panic (Hembree, 2008). Worries (self-critical reflection) are the form of situational anxiety that affect performance the most due to the processing efficiency theory (Eysenck & Calvo, 1992). This theory explains the variation in anxiety levels for each individuals as well as external factors that impacts anxiety and cognitive performance (Eysenck, Derakshan, Santos, &

Calvo, 2007). Recent research investigated the difference between state and trait anxiety on cognitive performance (Meissel & Salthouse, 2016). It is unclear which one affects cognitive performance the most. Studies have shown that both state and trait anxiety can influence performance (Eysenck et al., 2007; Meissel & Salthouse, 2016). The main concerns students have, when performing, are comparing themselves to others, thinking about the consequences of failure, having a low self-esteem or losing self-esteem, apprehending the assessment, and feeling unprepared (Hembree, 2008; Morris et al., 1981; Shearer, 2016). Furthermore, representations of cognitive factors of anxiety have been associated with poor performance (Meissel & Salthouse, 2016), hence the importance of measuring them. Simulations can reinforced anxiety due to the fact that students have to perform in front of others where their actions are observed (Beischel & Pettigrew, 2011). The theory of cognitive interference suggests that performance anxiety causes the body to react with negative thoughts which decrease cognitive performance (Coy et al., 2011; Northern, 2010). It could also be a barrier for nursing students to achieve simulation' learning outcomes successfully (Cordeau, 2010) due to the fact that it is a high-stress environment (Cantrell, Meyer, & Mosack, 2017). On the other hand, the physiological response of the body will not affect the evaluation (Ignacio et al., 2016).

Therefore, it is important for educators to understand what students are going through during simulations to help their anxiety levels (Akhu-Zaheya, Shaban, & Khater, 2015; Beischel & Pettigrew, 2011). The effectiveness of simulations as a learning tool can be compromised due to high anxiety levels (Al-Ghareeb et al., 2017). In addition, anxiety influences performance specifically regarding the level of competency development (Ignacio et al., 2016). Fraser and al. (2012) found that in students with limited clinical exposure, simulation training was associated with a high cognitive load and the use of simulation with this group might place them at risk for reduced learning (Fraser et al., 2012). On the other hand, situational anxiety decreases with social learning or adaptation to the environment based on past similar experiences (Morris et al., 1981). Therefore, repeated exposure to the same situation would mean a possible reduction in anxiety. Thus, if students practice with simulations several times, their anxiety may decrease (Ignacio et al., 2016). Given the lack of research in dietetics education assessing anxiety levels during simulations, it is interesting to look into research in related health science fields. First, according to a survey given to 539 Jordanian nursing students, one of the main causes of anxiety is having to provide care to patients (Akhu-Zaheya et al., 2015). It could also be a concern for dietetic

students, since it is a related field. Secondly, according to a systematic review, anxiety during SP simulation is due to the realism and patient interactions. Performance tended to be better when anxiety was rated higher (Al-Ghareeb et al., 2017). The authors explained this phenomenon by the Yorkes-Dodson law (Al-Ghareeb et al., 2017). This law outlines that anxiety can have a positive impact up until a certain level (Yerkes & Dodson, 1908). We assume that this is also a concern for dietetics students, since it is a related health field.

According to a research on nursing students, low self-esteem nudges the learner to make mistakes and lose interaction with the patient, which can cause a higher anxiety level among students (White, 2003). Also, if the student believes the requested task is stressful, his/her performance will be affected (Ignacio et al., 2016), which can contribute to anxiety. This means that if a student perceived a high self-confidence level, he will most likely experience less anxiety. According to a study in nursing, after doing a four-hour simulation workshop, students' (n = 47) anxiety decreased significantly compared to a control group (n = 23) (Gore, Hunt, Parker, & Raines, 2011). Although, this result was taken directly after the workshop, the long-term impact on anxiety was not evaluated in this study. Anxiety could decrease after a simulation practice since students could increase their self-confidence level or due to repeated exposure to a similar situation. However, the results from one study revealed opposite findings. In fact, among nursing students (n = 895), after a series of simulations, participants' anxiety among nursing students (n = 327) was significantly higher than before the previous year cohort of nursing students who had little exposure to simulations (Sportsman, Schumacker, & Hamilton, 2011). Anxiety level was assess using the Learning and Study Skills Inventory (LASSI). As reported by researchers of this study, this tool did not differentiate anxiety caused by the series of simulations and anxiety from the practice in clinical settings during placements (Sportsman et al., 2011). Additionally, the series of simulations were a part of a formative evaluation, since summative assessment might have a greater impact on anxiety levels (Sportsman et al., 2011). In dietetics, according to pre-post questionnaires filled by students (n = 31), self-confidence regarding dysphagia management was significantly higher ($p < 0.05$) after IPS (Miles et al., 2016). Furthermore, in another study among dietetic students at the Ohio State University, participants (n = 62) wrote a reflective text after the simulation experience. The theme based analysis indicated that they perceived an increase in self-confidence regarding the administration of patient care (Holthaus et al., 2015). Even more so, dietetic students (n = 19) at the Georgia State

University felt more confident about going into their internship after a series of simulations (Todd, McCarroll, & Nucci, 2016). Yet, in another study, participants (students in nursing, dietetics and speech-language pathology) reported feeling more confident into providing interprofessional care after participating in IP simulation (Smith, Hsiao, et al., 2018). In sum, self-confidence level is a factor influencing the degree of anxiety of health care learners. And these last two parameters seem to vary during simulations. In dietetic education, anxiety levels have rarely been measured. Therefore, it is only possible to speculate about anxiety levels, sources and influences among dietetic students. Studies in nursing programs are widely spread and even in this field, some results are contradictory regarding simulation and anxiety. One study found that simulations are a stressor for students (Larue, Pepin, & Allard, 2015), another one found that simulations helped reduced anxiety prior to their internship (Szpak & Kameg, 2013).

In other words, simulations could influence the anxiety levels of students in various ways (Nielsen & Harder, 2013). By improving their self-confidence, they might experience less anxiety, which could lead to better performance (Ignacio, & al., 2016). However, simulation could be a source of anxiety, so the exercise should be modulated with a gradual approach to not cause too much anxiety and which could reduce the performance of students (Larue, & al., 2015). In short, all of these factors remain important to evaluate when integrating simulations into the dietetics curriculum.

2.4 Synthesis

At first glance, the use of simulations seems beneficial for the acquisition of certain essential skills for health sciences students. Secondly, if using IPS, it is important to consider influencing factors (eg, levels of anxiety and self-confidence). Therefore, it seems relevant to study the effect of simulation on essential skills acquirement for professional practice among dietetic students and, on anxiety and self-confidence levels. Also, it is important to assess performance indicators during simulations to document students' learning process. The following research project will be based on the conceptual framework proposed in Figure 2.1. The explanation of the conceptual framework follows in the next paragraph.

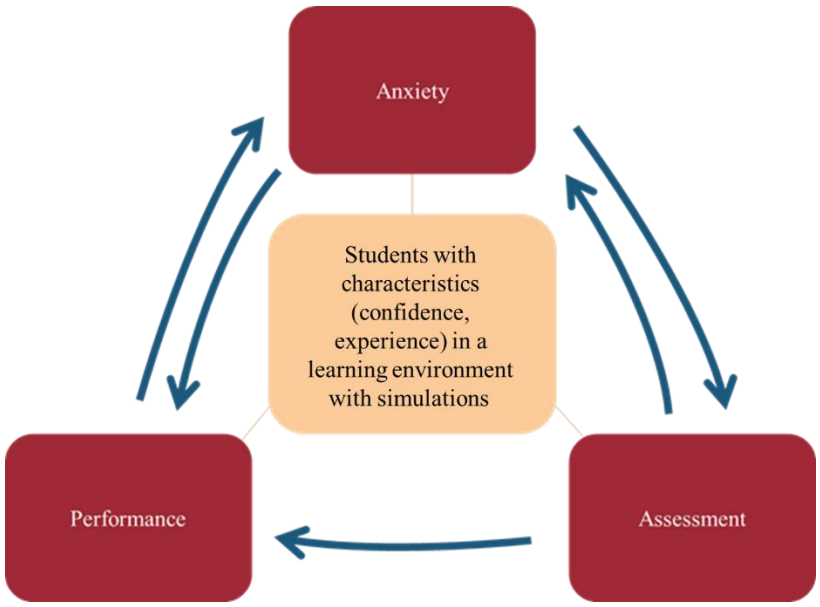

Figure 2.1 Conceptual framework

As shown in figure 2.1, The student in a learning situation through simulation is at the center of the study. Learning is influenced by personal characteristics, such as experience, self-confidence. Firstly, performance indicator assessment should be done in an authentic situation, such as a simulation, which allows students to apply their skills and knowledge in a real-life situation (Swanson et al., 1995). Subsequently, simulation and assessment can induce anxiety and decreases cognitive performance (Beischel, 2013; Coy et al., 2011). Finally, the hypothesis is that it is possible to adapt to the stressful environment with multiples exposure, therefore doing simulations several times could reduce anxiety and enhance performance (Morris et al., 1981; Ignacio et al., 2016).

2.5 Overall objective

In this vein, the overall objective of the project is:
To describe the effect of simulations on the development of dietetic students' professional competencies and their level of anxiety.

2.5.1 Specific objectives

1. a. To document the effect of simulations related to IP dysphagia management on the perceived development of competencies reported by dietetic students.
   b. To document the effect of simulations related to IP dysphagia management on the development of competency' performance indicators using a scoring tool.

2. To document the effect of simulations related to IP dysphagia management on the perceived anxiety level of dietetic students.

2.6 Research questions

1. Do simulations improve the learning of professional competencies needed in dietetics and specifically for the IP management of dysphagia?
2. What is the influence of simulations on dietetic students' perceived level of anxiety?

2.7 Hypothesis

1. Our first hypothesis is that simulations related to IP dysphagia management has a positive effect on development of professional competencies.
2. Our second hypothesis is that simulations have an effect on the perceived level of anxiety of dietetic students.

CHAPTER 3 - METHODOLOGY

The following is a summary of the design of the study, the instruments, the data collection procedure and the data analysis strategy to complete the study.

3.1 Study design

The following study aims to describe the effect of simulations on the development of students' professional skills in dietetics and their anxiety levels. To achieve this, a mixed-method convergence research design was used with a simultaneous qualitative and quantitative approach. The convergence approach provides different but complementary data that inform the research objective (Morse, 1991). In this type of mixed-method approach, the quantitative portion offers an opportunity to generalize or specify the data collected by qualitative instruments (Creswell, 2015). The qualitative data describes in detail the students experience with simulations and the influence of anxiety. The triangulation design implied that data collected was complementary (Sadan, 2014). An overview of the design of the study and a summary of the procedures for each step is in Figure 3.1. A triangulation design means that it is possible to find convergent, complementary or dissonant data (Erzberger & Prein, 1997; Farmer, Robinson, Elliott, & Eyles, 2006; Foster, 1997). Moreover, triangulation allows silence to be taken into consideration. Silence represents a theme/idea that arises from one set of data and not the other (O'Cathain, Murphy, & Nicholl, 2010). It can help understand the subject. The qualitative and quantitative approaches documented the evolution of competencies development and level of anxiety among students enrolled in the Honours Bachelor in Nutrition Sciences at the University of Ottawa. The quantitative measurement tools and the qualitative data collected complemented each other to obtain a better understanding of the phenomenon. This design brought together advantages from both research approaches (Sadan, 2014).

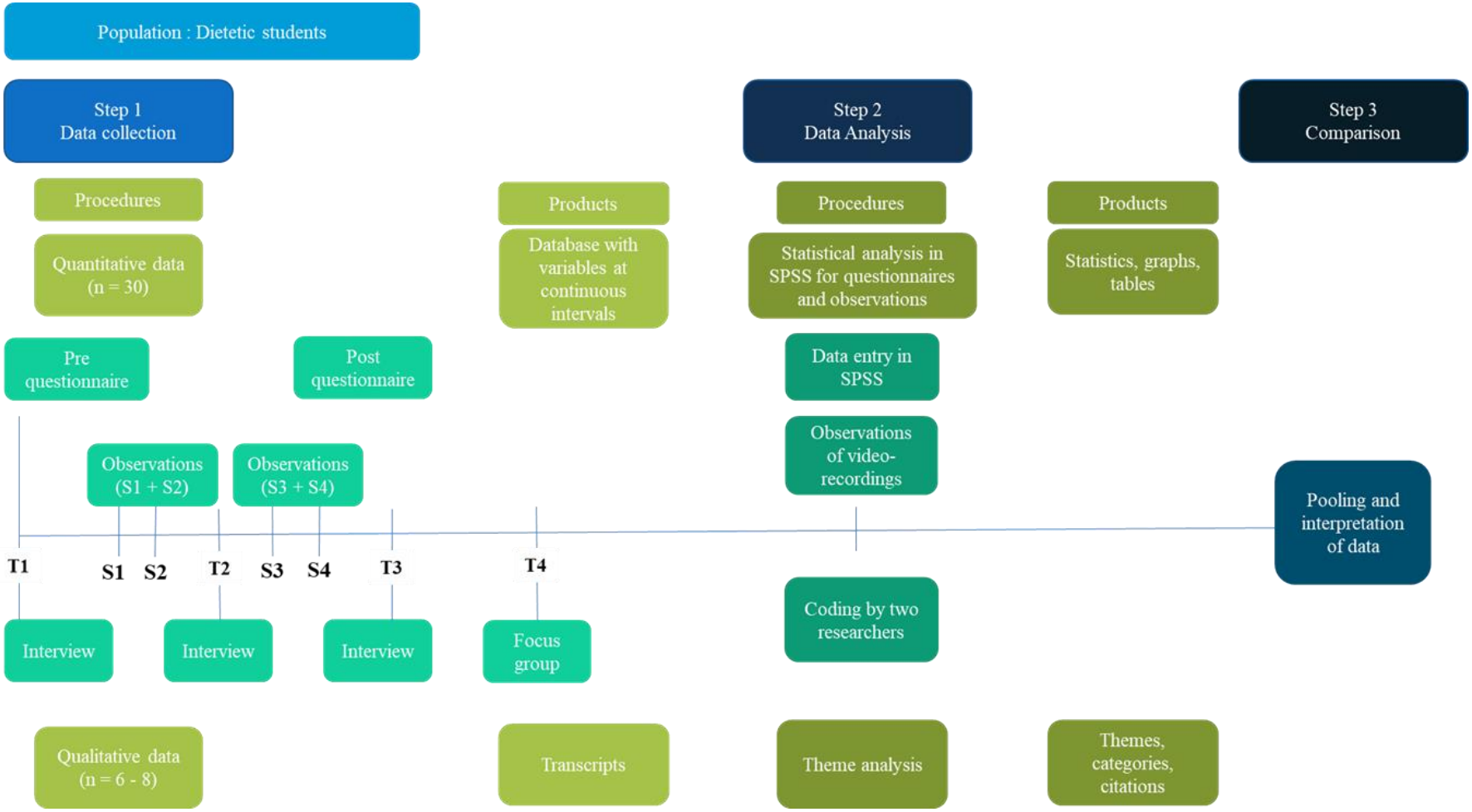

Figure 3.1 Convergent mixed method approach study design (S = video recorded simulations (see Table 3.1 for details) for rating with scoring tool, T = timeline; T1 = first qualitative data collection (interview) and completion of pre questionnaire (September), T2 = second interview (November), T3 = third interview and completion of post questionnaire (December), T4 = forth qualitative data collection (focus group) (January))

3.2 Description of the simulations

Simulations are offered as part of the mandatory dietetic education course Nutrition Assessment. It is a third-year course of the Honours Bachelor in Nutrition Sciences at the University of Ottawa. The four simulations took place during the fall semester between September and December of the year 2017. The difficulty level of the simulations was gradual. The integration of the simulations into the curriculum was based on the model suggested by Thompson and Gutschall (2015). A summary of the four simulations is in Table 3.1.

Table 3.1. Summary of content of each simulation offered during the nutrition assessment course

	One on one		IP	
Simulation	S1*	S2*	S3*	S4*
Type of appointment	1st appointment	Follow-up	1st hospital visit	Follow up
Attendee	Patient	Patient	Patient, wife, and nurse	Patient, wife, and speech-language pathologist
Reason of the consultation	Constipation and dry mouth	Same as S1	Hospitalized for a stroke, dysphagia secondary to stroke	Feeling better and ready to go home
Objectives	• Nutritional assessment • A 24 hour dietary recall	• Reassess • Give dietary recommandations	• Collect information for nutritional assessment	• Reassess • Teach the home diet • Answer questions

***S = Simulation;** S1 = simulation 1, S2 = simulation 2, S3 = simulation 3, S4 = simulation 4

These simulations took place in the Centre for Innovative Education and Simulation in Nursing, located on the Lees Campus at the University of Ottawa. All simulations took place in the same room. There were three or four stations in the room. Students worked in teams of two or three, depending on the number of stations and SP available. Each team went for an hour each, over a four-hour period. A total of thirty students participated in the activity. Students had a prebriefing session with the professor of the course, outside of the room. The professor reviewed the learning objectives and the expected outcomes. When students entered the room they had

approximately thirty minutes to do the simulation, and fifteen minutes to debrief afterwards (see Figure 3.2). The debriefing session was a conversation between students, SP, and a trained observer (registered dietitian). The debriefing session was based on the *Promoting Excellence and Reflective Learning in Simulation* (PEARLS) approach (Eppich & Cheng, 2015). The observer was the facilitator during the debriefing session. Students were asked to reflect on their simulation experiences and this generated knowledge based on objectives (Eppich & Cheng, 2015). Each facilitator had a script to follow during the debriefing conversation. The debriefing script was composed of four stages; reaction phase, description, analysis and summary (Eppich & Cheng, 2015). During analysis phase, students were asked to talk about how they had achieved the learning objectives. The observer (or facilitator) gave feedback on the performance. In our simulations, SP gave feedback based on a grid of criteria that was provided to them. SP gave their perspective as the receiver of care about how the communication went, and how they felt towards the student' practice of professional skills.

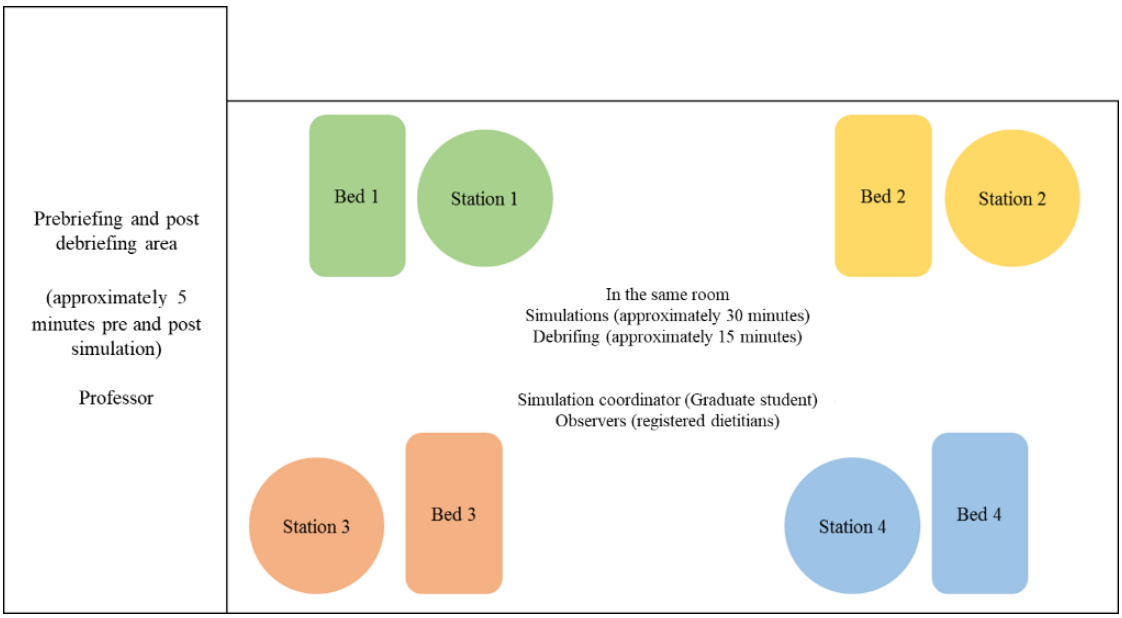

Figure 3.2 Pictorial presentation of the simulation room

3.3 Recruitment of participants

All students registered in the course were invited to participate in the quantitative portion of the study. There are approximately thirty individuals enrolled annually in this third year course. According to Elgie (2014), it was estimated that only 33% of post-secondary students would participate in this type of study, and 20% would abandon during the research process (Elgie,

2014). Although, we tried to recruit more than 33% of students, the potential sample was small (n =30). The sample was estimated based on the pool of potential participants (total = 30). According to Elgie (2014) since thirty students were registered in the course, it was estimated that a total of 10 students (33%) would participate in the quantitative part of data collection (Elgie, 2014). Based on the statistical tests we wanted to perform for the study, the G power software determined that the sample size must be of at least 22 participants to be able to observe a significant difference between pre-post simulations (Faul, Erdfelder, Lang, & Buchner, 2007). Therefore, based on the targeted population and the G power statistical calculation, we aimed to recruit between 10 and 22 students in order to increase the likelihood to observe one or more significant differences. Additionally, we estimated that if the minimal number of participants was 10, the number of evaluations made by live-observations or video recordings totals would be about 40. The minimum sample size to test inter-judge reliability has been estimated to be 20 for the evaluation of a 3-point scoring tool (Cicchetti, 1976).

In addition, considering the quality of the data collected by the qualitative portion and possible data saturation, up to eight students were solicited for the individual interviews and the focus group discussion. To obtain richness in data collected, the recommendation is to have 5 to 8 participants in a focus group discussion (Krueger & Casey, 2009). Participants were chosen on a first-come base for the individual interviews. A summary of the estimated sample size required is in Table 3.2. Participants in interviews and for the focus group were the same. The only inclusion criterion was to be registered in the Nutrition Assessment course while the data collection took place. There was no exclusion criterion. A research assistant went in one of the third-year classes other than in the Nutrition Assessment course and invited students to participate in the study. The research assistant presented the general objective, the implication for students if they chose to participate and the compensation for their time. Participants received a $25 gift card to a grocery store if they chose to participate in each of the interviews and the focus group. Students also received an email from their student association reminding them to contact the research assistant if they wished to participate.

Table 3.2 Summary of the estimated sample size required according to data collection instruments

Data collection instruments	Estimated number of participants required
Questionnaires	10 to 22
Interviews and focus group	5 to 8
Scoring tool with video recordings	10*

*10 participants X 4 videotaped simulations = 40 simulation video recordings

3.4 Data collection instruments

The instruments used were a pre-post online questionnaire (Appendix 1.1), an individual interview guide (Appendix 1.2) and one for the focus group (Appendix 1.3), as well as a scoring tool (Appendix 1.4) for assessment of competency performance indicators.

3.4.1 Quantitative measures

To collect a variety of quantitative data, we have developed different tools to obtain students' perception of learning, students' perception of anxiety level and an observation tool of performance indicators.

3.4.1.1 Pre-post questionnaire

The questionnaire (Appendix 1.1) was composed of three different sections. Section 1 asked demographic information, section 2 was about students' perceptions of comprehension of different competencies and self-confidence, section 3 contained the state-trait anxiety inventory.

3.4.1.1.1 Demographic information

The first section asked demographic information about participants as well as information about past work experiences with patients. This last factor can affect performance and anxiety when practicing with simulations. Prior experience with patients could have increased self-confidence and reduced anxiety regarding the activity (Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005).

3.4.1.1.2 Comprehension and self-confidence of competencies

The second section included questions regarding students' perception of their comprehension and their ability to perform practical competencies, their self-confidence level. Students had to answer on a sliding scale from 0 (not at all) to 100 (absolutely). The third section consisted of items about interprofessional practice. On a 5-point Likert scale, participants had to indicate how they felt about the listed items from totally agree (5) to totally disagree (1). Sections two and three were firstly written in French and translated in English by one researcher (EP). Two researchers (MR and IG) revised the translation. The fourth section was the STAI. Although part of the online questionnaire was not validated prior to its utilization (sections two and three), the whole questionnaire was piloted in pre-post settings the previous academic year. No changes were necessary based on the pilot study.

3.4.1.1.3 State-Trait Anxiety Inventory (STAI)

The State-Trait Anxiety Inventory (STAI) was develop by Spielberger (1983) (Spielberger, 1983a). This psychometric test has been widely used around the world and is now the norm to measure students' level of anxiety (Bremner, Aduddell, & Amason, 2008; Gore et al., 2011; McNiesh, 2011; Spielberger, 1983a). Its utilization with simulations is largely documented in different health-related professions such as in **medicine** (Bauer et al., 2016; Bommer et al., 2018; Lilot et al., 2018; Phitayakorn, Minehart, Hemingway, Pian-Smith, & Petrusa, 2015; Sorensen et al., 2013; Stefanidis et al., 2017; Wetzel et al., 2011), **nursing** (Cohen & Khalaila, 2014; Dearmon et al., 2012; Szpak & Kameg, 2013), **pharmacy** (Schell & Grasha, 2000), and **physiotherapy** (Judd, Alison, Waters, & Gordon, 2016). This questionnaire differentiates situational anxiety from trait anxiety by, respectively, asking "how they feel right now" and "how they generally feel" on a total of 40 items. Each item is scored on a 4 point Likert scale (almost never to almost always) (Spielberger, 1989). For each section, situation and trait anxiety was calculated, a low score to STAI means low perceived anxiety (< 36 = very low; 36 to 45 = low; 46 to 55 = average; 56 to 65 = high; > 65 = very high; 80 = highest anxiety) (Bauer et al., 2016). The construct validity of trait (20-items, Cronbach's alpha 0.86 to 0.96, average 0.91) and state (20-items, Cronbach's alpha 0.86 to 0.95, average 0.92) anxiety has been demonstrated with different populations and ages (Spielberger, 1983b). In addition, there is a French-Canadian

translation of the tool which reliability and validity is comparable to the original STAI (Gauthier & Bouchard, 1993).

3.4.1.2 Observation tool

3.4.1.2.1 Content development

As mentioned, students tend to overestimate their learning, therefore an assessment by an observer of performance indicators is more reliable to document the students' progress (Horacek et al., 2007). Thus, one of the data collection instruments was an observation grid developed that assess the necessary competencies for nutrition care in IP dysphagia management. The performance indicators was based on ICDEP' required competencies for entry-level practice defined by the PDEP and on the Interprofessional Collaborator Assessment Rubric (ICAR) for behavioral indicators (BI) of interprofessional competencies (Curran et al., 2010; Partnership for Dietetic Education and Practice, 2013). Another researcher developed a grid using the performance indicators in ICDEP (Buchholz, Vanderleest, et al., 2018). Our grid was developed based on the steps of a nutritional interview (introduction, body, and conclusion), on performance indicators of dietetic areas of practice (professional practice, communication, nutrition care, and interprofessional collaboration) and on BI of IP competency category. We have selected sixteen dietetic performance indicators (PI) and six interprofessional behavioral indicators (BI) that applied to the learning objectives and scenarios of all four simulations (Curran et al., 2010; Partnership for Dietetic Education and Practice, 2013). The description of each PI and BI are in Appendix 2. The ICDEP has no PIs that specifically addressed competencies for the introduction and conclusion. Therefore, we developed items (6 in total) that assess these components of the interview. Content was reviewed by three researchers. Comments from each researcher were collected and agreement was met for content. Each skill was scored on a Likert scale.

3.4.1.2.2 Notation

The notation followed the model of other validated grids (Pottier et al., 2016; Todd et al., 2008): does not reach competence (0), achieves more or less competence (1), achieves competence (2) (see Appendix 1.4). This observational grid helped identify each student' weaknesses and made it easier to adjust feedback accordingly (Ilgen et al., 2015; Schuwirth & Van der Vleuten, 2011).

Checklists have few advantages; it has been reported that they tend to have a higher inter-rater reliability than global rating scales (Ilgen et al., 2015). Also, it requires less training for observers, thus making it easier to implement in education programs (Holmboe et al., 2010).

3.1.1.2.3 Assessment settings

This instrument was used during simulations, for live-observations assessment, and afterwards for video-recordings assessment of the students' performance. The observation grid was used several times and by several raters which made it possible to calculate inter-rater reliability. Inter-rater reliability addressed the level of agreement among assessors. The content of the scoring tool was reviewed by three researchers and the agreement among assessors was evaluated, therefore, according to results it was possible to demonstrate reliability and validity.

3.4.2 Qualitative measures

3.4.2.1 Individual interviews

The qualitative approach provided insight on students' perceptions of the development of professional competencies and thus allowed to better understand the studied phenomenon. To obtain such information, students were invited to participate in three individual interviews, in addition to completing the questionnaires. Students were asked about their perception of competency development as well as anxiety experienced with simulations. The interview guide was composed of core open-ended questions, and few related questions to each core question (Creswell, 2007). This helped capture essentials data (Jamshed, 2014). The semi-structured pre interview guide included questions about previous experience with simulations or with patients, feelings about the expected experience, comprehension of competencies. The interview guide after two simulations contained questions about the past two simulations experience, feelings about the past experience and the last two simulations, as well as questions about comprehension of acquired competencies. For the last interview, participants were asked to summarize the whole experience. Then they were asked questions about their perceptions of the development of competencies, their feelings experienced during the activity, and possible influences. There were also a few questions about the appreciation of the activity. Interview guides are in Appendix 1.2. Questions could be added depending on the interview process and the researchers' judgement.

All interviews were audio recorded and generated verbatim transcripts for data analysis. Recording was the recommended method to effectively capture the discussion as hand notes usually stop the flow during an interview and are not as reliable as recordings (Jamshed, 2014).

3.4.2.2 Focus group discussion

Finally, all students who participated in the interviews were invited to join a focus group discussion after the end of the semester to share their learning experiences with other participants. Given the small sample size, this then allowed for triangulation of the data obtained in the individual interviews and to validate what had been said before. Focus group discussion allowed participants to exchange on their shared learning experiences and different points of view came out (Krueger & Casey, 2009). A moderator conducted the focus group discussion by asking open-ended questions to participants. The moderator let participants exchange on the different questions; without interfering with the discussion (Bloor, Frankland, Thomas, & Robson, 2001). Questions were created to promote exchange according to Krueger' recommendations; open-ended, clear, short, and one-dimension (Krueger & Casey, 2009). The focus group protocol and questions are in Appendix 1.3.

3.4.3 Translation

All tools have been developed in French and English to provide participants with the opportunity to participate in the project in the language of their choice. For pre-post questionnaires, individual and group interview guides, the questions were first written in French and then translated into English by a researcher. Two researchers checked the translation and finally arrived at a final version for each tool. The STAI that is part of the pre-post questionnaires had already been translated by other researchers, so we used the published translated versions (Gauthier & Bouchard, 1993). The items of the ICDEP' PIs (Partnership for Dietetic Education and Practice, 2013) and ICAR BIs (Curran et al., 2010) used to construct the scoring tool had already been translated by the respective organizations that developed them.

3.4.4 Pilot study

In fall 2016, some tools were piloted. The pre-post questionnaires were piloted with students enrolled in the Nutrition Assessment course. Content of questionnaires was created by one

researcher based on previous questionnaires used with simulations by one of the researchers and reviewed by two other researchers, including a content expert, the professor of the course. In addition, the interview guide for the focus group was also piloted January 2017. A total of nine participants took part in the pilot study. The individual interview guides were not piloted due to lack of time and lack of potential participants. Also, we did not want to decrease the number of participants available for the research project. Very minor adjustments were made on the interview guides after the first few ones. The graduate researcher did interviews about the learning experience with simulations with two students of the piloted cohort in November 2016 as part of a research project in one of her graduate courses. The interview guide was similar to the one used for this research project but adapted to the learning context. It was a one-time interview about the students' perception of learning with simulations.

3.5 Data collection process

The observation tool was used during each simulation by the four observers, ie a registered dietitian who was trained to use the instrument. Since there were three to four simulations at the same time, there were three to four different observers at each simulation learning activity. Nonetheless, to ensure inter-judge reliability, these observers stayed the same throughout the semester (Simulation 1 (or S1), S2, S3, and S4). Later on, video recordings were viewed and participants' performance was rated with the same grid by two independent observers. First, the individual interviews were conducted with each research project participants before the simulations (Time 1 or T1), mid-semester (after two simulations (T2) and at the end of the semester, after the four simulations (T3). The focus group was held at the beginning of the next semester (T4) (Figure 3.1). This allowed for the estimation of the longer-term effect of four simulations over a semester on the development of professional competencies compared to other studies that looked at the experience directly after the simulation activities. As for the questionnaires, they were sent at T1 and T3 to all participating students by email and they were able to respond online. Participants had two weeks to answer the online questionnaire. Reminders were sent as needed.

3.6 Statistical analysis

3.6.1 Quantitative analysis

3.6.1.1 Data from questionnaires

Frequencies were calculated for demographics data. Data obtained from sections two and three of pre-post questionnaires are continuous intervals with a scale from 0 to 100 for each statement (not at all) to 100 (absolutely). Quantitative data collected were analyzed in the SPSS software. For each statement, a Wilcoxon signed-rank test was performed. This test informed us if there were significant differences between participants' perception regarding each statement before and after all four simulations. The same test was calculated on data from section three regarding interprofessional practice. Finally, section four of the questionnaire was the STAI. Descriptive data were calculated for all data of pre-post questionnaires. Since this questionnaire differentiated state anxiety (due to external factors) and trait anxiety (personality), descriptive data were also calculated for each section (state and trait). In addition, Wilcoxon signed-rank test were calculated for each section. This test informed on the possible significant difference pre and post simulation on state and trait anxiety. See Figure 3.3 for a summary of analysis from all data collected.

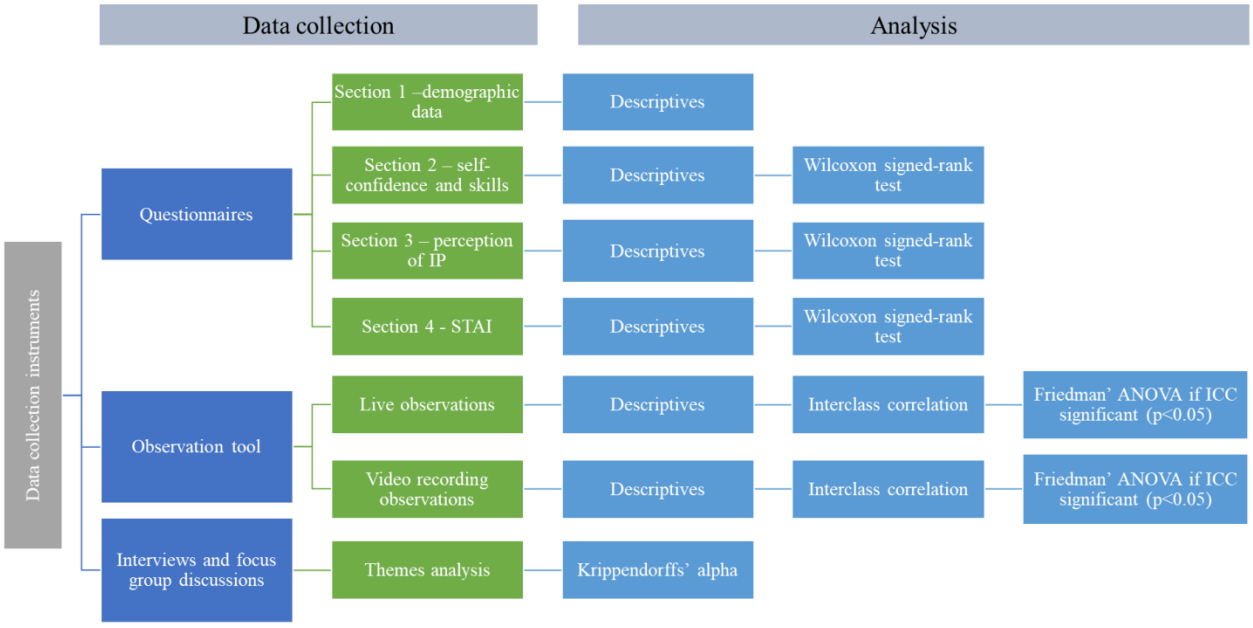

Figure 3.3 Summary of analysis of data collection instruments

3.6.1.2 Data from scoring tool

Since the scoring tool was not a validated tool, we calculated an interclass correlation coefficient (ICC) for the results from live observations and another one for video-taped observations to assess inter-judge reliability. Calculations for the ICC were based on scores from all four simulations. ICC informed us on the level of reliability of the tool. This coefficient demonstrates the level of agreement among assessors (Shrout & Fleiss, 1979). Typically, ICC values are classified as: "< 0 = poor; 0 – 0.20 = slight; 0.21 – 0.40 = fair; 0.41 – 0.60 = moderate; 0.61 – 0.80 = substantial; and 0.81 – 1.00 = almost perfect agreement" (Whitehead et al., 2014 p.325). With an acceptable ICC from either live or videotaped observations, Friedman' ANOVAs were calculated for overall scores within the four simulations.

The scoring tool was separated in competencies; therefore, median scores from each category were presented. If overall scores were significant, Friedman' ANOVA were calculated for each competency score between all simulations (Bonferroni corrected p value at 0.008). If there was a significant difference within one competence, Wilcoxon signed-ranked test were calculated between S1 and S2, S2 and S3, S3 and S4, and S1 and S4 (Bonferroni corrected p

value at 0.001) (see Figure 3.4 for details). All these analyses helped understand which competencies were significantly different and possibly improved by a series of four simulations.

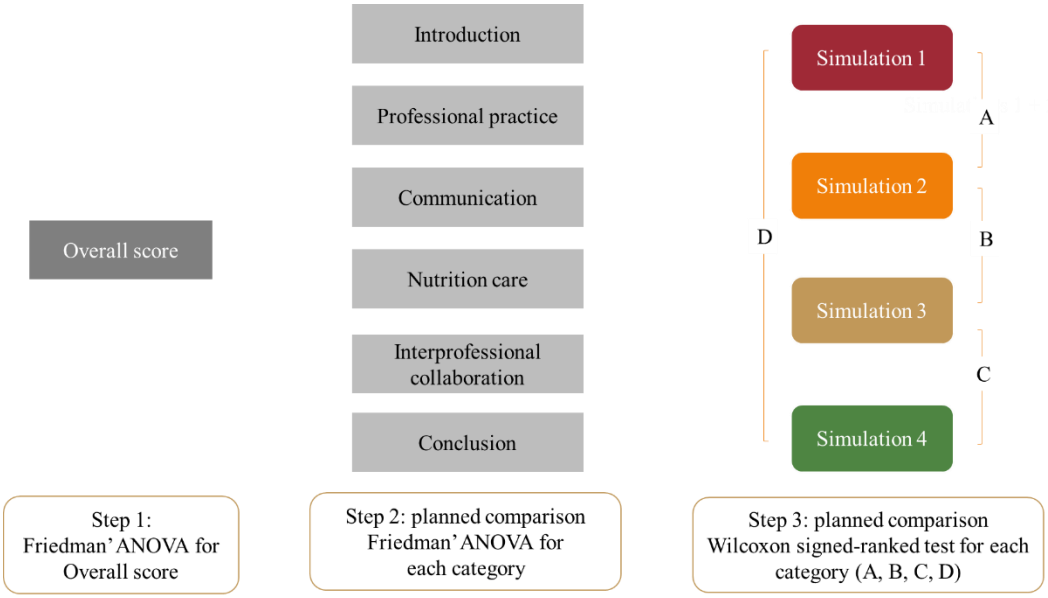

Figure 3.4 Step-by-step summary of statistical analysis of scores from video recording observations

3.6.2 Qualitative analysis

Qualitative data from the interviews and the focus group discussion were transcribed and analyzed by themes using the NVivo QSR software (QSR International Pty Ltd. Version 11). The theme analysis was done using a grid of content developed in advance to help the classification of codes (see Appendix 3). Content analysis was executed by looking at manifest content. Statements, wording, richness of content and strategies of argumentation were analyzed (Van Der Maren, 2004). Content analysis was accomplished by condensing, summarizing, systematizing codes (Van Der Maren, 2004). In addition, since there were interviews at three different points in time, each set of interviews and focus group discussion were compared to one another to examine the evolution of content and possible important similarities or differences (L'Ecuyer, 1990). The themed analysis was done by two independent researchers and a Krippendorff's coefficient was calculated for inter judge reliability. Compared to other coefficients, Krippendorff's alpha resolves lots of limitations of other coefficients. This method minimizes the effect of chance in agreement (Feng, 2014; Park & Park, 2015). It calculates disagreements among coders instead of

looking for agreements like other coefficients (Nili, Tate, & Barros, 2017). It also measures reliability in missing codes (Nili et al., 2017). Calculations are possible with all types of variables (nominal, ordinal, interval, ratio) (Nili et al., 2017). A Krippendorff's alpha over 0.9 is always satisfactory, over 0.8 is fairly reliable, and over 0.7 is sufficient for exploratory study (Feng, 2014, 2015; Lombard, Snyder-Duch, & Bracken, 2002). Both researchers (MR and AB) received the same grid with explanations on how to use it. They were told to use pre-established categories and add others if different themes emerged from transcripts. New categories can emerge according to the relevance of the statements. Researchers discussed about the emerging themes to assure reflexivity (Johnson, 1997). They also discussed possible discrepancies, and a third researcher was available to help settle an agreement between coders. Finally, the results of quantitative data analysis from pre-post questionnaires complemented qualitative data results. In addition to triangulating the data and increasing the validity of the results, the different types of data were compared and combined to mutually enrich each other.

3.7 Ethical considerations

This research project received the approval from The University of Ottawa's Research Ethics Board on April 7th, 2016 (file number: H10-15-34B) (Appendix 4). Since this project started as a pilot study in 2016, amendments to the ethics protocol were made and approved by the Ethics Committee. Prior to participating in the research project, students were given a consent form. All the information about the research, and their involvement were on the form. Students received the link to complete the consent form. Since the research project contained several components, students could choose which components they wanted to participate in. They had to click on "I consent" if they wished to participate. Students were informed that they should print a copy of the consent form, according to protocol.

3.7.1 Consent

The graduate student went in one of the third-year class at the beginning of the fall semester to invite students to participate in this research project. The graduate student explained the aim of this research and potential implications for students who wished to participate. Students were given the contact information of the researcher. They were told to contact her if they have more questions about the research project or if they wished to participate. Then, they received a link to

complete the consent form before completing the pre simulation questionnaire (see Appendix 5 for consent form). Participants had the opportunity to print a copy of the consent form, once completed.

3.7.2 Ethical considerations

This research project was overseen by Isabelle Giroux, professor at the School of Nutrition Sciences at the University of Ottawa. Isabelle Giroux teaches the Nutrition Assessment course where simulations took place. Students and participants had the guarantee that their participation in the study would stay confidential and their professor would not be informed of it. The researcher doing the data collection was not assuming a role of authority with students. Thus, potential hierarchy problems were eliminated. Participants knew they could withdraw from the study at any point.

This research project received funding from the Consortium national de formation en santé – Volet Université d'Ottawa as part of the project on "Development, implementation and evaluation of interprofessional simulations in dysphagia for the learning of professional skills in dietetic training".

The next chapters present the results of the research methodology presented in this chapter. Chapter 4 presents the results to answer objective 1a. It aimed to enlighten the perceived effect of simulations on the development of entry-level dietetic competencies. Chapter 5 answers to objective 2. It aimed to document the effect of simulations on dietetic students' perceived anxiety level. At last, Chapter 6 answers to research objective 1b. It planned to document the development of entry-level dietetic competencies of students with simulations using a PI scoring tool. The articles presented in Chapters 4, 5 and 6 will be submitted for publication in peer-reviewed scientific journals. The authors are Mylène Rosa and Isabelle Giroux.

CHAPTER 4 - DIETETIC STUDENTS' PERCEPTIONS OF LEARNING PROFESSIONAL COMPETENCIES WITH FOUR SIMULATIONS THROUGHOUT A SEMESTER

Abstract

Introduction: In a learning environment where students participate in human patient simulations, they can develop different competencies. In nursing and medicine, taking part in these activities is beneficial for students' learning. In dietetic education programs, few studies have looked at students' perceptions of learning professional competencies.

Objective: This study aimed to document the perceived effect of four simulations on the development of professional' competencies by dietetic students

Methods: A mixed-method convergent approach was used with pre-post questionnaires, interviews at three different times and a focus group discussion to look at dietetic students' perceptions of learning as part of a mandatory Nutrition Assessment course. Non-parametric test for questionnaires and theme analysis for transcripts were used to examine data. After analysis of each section, data were compared and merged for interpretation.

Results: As per questionnaire responses, students (n = 14) perceived a significant increase in comprehension of various competencies. In interviews and focus group, a sub group of participants (n = 7) perceived an enriched understanding of some dietetic competencies compared to before the simulations, including competencies related to collaboration, communication, understanding interprofessionalism, clinical reasoning, and nutrition care.

Discussion: Quantitative and qualitative datasets were compared and there were no inconsistencies between results from questionnaires and interviews. Simulations seemed to have transformed classroom concepts to a more practical understanding of dietetic practice.

Conclusion: Students reported a development in their understanding of dietetic competencies with the use of simulations. More studies are needed to identify if these results could be observed with in different settings. Simulations had a positive effect on students' perception of competencies development.

4.1 Introduction

Simulations are an innovative educational approach used in competency-based health sciences programs. Indeed, various medicine and nursing schools are now systematically using simulations to teach students technical skills with the use of manikins and role-playing (Boet et al., 2013). There are different types of simulations, one of them, the human patient simulation (HPS) puts students in a real-life scenario where they act as health professionals with standardized patients (SP) (Levett-Jones & Lapkin, 2013). HPS can be used to teach technical skills and other competencies such as communication, collaboration, inter-professionalism (Boet et al., 2014).

Simulations provide practice-based learning experience. These experiences are beneficial for students to acquire different skills related to their future role of health professionals in the workplace (Dinther, Dochy, & Segers, 2011; Lancaster & Bain, 2007; Palmer, 2006; Papastergiou, 2010). In these types of learning experiences, considering students' perception has been linked to improved learning outcomes (Nijhuis, Segers, & Gijselaers, 2005; Segers, Gijbels, & Thurlings, 2008; Segers, Nijhuis, & Gijselaers, 2006; Struyven, Dochy, Janssens, & Gielen, 2006). According to social cognitive theory, students' perceptions of learning is influenced by self-efficacy, mastery experiences (authentic assessment) and social persuasion (encouragement, positive feedback) (Bandura, 1997; Pajares, 2006). In fact, there are lots of factors that motivate students to learn. Constructive feedback is one of them (Dinther, Dochy, Segers, & Braeken, 2014). The debriefing session after a simulation is the moment where students share what they have learned and received positive or constructive feedback (Eppich & Cheng, 2015). Positive feedback can increase the feeling of self-confidence (Pajares, 2006). Another factor that increases motivation is when students perceived they have learned something. It motivates them to continue the learning process (Pajares, 2006). For those reasons, simulations seem beneficial for students' learning experience. However, it has only been recently used by dietetic education. Future dietitians need to learn a variety of competencies during their academic curricula and practicum placement, and simulations could improve the transition between the learning of theoretical notions and practice in a work environment by helping them to apply knowledge and develop judgement and skills. According to recent studies, simulations in dietetic education programs are mostly used to practice communication and counselling skills (Gibbs et al., 2015;

Gibson & Molloy, 2012; Henry et al., 2009; Schwartz et al., 2015). Students' perceptions are mostly obtained from a comparison between pre and post simulations questionnaires with Likert scales (Gibbs et al., 2015; Miles et al., 2016).

Education to future dietitians should focus also on conditions where the patient is at higher risk of complications, or on conditions frequently seen by the health professional (Chatalalsingh, 2014; Chiniara et al., 2013). One of those conditions specifically identified by registered dietitians working in clinical practice is dysphagia, which requires nutritional management (Chatalalsingh, 2014). Dysphagia is a difficulty of passing food and/or liquid from mouth to stomach (College of Dietitians of Ontario, 2018). For example, patients often experience swallowing difficulties after a stroke, or as a consequence of Parkinson's disease or dementia (Ordre des professionnel des diététistes du Québec, 2017). Dietitians work alongside a collaborative interprofessional (IP) team, i.e. speech-language pathologist, occupational therapist, physiotherapist, and nurses, to provide the best care to the patients (College of Dietitians of Ontario, 2018). Such IP work increases patients positive outcomes such as satisfaction and helps reduce health cost (de la Tribonnière & Gagnayre, 2013). If dysphagia is not treated adequately, patients are at higher risks of hospital readmissions, extended hospital stays, and need for respiratory and nutritional support (Clavé et al., 2011; Volkert et al., 2019). In other words, there is a need to have more education on nutrition care for dysphagia management.

In terms of simulations in dietetic programs, several studies have found that it is a pleasant activity (Beshgetoor & Wade, 2007; Farahat et al., 2016). In a focus group discussion between dietetic students (n = 11) from the University of Northern Illinois who participated in a simulation activity 8 weeks prior, they reported a perceived improvement in their counselling and communication skills (Henry et al., 2009). In another study at the University of Kansas students participated in three simulations on the same day. Participants (n = 16) took part in a group discussion right after the simulations. They reported that the activity was beneficial for their patient-centered approach and counselling skills (Gibbs et al., 2015).

In the light of recent studies, there is a need to identify the perceived effect of simulation with interprofessional simulation on the development of professional competencies necessary to entry-level practice for dietitians and specifically for dysphagia care since it is a frequent condition dietitians need to manage and a high risk condition (Chiniara et al., 2013). This study

aimed to document the perceived effect of simulations on the development of professionals' competencies necessary for entry-level practice dietitians in IP dysphagia management. Competency such as communication, IP collaboration, delivery of nutrition care (step-by-step interview) are essentials to become a registered dietitian.

4.2 Methods

4.2.1 Design

A mixed-method convergent research design was used with a simultaneous qualitative and quantitative approach (Creswell, 2015; Morse, 1991). Data collected from both approaches are complementary (Sadan, 2014). This design allowed triangulating the data. Triangulation design helped find different types of data; convergent, complementary or dissonant, as well as silences (Erzberger & Prein, 1997; Farmer et al., 2006; Foster, 1997; O'Cathain et al., 2010). Data from qualitative and quantitative instruments were analysed separately and compared once analysis for both were completed.

4.2.2 Population

Third year dietetic students who took part in the Nutrition Assessment course of the Honours Bachelor of Nutrition Sciences program at the University of Ottawa were invited to participate in the research project, which included online pre-post questionnaires, three individual interviews and one focus group discussion. All students enrolled in the class (n = 28) participated in a series of four simulations throughout one semester, participation to research was voluntary and had no impact on the simulations offered in class. Students were given the choice to participate in both the quantitative and qualitative sections and only the questionnaires. Students who wished to participate in the qualitative portion were chosen on a "first come" basis.

4.2.3 Intervention

Details about the four simulations are available in an article accepted for publication (Giroux, Pauzé, & Rosa, 2019). In short, the four simulations were divided into two parts. The first part was a nutritional assessment of a depressed client with xerostomia and a follow up appointment. Students had to help a senior man make better food choices considering his medical condition

and low income. The second part involved a hospitalized man with dysphagia secondary to a stroke. In this simulation, students had to assess the food intake and had to interact with the nurse, the confused patient and his wife. The follow-up meeting was between the dietetic student, the speech-language pathologist, the patient and his wife. The IP team had to collaborate and explain the patient' diet once he gets home. More details about the learning objectives of each simulation, as well as the strengths and limitations of the activity are in the article.

4.2.4 Ethics

This research project received the approval from The University of Ottawa's Research Ethics Board on April 7th, 2016 (file number: H10-15-34B). This research project received funding from the Consortium national de formation en santé – Volet Université d'Ottawa.

4.2.5 Quantitative measures - students' self-confidence and perception of learning

Written informed consent was given before the start of the data collection. Participants were asked to fill a questionnaire before the simulations started (time 1: T1) and once all simulations were done (time 3: T3). Demographic information were collected as part of the first questionnaire. Questions in section 2 were about students' comprehension and students' self-confidence in providing nutrition-related care (communication, collaboration, applying theoretical notions). On a sliding scale, they had to indicate from 0 (not at all) to 100 (absolutely), how they felt about each statement. Another section of the questionnaire consisted of statements about IP practice and collaboration. On a 5 point Likert scale, participants had to indicate how they felt about the listed statements from totally agree (5) to totally disagree (1). In terms of analysis, frequencies were calculated for demographics data. Quantitative data collected were analyzed in the SPSS software (IBM SPSS Statistics version 24). Scores from each statement were compared between pre and post with a Wilcoxon signed-ranked test.

4.2.6 Qualitative measures – students' perception of competencies development

Semi-structured interviews were conducted at different times (T1: baseline, T2: after two simulations, T3: after 4 simulations) and a focus group conducted at the beginning of the next semester (T4). The first interviews (T1) took place in September / October 2017, T2 in November, T3 in December and T4 in January 2018. Data collection took place over a five-

month period. Interview guides were composed of similar questions about the learning of competencies. Questions were adapted to the period in time in which the interviews were done. All interviews were conducted by the same researcher (MR). The focus group discussion were conducted by two researchers (MR, AB), one was asking questions and the other one was taking notes (Bloor et al., 2001). Individual interviews and focus group discussion were audio-recorded to retrieve verbatim transcripts for data analysis. Questions for the focus group were open-ended, clear, short and one-dimension to promote exchange (Krueger & Casey, 2009). For the analysis, verbatim from interviews and the focus group discussion were analysed separately by themes using the NVivo QSR software (QSR International Pty Ltd. Version 11). Theme analysis was done using a grid of content developed in advance to help the classification of codes by two independent researchers (MR, AB). Analysis from T1, T2, T3 interviews and T4 focus group discussion were compared to one another to examine the evolution of content and possible important similarities or differences (L'Ecuyer, 1990). Themed analysis inter-judge reliability was analysed using a Krippendorff's coefficient. This coefficient minimizes the chance of agreement by calculating disagreements among coders instead of looking for agreements like other coefficients (Feng, 2015; Nili et al., 2017; Park & Park, 2015). It also measures reliability in missing codes (Nili et al., 2017). During analysis, new categories could emerge according to the relevance of the statements. Researchers discussed about the emerging themes to ensure reflexivity (Johnson, 1997). They discussed possible discrepancies, as needed with a third researcher to help settle an agreement between codings. In addition to triangulating the data to increase the validity of the results, qualitative and quantitative data were compared and combined to mutually enrich each other.

4.3 Results

Out of twenty-eight students enrolled in the course, fourteen agreed to participate in the study, of which seven of them agreed to also take part in the qualitative portions. Details about participants are in Table 4.1. According to studies with this type of student population, only thirty-three percent were expected to participate (Elgie, 2014). With this research, almost forty-four percent agreed to participate and no one withdrew during the research process (Elgie, 2014). To ensure richness in qualitative data, focus group discussions should count between five to eight participants (Krueger & Casey, 2009). Seven were recruited from our population, which also

represented fifty percent of participants in the quantitative portion of the study; thus ensuring value of the qualitative data. More than half of our sample from both quantitative (8/14) and qualitative (4/7) sections had prior education on dysphagia management. In individual interviews, they said they had previous experience because they received college education in dietetics.

Table 4.1. Participant' characteristics for quantitative and qualitative components (total n = 14)

	Participants in quantitative component (n = 14)	Participants in qualitative component (n = 7)
Gender		
Male (%)	7	0
Female (%)	93	100
Age		
19 – 20 years old (%)	57	42
21 – 24 years old (%)	29	42
25 + years old (%)	14	14
Prior education in dysphagia management		
Yes (%)	57	57
No (%)	43	43

4.3.1 Quantitative results

Students scored significantly higher in the post questionnaire for all of the statements regarding comprehension and self-confidence in their competencies related to the nutrition care process for IP dysphagia management (See Table 4.2). Thus, indicating that students felt an increase in confidence in different aspects of nutritional assessment (re. clinical practicum placements, interview skills, assessment of oral intake, development and application of a treatment plan for a patient with dysphagia, dysphagia screening, and IP practice). Results also showed a difference before the first and after the last simulation, in students' comprehension of delivery of dysphagia nutrition care, educating about modified diets and appropriate fluid consistencies, different IP roles, and the development of the nutrition treatment plan for a patient with dysphagia. The greatest differences in medians scores between the first and after the last simulations were seen in statements regarding the comprehension of the establishment and development of a treatment plan for a patient with dysphagia the self-confidence in clinical placement in 4th year, as well as the ability to perform a nutritional assessment and the ability to assess food intake.

Table 4.2. Comparison of changes in comprehension and self-confidence scores before the first and after the last simulation self-reported by dietetic students (n=14)

	Pre simulation	Post simulation	
	Mdn[a] (25^{th} - 75^{th})[b]	Mdn[a] (25^{th} – 75^{th})[b]	p[c]
Comprehension level of the:			
Nutritional care of dysphagia	66.5 (43.7 – 76.2)	85.0 (68.0 – 86.0)	0.00
Implementation of the principles of active listening	80.0 (70.0 – 86.2)	96.0 (90.0 – 100.0)	0.00
Provision of education to patients and their families about different diets for dysphagia management	75.0 (45.0 – 86.5)	85.0 (77.0 – 93.0)	0.00
Provision of education to patients and their families about different liquid consistencies for dysphagia management	73.0 (45.0 – 89.0)	85.0 (78.0 – 93.0)	0.00
Establishment of a treatment plan for dysphagia	50.0 (22.5 – 75.0)	80.0 (73.0 – 85.0)	0.02
Roles of various health professionals in the treatment of dysphagia	72.5 (48.7 – 86.2)	85.0 (75.5 – 94.0)	0.01
Development of a treatment plan for a patient with dysphagia	50.0 (7.5 – 74.5)	80.0 (65.0 – 82.5)	0.00
Self-confidence level regarding the:			
Clinical practicum placements in 4th year	47.5 (27.7 – 56.2)	77.0 (55.0 – 87.5)	0.00
Ability to perform a nutritional assessment	55.0 (27.7 – 62.0)	85.0 (65.0 – 87.5)	0.00
Ability to detect dysphagia	60.0 (31.5 – 67.7)	80.0 (70.0 – 84.2)	0.00
Ability to assess food intake of a patient	58.0 (38.7 – 70.7)	88.0 (72.5 – 90.0)	0.00
Establishment of a treatment plan for dysphagia	50.0 (1.0 – 65.0)	79.0 (60.5 – 82.5)	0.00
Interprofessional practice	70.0 (50.7 – 85.0)	90.0 (85.0 -96.0)	0.00

[a] Median
[b] Percentile 25 – percentile 75
[c] Testing for median change using Wilcoxon signed-rank test, p value < 0.05

Although students perceived a significant difference in self-confidence regarding IP practice (p = 0.00), pre and post median scores detailing interprofessional attitudes in Table 4.3 were not statistically different. Students did not report a different perspective on interprofessional collaboration from pre to post simulations. When looking at the median scores, participants already had a positive perception (median above 4 for statement 1, 3, 4, 5; median below 2 for statement 2, 6, 7) of interprofessional collaboration pre simulations.

Table 4.3. Median scores from pre-post simulations questionnaires regarding IP collaboration (n = 14)

	Pre simulation	Post simulation	
	Mdn[a] (25^{th} -75^{th})[b]	Mdn[a] (25^{th} -75^{th})[b]	p[c]
1. The speech-language pathologists play an important role in the management of patients with dysphagia.	5.0 (4.0 – 5.0)	5.0 (5.0 – 5.0)	0.11
2. The competent dietitians don't need to consult other health professionals to treat patients with dysphagia.	1.0 (1.0 -2.0)	1.0 (1.0 – 1.5)	0.26
3. I will offer the best care for an individual with dysphagia if I collaborated with other health professionals.	5.0 (5.0 – 5.0)	5.0 (5.0 – 5.0)	0.32
4. Nurses work with dietitians and speech-language pathologists in the treatment of dysphagia	5.0 (4.0 – 5.0)	5.0 (4.5 – 5.0)	0.85
5. The scope of practice of dietitians and speech-language pathologists overlaps.	4.0 (3.7 – 5.0)	5.0 (4.0 – 5.0)	0.11
6. Nurses don't intervene significantly in the treatment of dysphagia	2.0 (1.0 – 3.0)	1.0 (1.0 – 2.0)	0.06
7. Since the role of dietitians and speech-language pathologists are very similar, it is not necessary that these health professionals are both involved in the management of dysphagia a patient.	1.5 (1.0 – 2.0)	1.0 (1.0 – 2.0)	1.00

[a] Median
[b] Percentile 25 – percentile 75
[c] Testing for median change using Wilcoxon signed-rank test, p value < 0.05

4.3.2 Qualitative results

Seven students chose to participate in the qualitative portion of this research. Each participant took part in the three interviews. A total of 21 individual interviews and one focus group discussion with the same participants were audio recorded and transcribed for theme analysis. Themes were established from literature review and entry-level competencies as defined by the Integrated Competencies of Dietetic Education Practice (ICDEP) of the Partnership for Dietetic Education and Practice (PDEP) such as communication, collaboration, understanding of interprofessional roles, clinical judgment, nutrition care (Partnership for Dietetic Education and Practice, 2013). One theme that emerged from the last interviews (T3) was preparation for clinical practicum placements. Most of the participants talked about how simulations have

impacted their perception of their preparedness for their clinical practicum placements in 4th year. A significant difference result also seen in pre-post questionnaire ($p < 0.00$). Theme analysis was made by two independent researchers (MR and AB). A first Krippendorff's coefficient ($\alpha = 0.66$; not suitable) was calculated once 30% of the material was analysed. Researchers met to discuss discrepancies between coding and emerging themes. Once agreement was met, a second Krippendorff's was calculated ($\alpha = 0.97$) and met inter-judge reliability criteria.

In general, participants talked about the patient or scenario or about how their competencies evolved over time (see Table 4.4 for details). During the last interview, and even after two simulations, participants described several concrete examples of "how to" apply skills (e.g. related to nutrition care or interprofessional collaboration). All participants seemed to understand better the importance of valuing the perspective of the patient and his/her family. Participants felt empowered in their capacity to become a dietitian and apply competencies. Through the changes expressed in the interviews, most participants seemed to have introspected about their performance and how they have improved their competencies. The remarks related to the application of nutrition care changed. Participants added relevant details that suggested that their perception in delivery of care was improving to see the bigger picture of the patient-centered approach.

Table 4.4. Summary of themes of perceived competencies presented by categories and time line based on discussion with dietetic students (n = 7) (E): emerging themes

	Individual interviews			**Focus group discussion**
Themed competencies	**Pre simulation (T1)**	**After two simulations (T2)**	**After four simulations (T3)**	**Next semester (T4)**
Collaboration	Patient = centre of care. (n = 7)	Important to take into account the patient's reality, respects his/her family and ensure that he understands treatments.	A better collaboration with the patient will help him/her adheres to treatment. (n = 4)	-
Conflict management	Dealing with an unhappy client seems difficult.	Evolves by adding the client's perspective and listening to his side of the story. (n = 7)	Potentially a difficult situation to manage.	Most participants agreed that this competency will develop with practice, over time. (n = 4)
Communication	Comfortable with communication skills. (n = 5)	Communication is using active listening, knowing how to introduce oneself to the patient, and information vulgarization.	"004*: I learn my communication style and how I, as a professional, communicate with a client*".	-
Understanding inter-professionalism	Inter-professionalism is defined by the textbook definition. A helpful approach for the patient. (n = 7)	-	Other health professionals are important source of information. Adherence to treatment is easier when all professionals are on the same page. (n = 4)	-

Understanding interprofessional roles	-	-	Have a better idea of everyone's role.	Many mentioned that is it important to know everyone's role and how to use them wisely. (n = 3)
Clinical reasoning	-	-	It is possible to adapt what is taught in class. (n = 2)	001: "*There is not only one ideal, but everyone can do it his own way."* 006 : "*We must use our judgment or ask the patient what he wants."*
Nutrition care	-	-	-	004: "*Trying to answer the patient's questions allowed me to reflect and develop my knowledge*."
About dysphagia	Dysphagia explained with terms from the classroom i.e. modified texture, modified consistencies.	Focus more on nutrition assessment, monitoring, hydration level, individualized approach, etc.	Include the importance of the family, consent to care, and work with IP team. (n = 7)	-
Preparation for clinical practicum placement (E)	-	-	006: "*Now I know, there is a lot to learn but I'm on the right track to be a dietitian*."	All feel readier to do their clinical internship now. (n = 7)

T = Time

At first, participants knew that the patient is a very important part of the collaboration in delivery of care. But their learning deepened with a better understanding of concepts explained in class. From the first interviews, most participants stated that communication is key to conflict management, whether the conflict is between health professionals or with the patient. After experiencing an unhappy patient during simulations, participants reported being aware of the potential difficulties in dealing with a conflict. On another note, a participant reflected on her communication approach to the simulations. The first simulation, she wanted to control everything during the discussion, but by practicing during the simulations, she realized that the interview is an interaction where the patient talks more and the dietitian actively listens to adapt care to the client. During the focus group discussion, the same participant brought this point up, and all others agreed with her. And as our results from questionnaires showed, students' self-esteem increased regarding their ability to do the dietitians' work after the four simulations. With discussions, interviews and questionnaires, we can see that students' self-efficacy increased which improved learning outcomes as the social cognitive theory explained. All participants were open to use IP in practice. As shown by our results in questionnaires, a positive attitude was there from the beginning. Although after the simulations, participants had identified a difficulty to manage different personalities. If that was the case, it could be harder to interact with someone. General opinion about IP were still very positive. Participants' understanding of the concept widened apart from the classroom definition. During the focus group discussion, they all recognize the "unexpected" importance of the nurse in providing client-centered care. Also the speech-language pathologist knew more about dysphagia than they initially thought. According to data, simulations made it possible for dietetic students, to understand what a nutrition interview is in real-life settings. The application of nutrition care in dysphagia was much more concrete for them than at the beginning.

Results from questionnaires and the themed analysis of interviews and focus group discussion complemented each other and went in the same direction. Participants perceived applied skills differently than at the beginning and results from questionnaires were demonstrating a significant increase in comprehension of skills.

4.4 Discussion/ Conclusion

The purpose of this study was to provide insight into the perceived effect of simulations on the development of professional competencies necessary for entry-level practice dietitians in IP dysphagia management.

Dietetics students who participated in four simulations throughout the semester reported feeling more confident in their future dietetic practice. Based on questionnaires and interviews their understanding of nutrition care seemed to have increased. Pre-post questionnaires indicated that there was a significant increase in understanding of various concepts of the nutrition care process. With interviews, participants revealed that simulations helped them embody how dietitians communicate and collaborate with patients, their family and the interprofessional team. Precisely, after all four simulations, participants reported having a better understanding of the role of everyone in the IP team. These results were also seen in two separate studies (Gibbs et al., 2015; Holthaus et al., 2015). Just like Gibbs et al.' study (2015), our research demonstrated that simulations allowed dietetic trainees to understand how to apply the principles of communication with the patient and his family. In summary, the final interviews (T3) and focus group discussion (T4) showed that in retrospect students reported wanting to have control over the conversation with the patient by following a specific order. However, with practice, they realized that it is not necessary, and that it is even better to let go of the conversation while having an idea of the points to discuss but without doing it in a precise order, allowing to use active listening and a client centered-approach.

Participants identified feeling more confident regarding various application of nutrition care. This allowed students to feel more self-efficacious. As per the social cognitive theory (Dinther et al., 2014), students' self-efficacy influenced competence evaluation outcomes. Therefore, when students are more confident, it should positively influence their learning outcomes of entry-level competencies. Simulations allowed for classroom concepts to be transformed to a more practical understanding of delivery of care. It allowed students to see in practice how to apply what they learned in class.

4.4.1 Strengths and limitations

This study provides important insights on how students perceived learning outcomes with a series of simulations over a semester. There is no study in dietetic education that looked at students' perceptions with in-depth interviews on such long period of time. Most of the studies were mixed studies approaches with qualitative data collection only at the end of the simulations (Gibbs et al., 2015; Henry et al., 2009; Holthaus et al., 2015; Miles et al., 2016). Collecting students' perceptions of their understanding enriched our comprehension of how simulations help with learning of entry-level competencies. Although our sample size may seem small, it allowed us to do frequent interviews throughout one semester with four simulations. Sampling from the quantitative data represented almost 50% of the targeted population. It is not possible to say for sure that for the same cohort of students who participated in the same simulations the results would be the same. However, the homogeneity of the population suggests that the learning is similar.

More studies are needed to identify if these results could be observed with different types of simulations (i.e. different conditions, different IP team situations). In the future, researchers could specifically look at perceptions indicators that influence students' learning outcomes. For example, looking at the effect of perceived assessment on performance, positive/ negative feedback on learning outcomes or measured self-efficacy (Alkharusi, Aldhafri, Alnabhani, & Alkalbani, 2013). Validated questionnaires are available to use on a student population. This would help better understand the effect of students' perceptions on learning outcomes with quantitative data.

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CHAPTER 5 - DIETETIC STUDENTS' PERCEIVED ANXIETY BEFORE AND AFTER A SERIES OF SIMULATIONS – A MIXED METHODS APPROACH

Abstract

Introduction: Anxiety is a common minor psychiatric disorder among undergraduate students and health care professionals. Practice with simulations could induce anxiety since students have to perform in an unknown situation. High anxiety has been shown to reduce school performance (eg during an examination, or oral presentation) and low anxiety seems to help to have a better job performance. However, documenting sources of anxiety could help managing them.

Objective: To document the effect of simulations on anxiety levels and sources in dietetic students.

Methods: A mixed-method convergent approach was used with pre-post questionnaires, individual interviews at different times and a focus group discussion to measure dietetic students' anxiety and sources. Nonparametric tests for questionnaires and theme analysis were used to examine data. Quantitative and qualitative data were analysed separately and were compared and merged for interpretation.

Results: A Wilcoxon signed rank test from pre-post questionnaires filled by students (n =14) reported a significant decrease in anxiety level based on the State-Trait Anxiety Inventory (STAI). As well, participants in interviews (n = 7) reported different sources of anxiety during simulations including having observers, the unknown aspect, low self-confidence, and stress.

Discussion: Through practice with simulations, participants' anxiety on STAI decreased. Results are consistent with social learning model that explains how students adapt to environment based on past experiences. By telling how students experienced the simulations, we know more about different sources of anxiety.

Conclusion: As our findings indicate, anxiety among dietetic students reduced when practicing with simulations. Furthermore, our research identified different sources of anxiety that no other research in dietetics had reported. Which may help dietetic educators to enhance learning.

5.1 Introduction

Anxiety among health professionals has increased over the years (Twenge, 2000). In 1997, approximately 27% of health professionals reported having symptoms of minor psychiatric disorder (i.e. from depression and anxiety) (Wall & Wall, 1997; Wilkins & Beaudet, 1998). Additionally, in 2003, 45% of health care providers reported that most days are "quite" or "extremely" stressful (Wilkins, 2007). This statistic drops to 31% in other employed population (Wilkins, 2007). Stress is related to poor mental and physical health which include anxiety disorders (Wilkins & Beaudet, 1998). Anxiety is also common among undergraduate students. Between 25 to 40% of them show signs of anxiety and 12 % have received a diagnosed anxiety disorder (Cassady, 2010). By definition, anxiety is a feeling from an unknown source that produces apprehension or fear (Mosby, 2009). Two main types of anxiety have been studied. Trait anxiety is a feeling stable over time because it related to the person' personality (Smith, Hogewood, et al., 2018). State anxiety, however refers to an immediate response to a change in a specific environment (Morris et al., 1981; Smith, Hogewood, et al., 2018). It can lead to distress, low confidence and poor academic performance (Cheraghian, Fereidooni-Moghadam, Baraz-Pardejani, & Bavarsad, 2008; Moadeli & Ghazanfari-Hesamabedi, 2005). Recently, researchers have shown that anxiety among students appears to negatively affect their academic performance, specifically acquisition of various skills (Ignacio et al., 2016). Anxiety experienced by students may be due to several causes. Among other things, students may be more anxious (trait anxiety), while it is possible that an event (eg test, simulated activity, oral presentation) causes anxiety and influences the outcomes. Simulated activities have become a growing part of health professionals' education, such as dietetics in order to develop clinical competencies (Boet et al., 2013).

A simulated activity is a situation where students act in a real-life work scenario under a controlled environment (Levett-Jones & Lapkin, 2013). Students could see this activity as a skill building opportunity but also as a potential threat inducing anxiety because they are required to perform in front of others, in an unknown situation. They can feel observed and judged by others. As mentioned, state anxiety is most commonly cause by an external factor. However, research has shown that it is possible to reduce anxiety (Morris et al., 1981). This may be accomplished

with appropriate pedagogical approaches. For example, anxiety can be decreased with social learnings or adaptation to the environment (Morris et al., 1981).

In fact, according to a study in nursing, after doing a four-hour simulation workshop, the anxiety level of participants measured with STAI in the experimental group (11.0 ± 2.8) (n = 70) was significantly lower compared to the control group (13 ± 3.4) who did not participate in simulation prior to their first clinical experience (Gore et al., 2011). Although, it is important to note this assessment was made directly after the workshop and therefore, the long-term effect on anxiety was not evaluated. Results from another study revealed opposite findings. In fact, after a series of simulations, anxiety among nursing students (n = 327) was significantly higher than the previous year cohort of nursing students who had little exposure to simulations (Sportsman et al., 2011). There are only few studies among dietetic students. According to a study by Cazzell & Rodriguez (2011), simulation is a stressor as per nursing students mentioned in focus group discussions (Cazzell & Rodriguez, 2011). On the other hand, Holthaus et al. (2015), found that dietetic students experienced an increase in self-confidence after a simulation. However, this study did not look at anxiety experienced throughout the activity, only at perceived self-confidence (Holthaus et al., 2015). Therefore, additional work on this is needed as the anxiety of students may vary on the pedagogical approach used.

It is necessary to explore the reality experienced by the students during simulations because, as reported by several preceptors of clinical practicum placement in dietetics, one of the main weaknesses of trainees when they start their placement is their level of anxiety (Gibson et al., 2015). Knowing students' change in anxiety levels with simulations will help predict probable anxiety related not only to their practicum placement but also to real work experience and job performance. As reported by Schell (2011), low anxiety seems to help to have a better job performance (Schell & Grasha, 2011). There is no research on anxiety levels in dietetic students or dietitians. This research is a promising way of understanding how to prepare interns and how activities to reduce anxiety can be beneficial for students' learning. Since little is known in the dietetic field about anxiety, the aim of this study was to document the effect of simulations on dietetic students' perceived anxiety levels and sources as part of their undergraduate education.

5.2 Methods

A mixed method approach was used to conduct this study. Data collection from both quantitative and qualitative approaches were used concurrently to triangulate the findings (Creswell, 2015; Sadan, 2014). Each data set was analysed separately and compared at the end of the analysis process. Students (n = 28) who took part in simulation laboratories were registered in a third year mandatory course of Nutrition Assessment at the University of Ottawa. They all took part in a series of four simulations and were invited to participate in the research study. Students could choose to participate in two components, one in person with interviews and focus group discussion and the other one with online questionnaires. Details of the series of four simulations are available in Giroux et al., 2019.

5.2.1 Instruments and analysis

Two weeks prior to the first simulation and two weeks after the last one, participants were asked to complete an online questionnaire to determine their anxiety level. The research project simulations took place throughout the school year from September to January. Demographics information were collected as well as information about past experiences with simulations or clinical nutrition work since experiences and familiarity to an environment influence anxiety (Ignacio et al., 2016).

The State-Trait Anxiety Inventory (STAI) was used to assess anxiety among students. This psychometric test was developed by Spielberger (1983), has been widely used around the world and is the standard to measure state and trait anxiety (Bremner et al., 2008; Gore et al., 2011; McNiesh, 2011; Spielberger, 1989). Its utilization with simulations is largely documented in the field of medicine (Bauer et al., 2016; Bommer et al., 2018; Lilot et al., 2018; Phitayakorn, Minehart, Hemingway, Pian-Smith, & Petrusa, 2015; Sorensen et al., 2013; Stefanidis et al., 2017; Wetzel et al., 2011), nursing (Cohen & Khalaila, 2014; Dearmon et al., 2012; Szpak & Kameg, 2013), pharmacy (Schell & Grasha, 2000), and physiotherapy (Judd, Alison, Waters, & Gordon, 2016). The construct validity of trait (20-items, Cronbach's alpha 0.86 to 0.96, average 0.91) and state (20-items, Cronbach's alpha 0.86 to 0.95, average 0.92) anxiety has been demonstrated with different populations and ages (Spielberger, 1983b). Additionally, the tool was translated in French and researchers found that fidelity and validity of the translated version to be

comparable to the STAI (Gauthier & Bouchard, 1993). The English and French versions were used for this study depending on students' preferences. Participants had to rate on a four point Likert scale (almost never to almost always) each item for a total of forty (Spielberger, 1989). Medians, 25th and 75th percentiles from each section, state and trait anxiety, were calculated for both pre-post questionnaires. Wilcoxon signed-ranked tests were calculated from those results comparing pre and post medians. Correlations were calculated between anxiety reported in the pre simulation questionnaire and the previous work-related or simulation experience captured in the same questionnaire.

Semi structured individual interviews were conducted at three times points (at baseline (T1), after two simulations (T2), and after 4 simulations (T3)). Interview guides were similar but adapted to the time point in which the interview was done. Additionally, a focus group discussion was conducted after the semester (T4). The purpose of the focus group discussion was to triangulate what had been said in interviews. All interviews were conducted by the same researcher (MR) and the focus group discussion was conducted by two researchers (MR and AB). Following Bloor's (2001) recommendations, one researcher was taking notes, the other was asking the questions (Bloor et al., 2001). To promote discussion between participants, questions were one dimensioned, open-ended, and concise (Krueger & Casey, 2009). Questions in interviews and the focus group discussion were in connections with feelings prior to the experience, feelings directly before and after each simulation, apprehension, thoughts, and self-confidence. The interview guide for the focus group discussion was piloted the previous year with students who received the same series of simulations experience. Individual interviews and focus group discussion were audio recorded and transcribed to facilitate theme analysis. Verifications of verbatims were made by a researcher (MR) and a research assistant (AL) before theme analysis. Theme analysis was done with a grid of pre-established categories, by two independent researchers (MR and AB). It was possible to capture themes emerging from data according to relevance of statements. Researchers met to discuss emerging themes and possible discrepancies, a third researcher (IG) was available to settle an agreement between coding. Interviews from T1, T2, and T3 were analyzed separately for each participant. Data from all interviews at T1 were merged. The same process was done for T2, T3. Data from the focus group discussion (T4) was analyzed. Once analyzed, themes from each point in time (T1, T2, T3, and T4) were compared to examine the evolution of content and notice similarities or differences

(L'Ecuyer, 1990). Krippendorff's coefficient is the recommended coefficient and was calculated to assess inter-judge reliability (Nili et al., 2017). It measures reliability in missing codes and calculates disagreement among coders, instead of agreement (Feng, 2015; Nili et al., 2017; Park & Park, 2015). Thus, minimizing the effect of chance in agreement (Nili et al., 2017). Researchers discussed about the emerging themes to assure reflexivity (Johnson, 1997). They also discussed discrepancies and a third researcher helped settle an agreement between coding. In addition to triangulating the data and increasing the validity of the results, qualitative and quantitative data were compared and combined to mutually enrich each other.

Finally, results from both assessment components (i.e. qualitative and quantitative) complemented each other to gain a better understanding of anxiety among students participating in simulations. Triangulating data from different instruments (questionnaires, interviews, focus group) increased the validity of the results. It also enriched each component when combined.

5.2.2 Ethics

This research project received the approval from The University of Ottawa's Research Ethics Board on April 7th, 2016 (file number: H10-15-34B). This research project received funding from the Consortium national de formation en santé – Volet Université d'Ottawa.

5.3 Results

5.3.1 Population

Fourteen students consented to participate in the study and to answer the online pre-post questionnaires. Two participants did not complete both sections of the STAI (state and trait). Out of the fourteen participants, seven chose to participate in the qualitative section of the study. Thirteen of the fourteen students were female, which represents the wider population of dietitians (Dietitians of Canada, 2011b). None of the participants had experience with simulations. Nine of the fourteen participants had work/volunteer experience in clinical setting interacting with patients. Four of the seven participants in the qualitative component of the project had work/volunteer experience in clinical setting interacting with patients.

5.3.2 Quantitative results – perceived anxiety on STAI

Participants scored a median of 47 (37.5 – 48.7 (25e – 75e percentiles)) on state anxiety prior to the first simulation (T1), and 33 (26.0 – 44.0) after the last simulation (T3). Participants median scores are 44.5 (38.2 – 52.0) on trait anxiety prior to the first simulation (T1) and 32.0 (27.5 – 41.5) after the last simulation (T3). The differences between T1 and T3 for state and trait anxiety were significant (p=0.05 and p=0.01 respectively). There was no correlation found between state nor trait anxiety and prior work/volunteer experience in clinical setting involving patients. Generally, students had acceptable state anxiety levels, score on STAI between 46 and 55 before simulations, and it appeared that anxiety about simulations decreased throughout each activity (Figure 5.1). Three students scored higher in state anxiety after the activity. For two students, anxiety levels were stable and for the rest of the eight participants, anxiety decreased. These variations in anxiety levels could be explained by the findings reported by students in interviews. Along those lines, participants who were interviewed reported feeling stressed after the simulation due to received feedback. Although only few of them mentioned it, two students reported apprehending their clinical internship more than before.

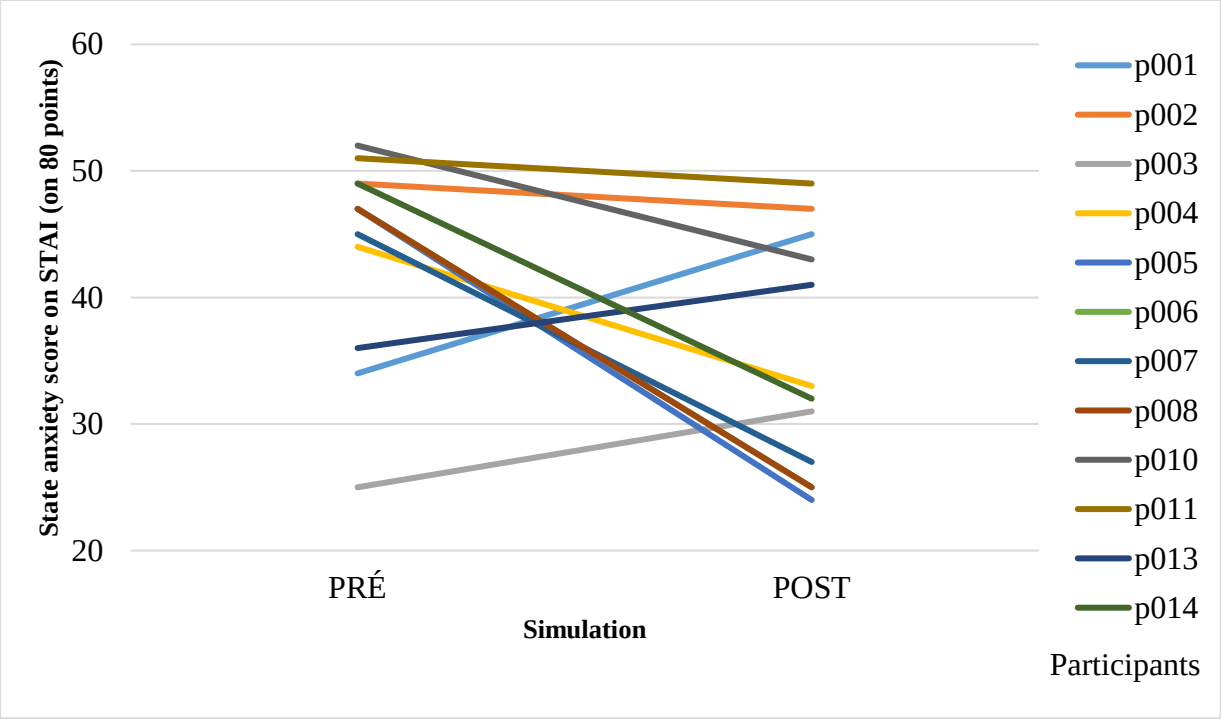

Figure 5.1 Difference on score in self-perceived state anxiety from STAI on pre-post questionnaires after a series of four simulations in dietetic students (n =13)

5.3.3 Qualitative results- source of anxiety at different times

Themed analysis from interviews and the focus group discussion helped better understand the sources of anxiety and how it influences participants. Themed analyses were completed by two researchers with pre-established categories and both knew it was possible to add categories according to relevance. After completing thirty percent of the data analysis, a first Krippendorf coefficient was calculated at 0.65, which is not sufficient to continue. Therefore, researchers met to review discrepancies and review new categories. After coming to an agreement, the previous analysis was revised and the rest of the data was analysed. A second Krippendorf coefficient was then calculated with all data at 0.97, which is greatly acceptable.

Themes are presented in two categories; sources and factors that influence anxiety. There are two pre-established factors that we thought could influence anxiety; stress and self-confidence. There were a lot of emerging sources of anxiety that participants reported during interviews. In the literature, having observers and the unknown aspect during a simulation were a few that we noted as pre-established categories that could be a source of anxiety for students. As mentioned in Table 5.1, emerging themes revealed different sources of anxiety at different times; language barrier, cultural background at T1, received feedback, preparation prior to the activity were reported at T2, T3 and T4, and academic settings at T4 only.

Table 5.1 Summary of themes of factors and sources of anxiety presented by categories and time line project based on the perception of dietetic students (n = 7) (E): emerging themes

	Individual interviews			**Focus group discussion**
	Pre simulation (T1)	**After two simulations (T2)**	**After four simulations (T3)**	**Next semester (T4)**
Factors				
Stress	Experience seemed stressful but beneficial for knowledge. (n = 7)	Some say more stressful than initially thought. (n=2)	Some are still a little stressed but less than before (n=2)	Same at T3.
Self-confidence	Low self-confidence. Majority thought it will increase with practice. Participants with work experience reported more self-confidence. (n = 4)	Mostly increased.	Each simulation became easier, even if difficulty level increased, because they reported having more self-confidence. (n = 5)	Same as T3.
Sources				
Observers	Stressful to have someone judge you but positive to receive meaningful feedback. (n = 4)	Stressful to see everyone at first, but easily forgotten during the simulations. (n = 5)	In general, students were not saying that observers were a stressor.	The professor would be a stressor if an observer in the room. (n = 7)
Unknown situations	Most felt they did not have much information about what was going to happen (n = 5). They were apprehending the patient's questions.	-	-	-
Language barriers (E)	Two students were anxious if the simulation would be in French or English. They should be fluent in both languages. (n = 2)	-	-	-
Cultural background (E)	Two participants said that they do not know exactly	-	-	-

	how to interact with different cultures. (n =2)			
Feedback (E)	-	All of the participants that received positive feedback (6 out of 7) said that it helped them feel more confident in their ability to do such activity.	With feedback, students understood what was expected of them. The actor's feedback brought a new interesting perspective. (n = 6)	Beneficial to receive it from different people (actors, dietitians, health professionals). (n = 7)
Preparation (E)	-	Few participants said that preparing questions for the interview was a good way to feel less stressed about the simulations. (n = 3)	They adapted the way they were getting ready to be more efficient during the simulation (example: having point form subjects to talk about, some cues regarding medications, instead of full script). (n = 4)	All participants thought it would be easier if the subject of the simulation is detailed in class prior to the exercise. That way they would know what to expect. (n = 7)
Academic settings (E)	-	-	-	Even if simulations were not marked, a lot of students still saw the activity as a performance, an assessment, therefore stressful. (n = 4)

T = Time

5.3.3.1 Pre simulations factors and sources of anxiety

As mentioned in Table 5.1, participants with high level of self-confidence also reported having work experience with patients. In opposition, students with no prior work-related experience reported low self-confidence. At T1, one source of anxiety was the unknown aspect of simulations. It was the first time students received such educational activity in their curriculum. Also, students said they were nervous because they could not know what would be asked by the patients, and therefore could not prepare for it. Language was a source of anxiety reported by two students. The University of Ottawa's Honours Bachelor in Nutrition Sciences is offered in French; however students are required to be fluent in both official languages. Participants who felt anxious about the preferred language of the participants also said they could not speak fluently in one of them. Two participants mentioned that the cultural background of the patient was a potential stressor. They both said they did not know how to interact with all different cultures and did not want to compromise their relationship with the patient because of that.

5.3.3.2 Factors and sources of anxiety after two simulations

Some participants (n = 2) said it was more stressful than anticipated. Only one participant reported physical symptoms of stress (*002: sweaty hands, fast heartbeat, hot flashes*). Self-confidence increased for participants after two simulations. One participant said: "*006: it gives me confidence that I can be a dietitian*". In opposition, the experience was not the same for one student. During the first simulation, it did not go well because she was not prepared. She then received negative feedback which decreased her self-confidence. Thankfully, constructive feedback was carefully given after the second simulation which help her increase her confidence.

5.3.3.3 Factors and sources of anxiety after four simulations

At the end of the four simulations, participants said that observers could have been a stressor although their feedback is beneficial to the learning experience and students recognize that. Therefore, even if at first observers were a source of anxiety by the end of the semester, students recognized the benefits of having them. In addition, the majority of participants adapted the way they were getting ready for a simulation. Some of them had a written script prior to the first

simulation, and realised they were not following it because it is not how communication works with a patient.

5.3.3.4 Factors and sources of anxiety the next semester (focus group discussion)

In the final discussion participants mostly reported the same ideas as in their last interviews. However, one participant said that if the professor would have been in class during the activity (she) would have been more stressed. Another participant agreed and explained that it is due to the fact that they think the professor is expecting them to act a certain way. They appreciate the freedom of being at ease and learn how they interact with a patient without thinking about performing according to what the professor is expecting. Although, what they did during the simulation and what was expected from them was the same thing. They were relieved to not have another source of anxiety.

5.4 Discussion

Results from quantitative and qualitative data were complementary. State anxiety decreased from before the four simulations to after. As mentioned, state anxiety is influenced by something that is happening at a given moment, for this research project the simulations. We supposed that if students were anxious prior to simulations, they would have become accustomed to the simulations according to the social theory and feel less anxious about simulations (Morris et al., 1981). In line with our hypothesis, there was a significant difference between pre and post questionnaires median scores regarding state anxiety ($p=0.05$) and trait anxiety ($p=0.01$). High results on STAI mean higher perceived anxiety. Therefore, state anxiety went from average to very low, and trait anxiety from low to very low. The same tendency was reported by students in individual interviews and focus group discussions. All the data helped better understand the phenomenon. Qualitative data obtained revealed that participants' anxiety was influenced by different factors (stress and self-confidence), and came from different sources (i.e. observers, unknown situation, language barrier, cultural background, received feedback, preparation and academic settings). It seems that certain sources of anxiety influenced self-confidence. As per participants reported, received feedback and preparation prior to the simulation helped student build their self-confidence. Positive feedback confirmed that they were doing the right thing.

Some sources of anxiety have been identified by our participants but were not reported in scientific literature (i.e. cultural background, language barrier, received feedback, preparation and academic settings). Cultural background was a source of anxiety in our population. Students were worried they would not be able to correctly interact with a patient from a different culture. This is related to the cultural competence, which is defined as "the capacity to function effectively within the context of cultural beliefs, practices, and needs of clients and their communities" (Georgetown University National Center for Cultural Competence, 2004). According to McArthur et al. (2011), there is no scientific literature that assesses quantitatively cultural competences among dietetic students (McArthur, Greathouse, Smith, & Holbert, 2011). It would be relevant to assess cultural competencies with the use of simulations considering that it is a source of anxiety identified by students and that there are no studies on the subject. Language barrier is related to cultural competencies. Our students mentioned feeling anxious because they do not feel comfortable delivering care in the patient' preferred language. No other research reported this as an issue. At the University of Ottawa, we are one of the few bilingual universities in Canada. Although both languages are frequently spoken, patients may be unilingual. Our students are aware of this reality and have reported being stressed about meeting the patient' needs to provide services in the language of their choice. We knew that feedback helped the perception of learning and motivation (Bandura 1997, Alkharusi et al., 2013). But there was no study on how received feedback after simulations affects self-confidence and anxiety. We were able to come to these results by asking questions in individual interviews where students felt comfortable talking about their feelings. Several studies with a qualitative approach conducted focus groups (Cazzell & Rodriguez, 2011; Farahat et al., 2016; Henry et al., 2009). On another hand, we had decided not to evaluate and rate the students' performance during the simulations in order not to affect the level of anxiety. Some studies have shown that assessment can cause stress for students (Cantrell et al., 2017; Cheng, 2013; Ignacio et al., 2016; Judd et al., 2016). Participants still reported that the fact that it is done as part of a course stressed them because they still want to perform well.

Even though findings in qualitative and quantitative data were coherent, few inconsistencies have also been found. There was no correlation found between work/volunteer experience in clinical setting prior to the simulations and state anxiety. However, some participants in the T1 interview said they felt more confident with simulations because they had

work/volunteer experience in clinical settings with patients. Self-confidence is known to be a factor that influences anxiety.

Our findings are consistent with social learning as outlined by Morris et al. (1981). Social learning explained that anxiety/stress decreased when adapting to the environment from past experiences (Morris et al., 1981). In interviews, students revealed that observers were a stressor at first, but they realised how beneficial feedback comments were and after the second simulation students did not see them as much of a stressor anymore. They were adapting to the environment exposed to them. Ignacio (2016) also reported that repeated exposure could decrease anxiety, similar to our findings (Ignacio et al., 2016). In fact, it could be the same with the presence of a professor, who could provide helpful suggestions to enhance student competencies using a pedagogical approach to empower students. Students could get used to it and appreciate the individualized expert feedback and support. Another way feedback could be given without an observer in the room is through the use of video recording and a specialized software allowing feedbacks. In addition, the unknown situation was a source of anxiety at first but was not anymore after the first two simulations. The simulation was a recognized situation; even if the scenario changed, they knew what was expected from them and how they were supposed to interact with the patient/actor. Our findings are in line with other studies that found a decrease in anxiety after a four-hour simulation workshop (Gore et al., 2011). Although this study was done with nursing students, very few studies in dietetics program were made. Miles et al. (2016) found a reported increase in self-confidence after three simulations, which is similar to our results (Miles et al., 2016).

5.4.1 Strengths

Characteristics of participants in both quantitative and qualitative components were similar. None of them had prior experience with simulations and most had work/volunteer experience in clinical settings. Our population can be described as homogeneous. The quantitative instrument has been utilized largely and validated with the student population. Also, the focus group interview guide was piloted the year before. There were different measurement tools used in this research project to triangulate the findings. The majority of findings from the quantitative and qualitative components were consistent and complementary.

5.4.2 Limits

Our research was designed for a small population, however participants responded well to the invitation and we recruited almost 50% of the targeted population. In addition, students who participated in this research project, more precisely in the qualitative section were likely to have a certain personality. Since they were asked to talk about their learning process, their stress and anxiety with this new approach, we think students who participated were not nervous of talking about academic settings, learning processes, and may be less stressed about the simulations. This could impact the findings of our study.

5.5 Conclusion

Few studies have looked into anxiety and simulations in dietetic education at the university level. This could be explained by the very few studies with simulations in dietetic education in general. Research in nursing and medicine seemed to have found that while practicing with simulations, students are less anxious after the activity. However, little is known if these findings apply to all health professionals' education. The aim of this study was to document the effect of simulations on anxiety level and the sources of anxiety as perceived by dietetic students before they enter their fourth year university clinical internship placement. Our findings indicate that anxiety among students decreased with a series of four simulations. Stress and self-confidence were reported to be factors that influenced anxiety. Multiple other sources of anxiety were reported by students: observers, unknown situation, language barriers, cultural background, received feedback, preparation prior to the simulation and academic settings. Knowing what causes anxiety related to learning with simulations will be helpful for faculty and staff to make this an even better, more effective and more rewarding learning experience for students.

Our research contributes to a better understanding of the learning with simulations experienced by dietetic students. As our findings indicate, anxiety among dietetic students evolved similarly to that of nursing students when practicing with simulations (Gore et al., 2011). However, our research was able to identify different sources of anxiety that no other research had reported (i.e. cultural knowledge, language barrier, feedbacks, preparation and academic settings). These sources of anxiety may have been partly explained by the particular context in which our students are studying in (i.e. a bilingual learning environment). Lower anxiety could

help students perform better in simulations, as per Yerkes and Dodson law (1908) (Yerkes & Dodson, 1908). In addition, it could be possible to use simulations as an assessment tool. Simulations are good indicators for performance assessment of knowledge and for predicting job performance (Lievens & Patterson, 2011). Competencies, such as communication, collaboration, care to patient, and professionalism could be assessed using this activity. Therefore, further research should be on assessment of dietetic students during simulations to give insight on preparation level for internship placement. Furthermore, a better understanding of students' level of anxiety and teaching methods such as simulation help the preparation for the clinical practicum placement and the workplace. Considering the high rates of mental health problems in the workplace (Wilkins 2007), if the transition between academia and the workplace is carefully planned with a series of competency building simulations, it is possible for students to feel confident and equipped to face these challenges.

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CHAPTER 6 – ASSESSMENT OF ENTRY-LEVEL COMPETENCIES NECESSARY FOR DIETETIC PRACTICE USING PERFORMANCE INDICATORS SCORING DURING UNDERGRADUATE STUDENT SIMULATIONS

Abstract

Introduction: There is limited research on the use of simulations in dietetic education. Assessment of competencies with the use of simulations is recent and may represent a complex task for dietetic educators, since there is a lack of tools available for such assessments. However, during simulation assessments of performance indicators (PI) provide insight about students' acquisition of competencies. Furthermore, due to a changing environment in clinical settings including increase complexity of care, it is essential to start educating students about professional competencies during the academic university curricula.

Objective: To document the development of entry-level competencies for dietetic practice of students with PI scoring during simulations as part of an undergraduate dietetic course.

Methods: We developed a scoring tool based on competency PI defined by the Partnership for Dietetic Education and Practice of Canada. PI scoring by two researchers was performed with the use of video-recordings of four simulations in which dietetic students took part. Median PI competency scores were calculated for each simulation and each competency category. Friedman' ANOVAs were used to look for potential differences in scores for competencies between at least two simulations.

Results: Thirteen students enrolled in the course gave informed consent to participate. According to video recording observations, inter-judge reliability was very high (inter class correlation = 0.923). Based on judges' observations, there was a significant increase in communication, nutrition care and interprofessional collaboration competency PI scores between the first and last, as well as the first and second simulations ($p < 0.001$ with Bonferroni adjustment).

Discussion: We found a high inter-judge reliability using the developed competency PI scoring tool. According to our results, dietetic students' performance on some key competencies increased throughout the four simulations. Therefore, it would be a valuable approach to include

simulations with PI scoring in dietetic curricula to document the development of entry-level competencies.

Conclusion: Our research was able to document the value of the use of simulations with competency PI scoring in dietetic education. The developed scoring tool helped document students' progressive learning of entry-level competencies. Although competency PI assessment is a useful approach, the developed scoring tool needs more validation testing.

6.1 Introduction

Due to an increased complexity of care, clinical environments can only provide i.e. limited internship placements (Kaddoura et al., 2015) and are increasing their expectations of healthcare trainees. It is therefore essential to educate students to professional care practice during university courses. There needs to be a shift in dietetic education so students focus more on competency acquisition and how to apply knowledge (Newton et al., 2015). Some researchers have attempted to assess the acquisition of competencies for dietetic practice through the use of interprofessional simulations (Buchholz, Vanderleest, et al., 2018; Gibbs et al., 2015; Holthaus et al., 2015; Miles et al., 2016; Tyler, 2017). Until now some education programs have used simulations as a preparation tool to allow students to practice their skills and improve the overall student experience during their undergraduate curriculum. However, it would be relevant to use simulation as an assessment opportunity using a tool designed to measure students' performance as well. Indeed, such education programs would benefit from criterion-referenced tools for assessments with the use of simulations. These tools should be reliable and valid. Reliability is "the ability of a measure to produce consistent results when the same entities are measured under different conditions" (Field, 2014 p.882). Validity is "the evidence that a study allows correct inferences about the question it was aimed to answer or that a test measures what it set out to measure conceptually" (Field, 2014 p.885). In other words, the use of simulations and the assessment of student performance would help to document students' progress towards the acquisition of competencies needed for the practice of dietetics before going on practicum placements. In addition, by evaluating their progress, students get personalized feedback given by observers that allows them to work on specific and concrete elements to help increase their level of competency.

In a recent study, dietetic students in a master program at the University of Kansas (n = 16) were videotaped during a simulation, and two observers independently assessed students' performance afterward (Tyler, 2017). The simulation scenario was about the use of the Nutrition Focused Physical Examination (NFPE) in hospital settings. The raters used a checklist developed by the *Academy of Nutrition and Dietetics* specifically designed for the NFPE (Tyler, 2017). Significant improvements were observed in two of the seven competency categories (muscle exam and subcutaneous fat exam) (Tyler, 2017). Overall performance was significantly improved according to one observer, but not the other. According to researchers, even if there were discrepancies between scorings, inter-rater reliability was met (Cohen kappa = 0.7813). In a recent project at the University of Guelph, simulations with standardized patients were used to assess competencies. Researchers based their assessment on the Partnership for Dietetic Education and Practice (PDEP)'s performance indicators (PI) (Buchholz, Vanderleest, et al., 2018). However, little is known about the research methodology and the method of assessment in that study. According to their results, students improved their communication and nutrition-care related competencies (Buchholz, Vanderleest, et al., 2018). Nonetheless, observation assessment of student performance by a third party is relevant to ensure progression of training since students have a tendency to overestimate their progress (Horacek et al., 2007). Other researchers in dietetics have developed a validated and specific tool to evaluate communication between a dietitian and a patient (Whitehead et al., 2014). This tool is used to assess dietitians' practice in the workplace; however, the tool was not designed for students. Furthermore, in other areas of health sciences, several tools have been developed to evaluate student performance during simulations (Adamson et al., 2013; Bilgic et al., 2018; Ilgen et al., 2015; Jepsen et al., 2014). These tools assess competencies specific to their field of practice.

Although developing reliable and validated tools to assess students' demonstration of PI is important, the way in which educators assess students is also an important factor. There is no consensus on the matter. Ratings during live observations or afterwards with video recordings are both reported in the literature. A recent pilot study at the University of Southern California concluded that live rating and video recordings rating of interprofessional competency were not equivalent when assessing the same simulation (Lie et al., 2018). Authors suggested that video raters were typically expert trainers and may apply stricter competency scoring standards (Lie et al., 2018). In another recent study, the ratings based on observations made from video recordings

of simulations had higher reliability than ratings performed during live observations (Mete & Brannick, 2017).

Nonetheless, little is known about assessment of competencies during simulations as part of dietetic education programs. Evaluation of PI during live simulations or with video recordings are two options. The development and validation of dietetic competency PI assessment tools is needed. Therefore, the aim of this study was to document the development of students' competencies for dietetic practice through the use of simulations with a newly designed PI scoring tool.

6.2 Methods

Third year students registered in the Honours Bachelor of Nutrition Sciences at the University of Ottawa have a mandatory Nutrition Assessment course. In this class, students took part in a series of four simulations throughout the semester (Giroux et al., 2019). A PI scoring tool was developed to assess attainment of professional competencies with simulations. To compare two different methods of PI competency scoring during live observations and from video recordings, each simulation was videotaped to ensure video recording ratings. Observers (registered dietitians) rated competency PI during live simulations. Four simulations were running at the same time within the course laboratory schedule, therefore there were four different observers for live-observation competency PI rating. Observers were trained to use the PI scoring tool correctly. In addition, all recordings were viewed and rated by two researchers trained to use the competency assessment tool. The researchers that viewed video recordings were two of the observers during live ratings.

6.2.1 Scoring tool development

Based on the requirements of the Integrated Competencies for Dietetic Education and Practice (ICDEP) for entry-level practice defined by PDEP (Partnership for Dietetic Education and Practice, 2013), we selected sixteen PI that applied to the learning objectives and scenarios of all four simulations (Partnership for Dietetic Education and Practice, 2013). This method was also used by Buchholz et al. assessing competencies during simulations (Buchholz, Vanderleest, et al., 2018). In our research, chosen PIs were from three competency areas of practice: professional

practice, communication, and nutrition care. Furthermore, we selected six interprofessional behavioral indicators (BI) from the Interprofessional Collaborator Assessment Rubric (ICAR) for interprofessional collaboration (Curran et al., 2010). In addition to the development of a scoring tool, the evaluation based on the judgment of the observer using a criterion-referenced grid (scoring tool) has been recommended by various researchers (Baker & Dismukes, 2002; Bray et al., 2011; Ilgen et al., 2015; Jepsen et al., 2015; Klampfer et al., 2001; Marfeo et al., 2014; Monaghan et al., 2005; Swanson et al., 1995). Our observation tool was developed by a team of researchers working together through each step. We designed and reviewed the content of the PI scoring tool according to the simulations' learnings objectives. In addition to PI, the rest of the grid was developed following the logical sequence of a nutritional interview. The goal was to make is easier for the observer to follow the competencies applied to each section of the interview as it was performed (introduction, body of the interview and conclusion). The ICDEP has no PI that specifically addresses competencies for the introduction and conclusion of a nutrition interview. Therefore, we developed items (6 in total) that assess these components of the interview. Each competency PI was scored on a Likert scale following the model of other validated tools (Pottier et al., 2016; Todd et al., 2008): does not reach competence (0), achieves more or less competence (1), achieves competence (2). This instrument was used by four observers for live observations and by two researchers for video recording assessments.

6.2.2 Validation of the scoring tool

Since the PI scoring tool was not validated, we calculated an interclass correlation coefficient (ICC) from competency scoring of all simulations. ICC informs us on the level of reliability of the tool and the level of agreement among assessors (Shrout & Fleiss, 1979). Two ICC were calculated, one to assess inter-judge reliability during live observations and another for video-recording observations. Typically, ICC values are classified as: "< 0 = poor; 0 – 0.20 = slight, 0.21 – 0.40 = fair; 0.41 – 0.60 = moderate; 0.61 – 0.80 = substantial; and 0.81 – 1.00 = almost perfect agreement" (Whitehead et al., 2014 p.325).

6.2.3 Statistical analysis for competency PI scoring

Median total overall competency score and each competency category score were calculated for each of the four simulations. If the ICC was acceptable, from either live or videotaped

observations assessment, Friedman' ANOVA was calculated for total overall competency scores of the four simulations. If overall scores were significantly different, Friedman' ANOVA was calculated for each competency category score between all simulations (Bonferroni corrected p value at 0.008). If there was significant difference within one competency category, Wilcoxon ranked-signed test was calculated between each simulation, see Figure 3.4, Chapter 3 (Bonferroni corrected p value at 0.001). These analyses helped understand which competency scores were significantly different and possibly improved during the series of four simulations.

6.3 Results

6.3.1 Scoring tool validation

Out of the 28 students registered in the mandatory Nutrition Assessment course in September 2016, thirteen gave their consent to participate in this study. From all four simulation activities, fifty-two evaluation forms should have been available. From live-observations, fifty forms (approximately 12 to 13 participants per simulation) were collected. Thirty-six video recordings were available for assessment, 9 per simulation. Some video recordings could not be used due to technical difficulties with the cameras or sound system. One participant was absent the day of two different simulation activities. An ICC (0.236) was calculated for live observations which is within range of "fair" agreement (Whitehead et al., 2014). Two researchers rated all 36 recordings each. An ICC (0.923) was calculated for video recorded competency assessments, which is within range of "almost perfect" agreement (Whitehead et al., 2014). Further analysis on the development of competencies were made from ratings based on video recordings since the ICC was higher and therefore more reliable than from live observations.

6.3.2 Competency assessment

Median scores from video recordings competency PI assessments are presented in Table 6.1. Median scores from each section of the assessment tool are presented for each simulation. There was a significant difference in median overall competency category scores (%) between at least two of the four simulations ($p = 0.002$). There was no significant difference in median scores (%) for the introduction, conclusion and professional practice competency categories between at least two of the four simulations ($p > 0.008$ Bonferroni adjustment). There was a significant difference

between at least two of the four simulations when it came to competencies regarding communication, nutrition care and interprofessional collaboration. However, the post-hoc test did not reveal any significant difference in medians scores between simulations (i.e. between S1 and S2, S2 and S3, S3 and S4, and S1 and S4) for all three competencies.

Table 6.1 Median score and 25th and 75th percentiles from video recording assessments of dietetic competency performance indicators for each simulation, and each competency category (n = 9)

		Simulation 1 (S1)	Simulation 2 (S2)	Simulation 3 (S3)	Simulation 4 (S4)	
		Mdn (25th-75th)[a]	Mdn (25th-75th)[a]	Mdn (25th-75th)[a]	Mdn (25th-75th)[a]	P value*
Introduction of the interview		67 (67 – 100)	100 (83 – 100)	50 (50 – 100)	50 (50 – 100)	0.244
Body of the inter-view	Professional practice	50 (33 – 50)	50 (50 – 83)	83 (33 – 83)	83 (67 – 83)	0.079
	Communication	50 (46 – 53)	64 (53 – 75)	57 (50- 71)	86 (71 – 88)	0.001
	Nutrition care	39 (28 – 39)	67 (52 – 69)	78 (61 – 86)	83 (78 – 89)	0.000
	Interprofessional collaboration	38 (25 – 69)	75 (63 – 81)	88 (63 – 88)	100 (88 – 100)	0.000
Conclusion of the interview		67 (17 – 100)	67 (50 – 100)	100 (50 – 100)	83 (67 – 100)	0.115

[a] Median (25th percentile and 75th percentile)
* Significant difference when p value < 0.008 (Bonferroni adjustment)

6.4 Discussion

Inter-rater reliability was higher with video recordings assessments of dietetic competency PI (ICC 0.923) compared to live observations (ICC 0.236). Therefore, PI scores from simulation video recordings were taken into account to look at the development of students' competencies for future dietetic practice. The possible explanations behind the discrepancies between ratings during live observations and from video recordings could be due to the fact that each live observer had to rate a different simulation at the same time. Moreover, it was not possible to have two observers for each simulation due to limited resources and this would have been intrusive and distracting for the students to have two observers present during the simulation. However, with video recordings the two researchers could assess the same simulation with the same participants. Since, the number of raters differed from live observations (4 observers) and video recordings (2 researchers); this could have affected the variability in scoring. The two researchers also observed the live simulations. This could have increased their ability to assess competency

PI with the use of the scoring tool; therefore, increasing inter judge reliability. Nonetheless, each observer and researcher received the same training to use the scoring tool. In addition, the interclass correlation calculations take into account the number of judges. In another recent study, live observations were made by multiple educators and the ratings from video recordings were made by one rater. This difference in the number of judges impacted the reliability of ratings (Lie et al., 2018). With video recordings it is easier for educators to assess the same exact simulation and compare ratings. These results were also seen in a research project at the University of Claude-Bernard in Lyon for which the ratings made from video recordings of simulations had higher reliability than ratings during live observations (Mete & Brannick, 2017). This type of assessment can be used to rate students' performance and deliver feedback on precise competency PI.

As for the assessment of dietetic student competencies, we measured that student improved some competencies throughout the series of simulations based on PI ratings from video recordings. There was no significant difference throughout all four simulations for indicators related to the introduction of the nutrition interview. We think that because of the different context between each pair of simulations, students might have forgotten to do the correct introduction. S3 and S4 were interprofessional and students had to "jump in" the situation, instead of welcoming a patient during a one-on-one session at a clinic such as in S1 and S2. Therefore, no significant differences where seen in this competency category. Those students may benefit from practice to perform introduction of a nutrition interview in a more complex context. Regarding PI in the conclusion part of the interview, scores were not significantly different throughout the four simulations. Although the scores had a tendency to increase at each simulation, they were not significantly different. Competency categories where we saw a significant improvement in PI scores were communication, nutrition care and interprofessional collaboration. Students received a lot of feedback from observers (e.g. registered dietitians) and the actors after simulations and were able to apply what they were told, so they could improve in subsequent simulations.

6.4.1 Strengths

The PI scoring tool developed has sufficient evidence of inter judge reliability to be used with video recordings of simulations for other cohorts of students registered in the same education

program. In addition to testing this new dietetic competency PI scoring tool, we have been able to differentiate results from live observations and video recordings. No research study using dietetic competency PI scoring has identified one observation method being more reliable than another. However, with our results, there is now another study that identifies video recordings observations has more reliable than live observations, just like Lie et al. (2018) in their research in a medicine program. Another strength was that raters for both types of assessments received the same training to use the developed scoring tool. In addition, this research project supported continuing education of registered dietitians by given them training about an assessment method for dietetic competency PI.

6.4.2 Limits

Even if reliability of the competency PI scoring tool was demonstrated, the sample of video recordings evaluated remained small. According to Ciccheni (1976), the minimum sample size to assess inter rater reliability with a 3-point scoring tool is 20. Our research project had 36 video recordings. Also, the scoring tool has to go through a complete validation of psychometric properties such as intra and inter-rater reliability, as well as face, content, construct and predictive validity, to be able to use it with different simulations (Whitehead et al., 2014).

6.5 Conclusion

This research aimed to measure the effect of simulations on the development of professional competencies necessary to practice dietetics. To do so, we developed a scoring tool to be used by educators while observing a simulation or afterwards using video recordings in order to score dietetic students' competency PI. Additionally, we observed a difference between PI ratings from live observations and video recordings, with the latter being more reliable. Furthermore, our results showed that in our sample of students' competency areas such as communication, nutrition care and interprofessional collaboration significantly improved through a series of four simulations as part of an undergraduate dietetics course. This research was able to demonstrate the possibilities of creating new tools for assessment of professional competency PI to accompany learning with simulations. In the literature, there were no such tools available for dietetic students prior to this research. This tool can be used to assess dietetic students' progression of competency development with simulations. In the future, it would be pertinent to

use this type of assessment tool to get an indication of students' performance based on competency PI scoring to document the development of certain competencies with simulations before practicum placements, and to help plan activities that adjust to dietetic students' learning needs.

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CHAPTER 7 – GENERAL DISCUSSION

7.1 Need for the project

The need for this project was identified based on the lack of documentation of the use and the effect of simulations on the development and evaluation of competencies in dietetic education. Indeed, little is known about how beneficial simulations are for the acquisition of specific competencies necessary for entry-level practice of dietetics. Therefore, it seems essential to study the effect of simulations on the acquisition of entry-level practice competencies. The development of such competencies can be evaluated by documenting the perceived effect of simulations on competency learning by students and by the assessment of performance indicators with a third-party observer. In addition to this, anxiety level could influence dietetic students' performance during simulations according to the cognitive interference theory (Coy et al., 2011). Anxiety refers to the unwanted thoughts in someone' life that have a negative influence (Sarason, Pierce, & Sarason, 1996). It is thus necessary to explore this reality experienced by students during simulations because, as reported by several preceptors of clinical practicum placement in dietetics, one of the main weaknesses of trainees arriving in their first placement is their level of anxiety, which is a barrier to their learning experience (Gibson et al., 2015). Specifically, it is relevant to document dietetic students' level of anxiety with the use of simulations and how it is influenced, since this relation has not been studied in dietetic education. Perceived acquisition of knowledge has been linked to self-efficacy in students. Indeed, students seem to want to learn more if they perceive they previously learned something (Pajares, 2006). Furthermore, assessment of performance indicators is used in other health education disciplines and informs educators about students' learning process (Boet et al., 2013). Such assessment makes it easier to adjust to students' learning needs more efficiently with each simulation's debriefing discussion (Marzano et al., 1993; Newton et al., 2015). During this discussion, students have a conversation with the observer on their performance right after the simulation. For example, based on Eppich' PEARLS debriefing model, students are asked to identify solutions that could have enhanced their performance during the simulation (Eppich & Cheng, 2015).

More specifically, the present research project looked at the development of key competencies related to IP dysphagia management in a sample of 14 dietetic students. Dysphagia

is a high risk condition for patients and the contribution of a competent dietitian helps ensure safety for patients and reduce risks of complications (Garus et al., 2015).

In view of the lack of current published dietetic education research on the topic, it is important to explore the effect of using simulations on the acquisition of key professional competencies including interprofessional competencies required to safely provide necessary care such as nutrition care for patient with dysphagia through simulations for dietetic students, in addition to assessing their perceived level of anxiety since this parameter could influence their performance.

7.2 Purpose of the project

Since little is known about the use of simulations in dietetic education, the overall objective of this research was to describe the effect of simulations on the development of dietetic students' professional competencies related to IP dysphagia management and their associated level of anxiety. Specific objectives were (1) to document the effect of simulations on the development of competencies necessary for the practice of dietetics and for IP management of dysphagia and (2) to document the effect of simulations on dietetic students' perceived anxiety level. To achieve specific objective 1, we looked at the (1a) perceived acquisition of competencies reported by students and at the (1b) development of competencies with the use of a PI scoring tool during simulations.

Unlike other studies who used only quantitative measures (Miles et al., 2016) or qualitative methodology (Farahat et al., 2016), the methodology chosen for this research project allowed to both understand students' perception with a qualitative methodology and to quantify with a score their learning of competencies with a quantitative methodology. This mixed methodology was necessary in order to fill the knowledge gap about the development of key competencies for entry-level practice of dietetic students with the use of simulations and to determine their level of perceived anxiety. The findings of this research bring insight into the students' perspective of learning with simulations of dietetic competencies.

7.3 Methodological approach

To reach objectives, we used a mixed-method convergent design, where quantitative and qualitative data were collected at the same time. Data from quantitative and qualitative methodologies complemented each other and were compared after analysis to help with data triangulation. Different tools were used to collect data. There were pre-post questionnaires, individual interviews at three different times (T1, T2, T3; see Figure 3.1 in Chapter 3), a focus group discussion at the end of the four simulations (T4), and a competency assessment with a PI scoring tool for each simulation. This methodological approach at different time points with different tools enriched the data collected.

7.4 Overview of main results

7.4.1 Participants

Out of the entire student population registered in the Nutrition Assessment course at the University of Ottawa in 2017 (n = 28), fourteen students gave informed consent to participate in the quantitative section of study. This represented 50% of the population which is higher than the expected rate of participation (Elgie, 2014) and sufficient for the targeted population (see Table 7.1 for a summary of sample size). However, according to the G power software, it is, supposedly, not enough to observe a significant difference between pre and post simulation results with a Friedman' ANOVA in this population (Faul et al., 2007). Nonetheless, we were able to find significant differences for all our objectives. Seven participants agreed to complete the qualitative component of the project. Not all participants were required to participate in individual interviews and the focus group discussion since it was more time consuming for participants and data from interviews and the focus group discussion are very rich. As education research showed, undergraduate students' participation in research projects is influenced by their busy schedule (Cyr, Childs, & Elgie, 2013). Finally, thirteen students agreed for us to use the video recordings of their simulations for observation and evaluation of PI attainment with the scoring tool. Considering that thirteen students per simulation is equivalent to 52 recordings in total, it was sufficient to address inter judge reliability and conclude to findings (Ciccheni, 1976).

Table 7.1 Summary of the estimated and real sample sizes according to data collection instruments

Data collection instruments	Estimated participants	Participants
Questionnaires	10 to 22	14
Interviews and focus group	5 to 8	7
Scoring tool with video recordings	10*	13**

*10 participants X 4 videotaped simulations = 40 simulation video recordings

** 13 participants X 4 videotapes simulations = 52 simulation video recordings; only 36 video recordings available due to technical difficulties

7.4.2 Dietetic students' perceptions of learning professional competencies

Results from questionnaires, as well as individual interviews, and focus group discussions complemented each other and allowed to understand the perceived acquisition of competencies with the use of simulations. With interviews, we understood more how participants' perspective changed throughout the use of simulations. From before the first (T1) and after the last simulation (T3), participants indicated an increase in self-confidence regarding different aspects of the nutritional assessment, and regarding students' understanding of delivery of nutrition care. This was expected because students gained more experience in participating in the same type of situation (e.g. simulations with a SP) and received feedback from trained observers on their performance. These conclusions were also reported in other dietetic studies (Holthaus et al., 2015; Smith, Hsiao et al., 2018). From the seven items of our questionnaires detailing IP collaboration attitudes, students' perspective did not vary from the first to the last simulations. However, our results showed that from the beginning they had a favorable perception on all seven items of interprofessional collaboration. As shown in Table 4.3 (Chapter 4), pre-simulation mean scores of positive IP collaboration items (1, 3, 4, 5) were high (4-5; agree to totally agree) and mean scores of negative attitude towards IP collaboration items (2, 6, 7) were low (1-2; disagree to totally disagree). Participants disagreed to negative attitudes towards IP collaboration, meaning they did not agree that IP collaboration could interfere with the delivery of care. This explains the non-significant results from the seven items of the questionnaires regarding interprofessional collaboration. In opposition, other research has shown a more favorable

perception of interprofessional collaboration after a simulation activity (Holthaus et al., 2015). Our pre-post simulation questionnaires did not report such increase after the four simulations, since our participants already valued the importance of IP collaboration. However, in individual interviews, students' comprehension of IP collaboration shifted from textbook concepts to a more practical understanding of the implication in IP collaboration.

The same phenomenon was observed for other competencies (collaboration, communication, IP collaboration, clinical reasoning, and nutrition care), for which we saw an evolution in participants' dialogue about their learning. Concepts from textbook theory and classroom education were transformed during the semester with simulations to a more practical understanding of the delivery of care. At the end of the four simulations, participants talked more about the patient's perspective and a more centered approach with inclusion of other health professionals. This leads us to believe that students had adopted a more empathetic and patient-centred approach, a more practical approach to professional competencies than the theoretical concepts seen in theory. Students considered the patient as an important actor in the decision making and implementation of his/her health care plan. No other research in dietetic education has looked at students' perceptions of learning professional competencies throughout a series of simulations using individual interviews. Therefore, it is not yet possible to compare our results to others research in dietetics. In other fields, to our knowledge no other study has used the same complete approach either.

7.4.3 Assessment of entry-level competencies necessary for dietetic practice using performance indicators scoring

The second specific objective of the project (1b) was answered with the development and the use of a scoring tool to measure dietetic competency performance indicators. Validity of the developed tool met agreement almost perfectly between judges (ICC 0.923) with the observations from video-recordings when using the scoring tool to rate performance indicators. Furthermore, with the use of the scoring tool, there were significant differences between simulations when it came to total overall scores, specifically scores of professional competencies such as communication, nutrition care and IP collaboration (Table 6.1, Chapter 6). The most significant increases in competencies were seen, unsurprisingly, between S1 and S4, for the competencies related to communication, nutrition care, and IP collaboration. It is no surprise that the biggest

difference in scores was seen between the first simulation, where students had no previous experience with this activity, and the last one where they had been able to practice competencies and apply the previously received feedback from observers during the four simulations. A recent scientific study reported similar findings regarding the increase of dietetic competencies after only one simulation (Tyler, 2017). However, the researcher looked at competencies related to Nutrition Focused Physical Examination (NFPE) with an observational tool developed and validated by the Academy of Nutrition and Dietetics (Tyler, 2017). As for our results, the three competency categories where there was no significant change in performance indicators' scores were introduction of the interview, conclusion of the interview and professional practice. These three categories were also the ones with fewer performance indicators items in the scoring tool. We hypothesized that there were not enough items to see a difference of performance indicator scores between all four simulations for those categories. Although Tyler (2017) did not express a hypothesis as to why they did not see a significant difference in various competencies with simulations. They only observed a significant increase in two competency categories out of the seven related to delivery of the NFPE (Tyler, 2017).

7.4.4 Dietetic students' perceived anxiety

Finally, the last objective (2) of the project was to document the effect of simulations on the perceived anxiety level of dietetic students. Our results showed that for quantitative results, anxiety measured with the STAI questionnaire decreased from the first to the last simulations (Figure 5.1, Chapter 5). Surprisingly, contrary to results published in the scientific literature (Fraser et al., 2012), there was no correlation between work experience and anxiety before the first simulation based on our results. Moreover, individual interviews revealed sources and factors that influenced how anxious participants felt related to simulations. Stress and self-confidence were two factors identified by participants that influenced their anxiety level. Known sources of anxiety identified by literature (Hembree, 2008; Morris et al., 1981; Shearer, 2016) and reported by students participating in this project were the unknown aspect of a simulation and having observers present during the simulations. Various other sources of anxiety were mentioned by our participants: language barriers, cultural background, received feedback, preparation prior to a simulation and academic settings. Some participants expressed feeling uncomfortable communicating with a patient in one of the two official languages, therefore they

were anxious prior to the simulation regarding the patient' preferred language. The cultural background of the patient was a source of anxiety for students before the first simulation, as data from individual interviews revealed. They did not feel confident to interact with a patient from different cultural background as theirs. Certain sources of anxiety influenced participants' self-confidence, namely the preparation to simulations, and the feedback received by the actor and the observers from prior simulations. Those findings are consistent with social learning model since state anxiety decreased with exposure to simulations and adaptation to the environment (Morris et al., 1981).

7.5 Bringing results together

As our conceptual framework stated (Figure 2.1, Chapter 2), we thought that students in their learning environment such as a simulation could be influenced by anxiety induced by the activity. Our conceptual framework also supposed (based on Beischel, 2013, Coy et al., 2011, Ignacio et al., 2016, Morris et al., 1981 and Swanson et al., 1995) that with the practice of multiple simulations, students should adapt to simulations, feel a reduction in anxiety and learn competencies through the exposure to an authentic situation. Analysis of our results showed the following relationships (see Figure 7.1 for the adapted conceptual framework).

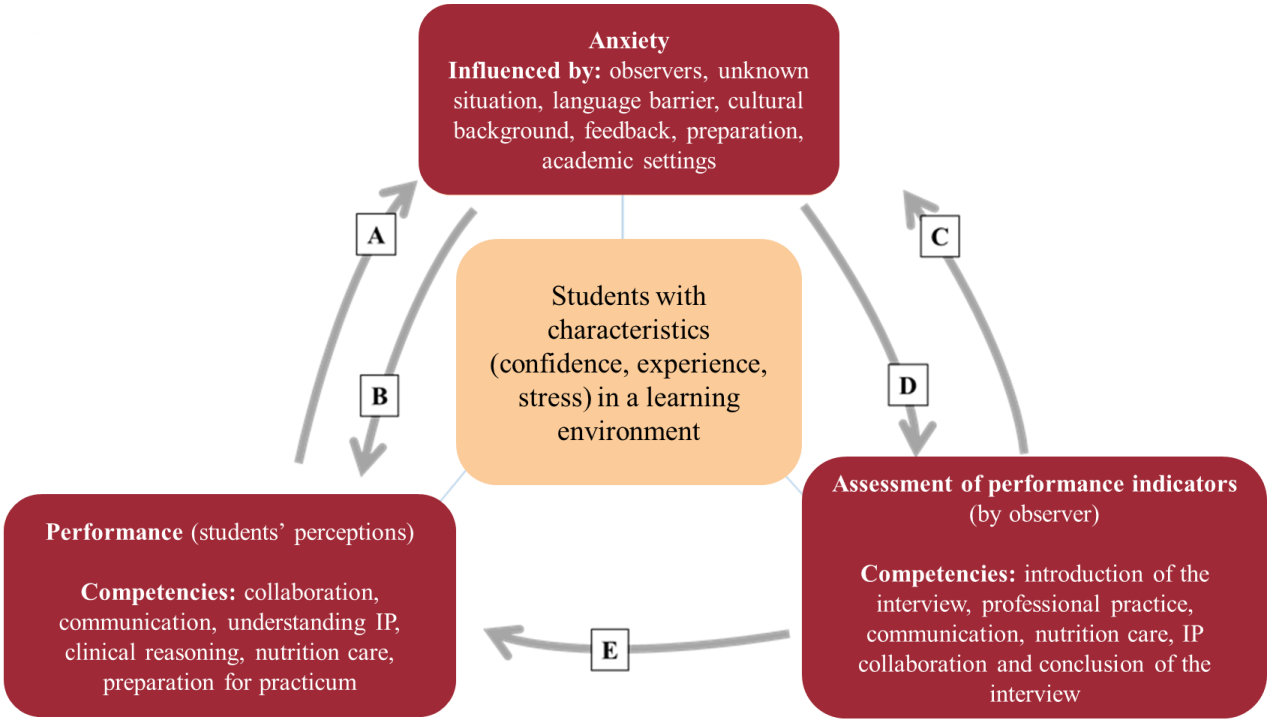


Figure 7.1 Adapted conceptual framework based on study results

Results from self-reported anxiety from pre-post simulation questionnaires and individual interviews, as well as assessment of PI in video recordings showed that achievement of competency PI seemed to have increased and perceived anxiety level decreased. It is therefore possible that performance was influenced by the decrease in anxiety which favored learning and demonstration of competency during assessments (showed by B in Figure 7.1). The hypothesis is that it is possible to accustom to an environment through multiple exposures and gain experience based on findings from Morris et al. (1981). Therefore, anxiety induced by the learning activity could have been reduced. With our results from pre-post simulation questionnaires and interviews, we observed a tendency to a reduction in anxiety and video recording observations showed a significant increase in scores for competency PI (showed by D in Figure 7.1). The scientific literature also shows a potential relationship between decreased anxiety and a better performance (Beischel, 2013; Coy et al., 2011). Our results showed a tendency to this relationship but no correlation was calculated. To see a correlation between two factors, there is a need for a research project that controls and measures confounding factors. The present research

project was exploratory and measurements of the two factors were not made at the exact same time (i.e. anxiety measured at T1 and T3, competency PI ratings at S1, S2, S3, and S4). Now that we know there is a tendency between the improvement of competency PI scores and reduction in perceived anxiety level, it will be possible to conduct a research project that measures both factors at the same time with the use of tests for anxiety perception (STAI) and for anxiety physiological measurements (e.g. saliva pH measurement of students (Cohen & Khalaila, 2014), as well as video recordings during simulations for observations with a PI scoring tool.

Our results suggested that students became accustomed to simulations and gained experience. Students were able to improve various competencies (namely communication and nutrition care) based on the increased scores of PI attainment and understanding of how to interact with a patient during simulated interviews. According to individual interviews, the students introspected on their practice and better understood how to apply the theoretical notions. The improvement in competencies can be influenced by anxiety and/or putting them into practice in a real situation (Coy et al., 2011; Ignacio et al., 2016). Students reported that at the first simulation, they were very stressed and preoccupied with following the steps of a patient interview. While in the last simulation, students were more comfortable with the interview process and engaged in a dialogue with the patient instead of a one-way conversation with questions for the patient. As one participant said in the T3 individual interview "006: *I was too rigid about what I had to say. I wasn't open enough to what the client said and it inhibited active listening. I realized it's a discussion, it's not like I'm interviewing someone. I was open to active listening and I think that this is the key to learning*." Along those lines, from T1 individual interviews, participants reported higher anxiety level and median competency scores on the PI scoring tool were lower, as compared to the last simulation (T4). They still reported apprehension, but they knew what to expect and how to interact with the patient. They reported feeling more comfortable with the unknown aspect of an interaction with a patient. Therefore, they felt less anxious and more confident (showed by A in Figure 7.1). Students' perceptions of competency development and the observers' assessments of PI yield parallel results (showed by E in Figure 7.1). With the students sharing their perceptions, we were able to understand their learning process and the ways that their understanding evolved. Further, when it comes to measurement of PI related to professional competencies using the scoring tool, it allowed to see that certain competencies (introduction of the interview, professional practice, and conclusion of

the interview) should be practiced more with students, since there was no significant increase in PI scoring.

Furthermore, based on our results on how the level of anxiety of students was influenced by learning with simulations it will be helpful for educators to try to control anxiety sources expressed by students to reduce their apprehension. One way educators can help students be more comfortable with the learning situations is by using a series of progressive simulations. As shown by our results and those from Dinther et al. (2014) and Ignacio et al. (2016), the perception of acquired skills increased self-confidence and thereby decreased anxiety (Dinther et al., 2014; Ignacio et al., 2016). In dietetic education research with simulations, studies have shown that students felt more confident in applying various skills, such as interprofessional care and provision of patient care, in that learning context (Holthaus et al., 2015; Smith, Hsiao, et al., 2018). While these studies looked at how confident students felt, our approach was rather to look at how students perceived the learning process with simulations with a qualitative approach and how they felt about it looking at their perceived anxiety. Hence, our study provided a different perspective on learning with simulations.

From our main results analysis, in Figure 7.1, it is possible to see that anxiety influenced students' self-perceived competency performance and observer PI assessment scores. These observations were made based on the difference between competency PI scoring at S1 and S4, and anxiety level determined with the STAI at T1 and T3. Participants had higher scores on the PI rating tool for S4 compared to S1, while also having lower anxiety level post-simulations at T3 compared to pre-simulations at T1.

In addition, observer assessments influenced anxiety because in individual interviews, students reported that having an observer was increasing their anxiety at the first simulation (C in Figure 7.1). They also said that even if no course marks were associated with performance during simulations, they still experienced stress related to the academic context of simulations. According to our results, self-perception of competency performance did influence students' anxiety. Students did report that with positive feedback, received after a good performance, they felt more confident and less anxious.

7.6 Strengths and limits

The following research project had strengths and areas for improvement. The strengths were the uniqueness of the study design, the uniformity in the data collected, the fact that the majority of data collection tools were tested and piloted, the representativeness of the sample collected, the development of bilingual tools, and finally the unique profile of the graduate researcher. The limitations of the study were the small targeted population given the project timeline, few inconsistencies between qualitative and quantitative data, some characteristics of the profile of participants, and the lack of a control group.

7.6.1 Strengths

Our research was unique compared to other studies published in dietetic education. None of the other research projects looked at dietetic students' perspective of learning competencies with simulations and observer competency assessment using a PI scoring tool over a long period of time (five months). Most studies looked at skills learning before and right after a simulation activity itself (Gibbs et al., 2015; Holthaus et al., 2015; Miles et al., 2016; Tyler, 2017) and one looked only at students' perceptions of the general experience after the activity and eight weeks after (Henry et al., 2009). The fact that we interviewed students at different time points in-between simulations helped us understand how their perceptions of learning with simulations and the influence of anxiety changed throughout the semester. Qualitative and quantitative data were compared and there were very few inconsistencies between both sets of data (i.e. work experience and IP collaboration).

Another strength in our research project was that the data collection instruments used, were tested and most of them piloted the year before in a small group of students of a similar population (n = 9) in the Nutrition Assessment course in 2016; including the pre-post questionnaires and focus group questions. During the piloting, students experienced the same four simulations case studies. In addition, the State-Trait Anxiety Inventory is also a tool largely used with student populations. Also, the graduate researcher did individual interviews about the learning experience with simulations with two students of the piloted cohort in November 2016 as part of a research project in one of her graduate courses. The interview guide was tested for the population and adjustments were made.

The fact that our population was homogeneous is also a strength. The profile of our study participants corresponded to the ratio of males/females in the dietetic population of working dietitians (Dietitian of Canada, 2016) and represented 50% of the overall targeted population of students in the cohort we studied. The participation rate was higher than expected according to Elgie et al. 2014, who suggested that participation rate is typically around 30% of the targeted population among undergraduate students (Elgie et al., 2014). Another strength was that we were able to find high evidence of reliability between judges with the developed PI competency scoring tool when using video recordings. There was enough evidence to see a difference in inter-judge reliability between live observations and video recordings. However, the PI competency scoring tool would benefit from testing with an extensive Delphi method to ensure psychometric properties are met (i.e. validity and reliability) (Vreugdenhil & Spek, 2018). This method would help guarantee consistency in scores and make it possible to use the tool in a broader range of learners.

Moreover, another strength of our research project is that it was developed knowing the contextual learning environment of students. The University of Ottawa is the only bilingual Canadian university. Students registered in the Honours Bachelor of Nutrition Sciences have to be bilingual. Therefore, it was important to offer the possibility to participate in our research project in both French and English. This implied that we developed all our resources (invitation to participate, consent form, questionnaires, interview guides, and observational tool) in French and English. In addition to the need for research in dietetic education related to the effect of the use of simulations on learning, there is a need for French programs to have access to reliable resources for dietetic educators (e.g. study case for simulations, PI scoring tool). Furthermore, it is important to offer French-language education to future health professionals who will work in an environment where French is the minority language. When education programs are in French, it can enhance the offer of services in French in the workplace and thus allow to provide more adapted services to patients (Drolet, Bouchard, & Savard, 2017; Société santé en français, 2010). This research project and the development of a scoring tool in French and in English were part of a larger project. Benefits from this project were multiples; including a published article on best practices in dietetic education with simulations (Giroux et al., 2019), a learning video based on simulations study cases (Consortium national de formation en santé, 2018), and a toolbox with

educational resources (Consortium national de formation en santé, 2018) to accompany professors in the process of including simulations into a dietetic education curriculum.

Finally, the training of the graduate researcher was a strength in the achievement of this research project. Her academic training in the Honours Bachelor of Nutrition Sciences program at the University of Ottawa offered her a unique perspective as an alumnus. She valued the experience of learning with simulations. In addition, her graduate academic training in education added an interesting perspective to the research approach. The principles of research in health sciences and education have enabled the graduate researcher to develop a research project that encompassed different perspectives in teaching while understanding the implications of learning competencies and practicing through simulations to enrich dietetic students' learning experience. Her work experience in education and dietetics also enriched her perspective on the research project. She brought a great understanding of the workplace and how a student might feel when starting his/her clinical practicum placement. Additionally, with her work as a teaching assistant she valued the importance of good pedagogical approaches to enhance learning in students. In addition, the graduate researcher of the project was supported by a team of researchers who were also health professionals in various sectors. The development and implementation of the simulations was done by an interprofessional team (dietitians, nurse and speech-language pathologist) to ensure the representativeness of the work in a clinical setting. The interprofessional team members also had experience developing simulations scenarios and experiencing simulations in their respective education programs.

7.6.2 Limitations

There were few limitations to our study. The targeted population limited our potential sample size within the timeline of a master's project. Indeed, there are presently thirty to fifty dietetic students per academic cohort. We were able to divert this limitation by having multiple interviews and a variety of instrument tools to collect various complementary data. To avoid this limitation, researchers could collect data on several cohorts of students through several years. Furthermore, there were potentials limitations with the translation of pre-post questionnaires, as the automatic translation of a tool is not equivalent to the original version. Translated tools require careful methodological work (Grondin, Dionne, Fleuret, & Boiteau, 2015). Nevertheless, our translated tools had multiple verifications by three different researchers. In addition, all

participants chose to conduct the research in French. Therefore, the risk of losing meaning in translation was in the end eliminated for our sample of participants.

Our data showed only few inconsistencies related to interprofessional collaboration and the relationship between anxiety and work experience. For those components, data from interviews showed a different perception than the quantitative results from the questionnaires. However, the majority of quantitative and qualitative data showed similarities such as for data on the influence of anxiety on learning, the perceived acquisition of competencies and the observed increase in scores from ratings of PI with simulations. Surprisingly, work experience was not related to self-perceived anxiety levels at baseline but was mentioned by students in T1 interviews to have an influence on self-confidence and anxiety. We initially thought that work experience could induce a lower level of anxiety because the students could have had prior experience with a patient, therefore potentially enhancing their self-confidence (Coy et al., 2011). However, our results did not show such relationship in pre-post questionnaires data analysis, but some students (n = 2) reported in individual interviews that they were not stressed because of previously working with patients which gave them more confidence in their ability to interact with a patient. Other than that, results from interviews and focus group discussions were consistent with results from pre-post questionnaires and observation assessment of PI using the competency evaluation grid.

Furthermore, the design of the study enhanced participating students' learning by having interviews throughout the semester compared to students who did not participate in our study. Indeed, interviews are a way of assessment in the classroom (Laurier, Tousignant, & Morissette, 2005). During the interviews, students were asked to talk about the simulations and what they thought they have learned. Therefore, this discussion could have enhanced their learning compared to students who did not participate in the interview process. Students also influenced each other when they talked about what they had experienced related to simulations. This was a common commentary that participants had talked with their colleagues after each simulation. However, this should not have had a negative effect on students' learning experience.

Moreover, we hypothesized that students who volunteered to participate in our study might have had a certain personality profile. Very anxious students might not have been willing to participate in multiple interviews and focus group discussions because during these discussions

they are potentially in a vulnerable position sharing their learning experiences (Knapik, 2017). Therefore, very anxious students might not have wanted to participate. These discussions might have seemed to students as putting them in a vulnerable position even though participants were gladly sharing their feedback and precautions were taken to make participants feel comfortable. Therefore, we might not have had all point of views in the qualitative data collected. In addition, the validation process of the competency PI scoring tool would have benefited from a larger number of video recordings and from more experts to review the scoring tool content. In addition, this assessment scoring tool is only specific to competencies for nutrition care in IP dysphagia management.

In addition, our research project did not have a control group, which would have allowed to compare results for participants with and without intervention. However, research in simulations has shown the advantages of simulations compared to traditional learning (control group) (Boet et al., 2014). To build on this prior research, our research project showed a deeper understanding of learning professional dietetic competencies with simulations. Furthermore, several students mentioned that having to interact with a patient or a patient and a health professional allowed them to make associations between knowledge and what they were experiencing during the simulation activity related to professional competencies. It is the practical experience of simulations as such that has enabled them to acquire skills. Lastly, although the graduate researcher's experience influenced positively the development of the research project, it can also have had an effect on data analysis due to her own perceptions. This is true for all researchers (Van Der Maren, 2004). However, researchers need to be aware of their own potential bias in data analysis to limit their impact. The fact that the researcher was aware of her potential biases and used quantitative data collection as part of a mixed-method approach reduced the risk of biases from happening.

7.7 Contribution to the advancement of research

Prior to this research project, little was known about the effect of learning simulations on the acquisition of professional competencies and the perceived anxiety level of the dietetic student population. Now, we understand a little more the sources of anxiety for dietetic students during simulations. Additionally, even though their anxiety level was low to moderate, but it can still be

important as one participant reported physical signs (in T2 individual interviews, 002: *sweaty hands, fast heartbeat, hot flashes*).

In addition, results of Chapter 4 concerning the perception of learning professional competencies were congruent with those of Chapter 6 on the measurement of PI based on professional competencies by an observer. Thus, there was an alignment on the development of professional competencies between students' perceptions and competency PI observation scores. Moreover, this project showed that observer dietetic competency PI evaluation was possible with video recordings of simulations and at least two people trained to do so. These results were not observed before in other dietetic research projects with simulations. Furthermore, no other project with a mixed-method approach looked at the effect of learning dietetic competencies with simulations during a whole semester reflecting student education experience. The majority of studies done so far were ad hoc or only using a pre-post questionnaire, but not with a qualitative portion during an entire university semester. To our knowledge, in dietetics, this is the first comprehensive study that looked at dietetic students' perceptions, observation assessment of competency PI and how students felt about the experience of learning with simulations. We think that this research helped understand the learning process dietetic students go through while using simulations. Our results implied that learning was happening during simulation activities, therefore this type of learning activity should be included more in dietetic education programs like previously advised by the Academy of nutrition and Dietetics (Thompson & Gutschall, 2015). With previous research, we knew that students perceived a benefit regarding self-confidence, communication and counseling skills when learning with simulations (Gibbs et al., 2015; Holthaus et al., 2015). Similarly, in a recent study, students have also been assessed with simulations, and results showed an improvement in Nutrition Focused Physical Examination skills (Tyler, 2017). However, none of these studies looked at perceived acquisition of competencies and assessment of competency PI through observations using a PI scoring tool. Our study was able to demonstrate that students perceived an increase in self-confidence, a decrease in anxiety level, and an increase in some competencies necessary for entry-level practice in dietetics. These results contribute to research in education of future dietetic professionals. Furthermore, they enrich our comprehension of dietetic students' learning with simulations while looking at how it influenced their anxiety level.

7.8 Implications for practice

Learning through a series of clinical simulations during an academic university semester enhanced students' competency acquisition related to communication, nutrition care, and IP collaboration based on measured PI and self-perception. In questionnaires and interviews students indicated feeling more confident to enter their clinical practicum placement. It seems that simulations helped them in their self-confidence level to work as a future dietitian and also it allowed them to conceptualize their understanding of dietetic competencies. The results of this research support the importance of including simulations in dietetic education curricula as mentioned by Thompson and Gutschall in 2015. Simulation learning is beneficial for dietetic students because, according to our research findings, it allowed each student to be aware of his/her progression of learning. Moreover, according to our results, simulation is a tool that can be used to evaluate attainment of competency PI by dietetic educators with the use of video recordings. Different software exists to ease video recordings' assessment allowing PI rating and could be included to favor hands-on dietetic education learning within program curricula stimulating the development of competencies.

Along these lines, students felt better prepared for practice in clinical settings as they indicated in the interviews. In addition, an abstract presented at a research symposium (Rosa et al., 2019; in Appendix 6) shared results from an online questionnaire given to preceptors (n = 28) of clinical practicum placements to look at their perception of trainees since the integration of simulations in the dietetic education program at the University of Ottawa. According to preceptors, students seem less stressed and more professional during their clinical practicum than prior to the integration of simulations. These results emphasize that there are opportunities the education specialists to further enhance preparation for entree to dietetic practice of trainees by supporting the development of their professional competencies using simulations. However, the integration of simulations should take into account the sources of anxiety identified by students. As mentioned in our results, students indicated they would have liked to be better prepared for the first simulation activity. Since simulation learning is a new activity for dietetic students and educators, adjustments are needed. Our recommendation would be to prepare students by sharing the recording of a simulation with permission. This would help students understand what is expected from them before the first activity.

At another level, the PI for competencies used for the development of the scoring tool are under cyclical review by PDEP, who are also exploring how dietetic educators can evaluate their inclusion by programs in curriculum design and competency evaluation (Partenariat pour la formation et la pratique en diététique, 2019). From this perspective, PDEP and dietetic educators may benefit from our integration of competency PI in simulations and measurement of their attainment. The fact that, in our project not only did educators use the PI of the ICDEP for the development of a mandatory course plan, but also used them as competency assessment indicators was important to allow for a better alignment for preparation of dietetic students prior to practicum placements, because those are the competency PI used for assessments in clinical placements in preparation for entry to practice. Since in the ICDEP reviewing process, PDEP consults registered dietitians and educators about how they teach and use PI of the ICDEP, our research approach and findings could contribute to this review process.

7.9 Implication for education

Our research results are important for dietetic educators who wish to enhance students' experience while learning important competencies necessary for dietetic practice. In addition, in view of the need to offer high quality student-centered learning opportunities through their curricula, program managers will find those results helpful in curriculum planning. These results may help them justify the resources they need to implement or expend experiential learning through simulations as part of mandatory education for future dietitians. Specifically, this project provides an opportunity to share suggestions to dietetic educators based on our results to contribute to ongoing program quality improvement. It is possible to offer feedback on best practice with simulations to professors and dietetic educators to continue improving and justifying the implementation and utilization of simulations in dietetic education. These conclusions can also influence best practices in simulations for Canadian and international dietetic education programs, and particularly for programs where there are francophone minority students. Simulations can be used as a learning experience for students to practice the applications the essential entry-level competencies in preparation for their clinical practicum, like it is the case in nursing education (Hayden, Smiley, Alexander, Kardong-edgren, & Jeffries, 2014). Simulations can also be used as an assessment tool to measure attainment of competency PI when implemented with video recordings and developed scoring tools based on PDEP's

ICDEP performance indicators. These types of assessments could be used as a formative evaluation where both students and the professor can identify areas for improvements and help the student work on them. Since these types of practical competency PI assessments are still new in dietetics and more research needs to be done on reliability and validity of the PI measurement tool, we recommend that this assessment be used to look at the progression of learning of competencies through a series of simulations as implemented with this project, instead of a one-time pass or fail final course assessment. High-stake assessment tools (e.g. pass or fail) require to go through a rigorous evaluation of psychometric characteristics (i.e. validity, reliability, feasibility, and acceptability) beforehand (Nunnink et al., 2014; Van Der Vleuten, 1996). Furthermore, the use of PI assessment would also allow professors to look at each learner's evolution in demonstrating competency PI and favor individual feedback and coaching which may be required for the development of professional competencies (Ninomiya, 2016).

Finally, since our study was able to demonstrate how students' perceptions of competencies changed through practice with simulations, dietetic education programs could include different types of simulations to practice different other competencies. For example, students could be exposed to a simulation where they practice managing a conflict with an irritated client, practice motivational interviewing skills, or face a patient at end-of-life cancer stage requiring ethical decision making. These situations would help dietetic students enhance competencies such as communication, professional practice and nutrition care. These challenges would help standardize the preparation of students into their clinical practicum placement. By ensuring that all students receive the same education to critical conditions such as IP dysphagia management, educators make sure of homogeneity in students' learning experience of essential competencies for entry to practice. From our results, it seems that the use of simulations targeting competency PI in dietetic education would be beneficial for dietetic educators to integrate in their teaching and evaluation strategies and for students' preparation for practice, but also to motivate dietetic students and increase their feeling of self-efficacy, which is beneficial for learning (Pajares, 2006).

7.10 Future research perspectives

This research project identified an evidence-based teaching method also useful for assessment of students' dietetic competency PI. Other educators have recommended the use of simulations to

improve the integration of practical skills, but very little research had been done on this subject in this discipline (Thompson & Gutschall, 2015). This research project met the needs to include practice and measurement of practical competency PI with simulations in dietetic education programs identified by the Academy of Nutrition and Dietetics (Thompson & Gutschall, 2015). Furthermore, part of the project involved introducing dietetic students to collaborate with professionals from different disciplines, including nursing and speech-language pathology, thus enhancing IP competencies. IP education is recommended to increase appreciation of teamwork in the workplace (Eliot & Kolasa, 2015). IP collaborations' goal is to offer the highest quality of care to patients and families with health professionals from different disciplines (World Health Organization, 2015).

This research project provided some of the scientific evidence needed to introduce this method of teaching into dietetic education curricula. In addition, this study documented the effect on the development of professional dietetic competencies with simulations in relation of the delivery of care of IP dysphagia management. Also, this study highlighted the influence of learning simulations on dietetic students' anxiety levels and helped to better understand the relationship between these factors. The results of this preliminary study could support other research projects that will serve to deepen knowledge about the assessment of learning through simulations and the help reduce student' anxiety levels during this process. Future research could include an extensive validation process for the developed dietetic competency PI measurement tool. This could be accomplished by following a Delphi method (Vreugdenhil & Spek, 2018). In addition, it could be advantageous to develop a universal competency PI scoring tool that assessed general competencies unrelated to a specific condition. This tool could be used with various simulations related to different topics or case studies and possibly through the dietetic education curricula.

Further research could also involve a deeper understanding of the variability in anxiety levels when different factors are controlled. For example, a research in critical care medicine looked at anxiety levels before and after a simulation using a meditation exercise prior to the debriefing session compared to a control group (Lilot et al., 2018). Further, to better understand the influence of different sources of anxiety, it would be interesting to compare with a control

group the influence of a more detailed preparation to the first simulation (i.e. watching a video recorded simulation *versus* not watching one) prior to the first simulation activity.

CONCLUSION

To conclude, this research responded to the need for evidence on the effect with the use of simulations on the development of professional competencies and the perceived anxiety level of dietetic students associated with this type of learning. Our research helped enlighten how a sample of dietetic students perceived their learning processes with the use of a series of simulations over five months (September 2017 – January 2018). Furthermore, it indicated that simulations can be used as an assessment with the use of video recordings and an observation of competency PI scoring tool. We identified an increase in attainment of performance indicators for some competencies necessary for entry-level practice dietitians with the use of four simulations, both from an observation assessment perspective and the participating students' perspective. In addition, our research documented dietetic students' perspective of how anxious they felt when learning with simulations. The anxiety level of participating students decreased with the use of simulations. They revealed they experienced various sources of anxiety. Dietetic educators and professors will be more informed to introduce simulations in learning now that we have, through this research project, a better understanding of the benefits related to the development of professional competencies necessary for entry-level dietetic practice. With this research project there is now evidence of the positive effect of simulations on the development of dietetic students' professional competencies and on the effect of simulations on their level of anxiety.

Appendix 1 – Data collection instruments

1.1 Pre-post questionnaires

French version

Renseignements généraux

Numéro d'identification : _____ **Date:** _____

(00) **(jj/mm/aaaa)**

Coordonnées de l'étudiant(e)

Nom : _____ **Prénom(s) :** _____

Téléphone : Rés: _____ **Bur :** _____

Cell : _____

Courriel : _____

Questionnaire pré-simulation

Veuillez répondre aux questions suivantes en répondant dans l'espace prévue ou en **encerclant** la bonne réponse. N'hésitez pas à poser des questions si vous ne comprenez pas une question

1. Âge : _____

2. Genre : _____

3. Années d'études au programme de nutrition de l'Université d'Ottawa: _____

4. Êtes-vous inscrit au cours NUT3702-Évaluation nutritionnelle ?
    a. Oui
    b. Non

5. Avez-vous reçu de l'éducation/formation sur la dysphagie avant le cours NUT3702-Évaluation nutritionnelle? (sélectionnez toutes les réponses possibles)
    a. Non, je n'ai pas reçu d'éducation/formation sur la dysphagie
    b. Oui, dans d'autres cours de nutrition à l'Université d'Ottawa
    c. Oui, dans d'autres cours (hors nutrition) à l'Université d'Ottawa
    d. Oui, dans un autre établissement post-secondaire

6. Avez-vous vécu une expérience personnelle avec la dysphagie ? (sélectionnez toutes les réponses possibles)
    a. Non, je n'ai pas vécu d'expérience personnelle avec la dysphagie
    b. Oui, dans le cadre d'un travail/bénévolat dans un établissement de santé
    c. Oui, un proche est atteint de dysphagie
    d. Oui, j'ai de la dysphagie

7. Avez-vous déjà participé à une simulation dans le cadre de vos cours ou pendant un stage?
    a. Oui
        i. Si oui, précisez le contexte (milieu, nombre, scénario) :
        _____
    b. Non

8. Avez-vous déjà travaillé dans un milieu clinique où vous aviez eu à interagir avec des patients?
    a. Oui,
        i. Si oui, précisez le contexte (milieu, nature de l'interaction) :
        _____
    b. Non

Section 1

Pour les questions suivantes, s.v.p. répondre en lien avec votre situation présente :

9. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à **vos stages cliniques** en 4e année.

Pas du tout (0) |——————————————————| Beaucoup (100)
50

10. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à votre capacité à effectuer une évaluation nutritionnelle ?

Pas du tout (0) |——————————————————| Beaucoup (100)
50

11. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à votre capacité à évaluer l'apport alimentaire d'un patient.

Pas du tout (0) |——————————————————| Beaucoup (100)
50

12. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** des soins nutritionnels de la dysphagie.

Pas du tout (0) |——————————————————| Beaucoup (100)
50

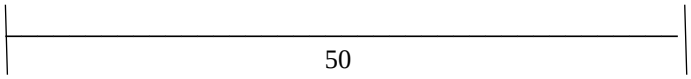
13. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à la mise en pratique des principes de l'écoute active.

Pas du tout (0) |——————————————————| Beaucoup (100)
50

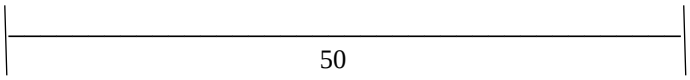
14. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à l'enseignement auprès des patients et leur famille au sujet des différentes **diètes** pour la dysphagie (ex : purée, hachée, tendre).

Pas du tout (0) |——————————————————| Beaucoup (100)
50

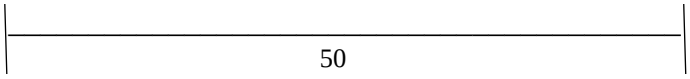
15. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à l'enseignement auprès des patient et leur famille au sujet des différentes **consistances de liquide** pour la dysphagie (ex : nectar, miel, pouding).

Pas du tout (0)  Beaucoup (100)

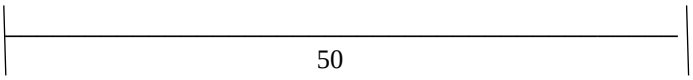
16. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance** face à la mise en place d'un plan de traitement pour la dysphagie.

Pas du tout (0)  Beaucoup (100)

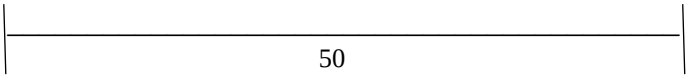
17. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à la mise en place d'un plan de traitement pour la dysphagie.

Pas du tout (0)  Beaucoup (100)

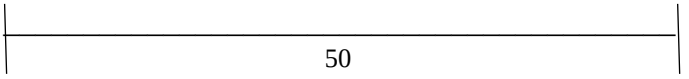
18. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** des rôles des différents professionnels de la santé dans le traitement de la dysphagie.

Pas du tout (0)  Beaucoup (100)

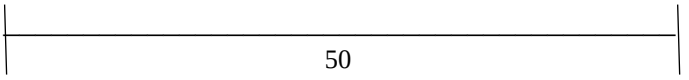
19. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à l'élaboration d'un plan de traitement pour un patient atteint de dysphagie.

Pas du tout (0)  Beaucoup (100)

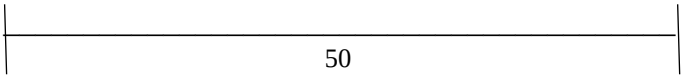
20. Veuillez indiquer sur l'échelle suivante votre **niveau de connaissances** sur les facteurs de risque à surveiller lors du dépistage de la dysphagie.

Pas du tout (0)  Beaucoup (100)

21. Veuillez indiquer sur l'échelle suivante votre **niveau de connaissances** des signes et symptômes de la dysphagie.

Pas du tout (0)  Beaucoup (100)

22. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à votre capacité à dépister la dysphagie.

Pas du tout (0)  Beaucoup (100)

23. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à la pratique interprofessionnelle.

Pas du tout (0) |——————————50——————————| Beaucoup (100)

Section 2

	Tout à fait en désaccord	Plutôt en désaccord	Ni d'accord ni en désaccord	Plutôt en accord	Tout à fait en accord
Les orthophonistes jouent un rôle important dans la prise en charge des patients atteint de la dysphagie.					
Les diététistes compétent(e)s n'ont pas besoin de consulter les autres professionnelles de la santé pour soigner les patients atteints de dysphagie.					
J'offrirais des meilleurs soins à un individu atteint de dysphagie si je collaborais avec d'autres professionnelles de la santé.					
Les infirmiers collaborent avec les diététistes et les orthophonistes dans la prise en charge de la dysphagie					
Le champ de pratique des diététistes et des orthophonistes se chevauche.					
Les infirmières n'interviennent pas de façon importante dans la prise en charge de la dysphagie.					
Puisque le rôle des diététistes et des orthophonistes sont très semblables, il n'est pas nécessaire que ces professionnels de la santé soient tous les deux impliqués dans la gestion de la dysphagie d'un patient.					

Section 3

State-Trait Anxiety Inventory, version française – tiré de:

Gauthier, J., & Bouchard, S. (1993). Adaptation canadienne-française de la forme révisée du State–Trait Anxiety Inventory de Spielberger. *Canadian Journal of Behavioural Science/Revue Canadienne Des Sciences Du Comportement*, *25*(4), 559–578.

Merci pour votre participation ! ☺

Questionnaire post-simulation

Section 1

Pour les questions suivantes, s.v.p. répondre en lien avec votre situation présente :

1. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à **vos stages cliniques** en 4e année.

Pas du tout (0) |——— 50 ———| Beaucoup (100)

2. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à votre capacité à effectuer une évaluation nutritionnelle ?

Pas du tout (0) |——— 50 ———| Beaucoup (100)

3. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à votre capacité à évaluer l'apport alimentaire d'un patient.

Pas du tout (0) |——— 50 ———| Beaucoup (100)

4. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** des soins nutritionnels de la dysphagie.

Pas du tout (0) |——— 50 ———| Beaucoup (100)

5. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à la mise en pratique des principes de l'écoute active.

Pas du tout (0) |——— 50 ———| Beaucoup (100)

6. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à l'enseignement auprès des patients et leur famille au sujet des différentes **diètes** pour la dysphagie (ex : purée, hachée, tendre).

Pas du tout (0) |——— 50 ———| Beaucoup (100)

7. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à l'enseignement auprès des patient et leur famille au sujet des différentes **consistances de liquide** pour la dysphagie (ex : nectar, miel, pouding).

Pas du tout (0) |——————————50——————————| Beaucoup (100)

8. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance** face à la mise en place d'un plan de traitement pour la dysphagie.

Pas du tout (0) |——————————50——————————| Beaucoup (100)

9. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à la mise en place d'un plan de traitement pour la dysphagie.

Pas du tout (0) |——————————50——————————| Beaucoup (100)

10. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** des rôles des différents professionnels de la santé dans le traitement de la dysphagie.

Pas du tout (0) |——————————50——————————| Beaucoup (100)

11. Veuillez indiquer sur l'échelle suivante votre **niveau de compréhension** face à l'élaboration d'un plan de traitement pour un patient atteint de dysphagie.

Pas du tout (0) |——————————50——————————| Beaucoup (100)

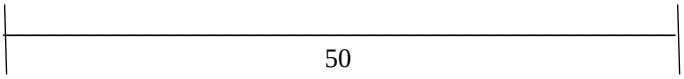
12. Veuillez indiquer sur l'échelle suivante votre **niveau de connaissances** sur les facteurs de risque à surveiller lors du dépistage de la dysphagie.

Pas du tout (0) |——————————50——————————| Beaucoup (100)

13. Veuillez indiquer sur l'échelle suivante votre **niveau de connaissances** des signes et symptômes de la dysphagie.

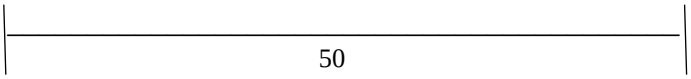
Pas du tout (0) |——————————50——————————| Beaucoup (100)

14. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à votre capacité à dépister la dysphagie.

Pas du tout (0)  Beaucoup (100)

50

15. Veuillez indiquer sur l'échelle suivante votre **niveau de confiance en vous** face à la pratique interprofessionnelle.

Pas du tout (0)  Beaucoup (100)

50

Section 2

	Tout à fait en désaccord	Plutôt en désaccord	Ni d'accord ni en désaccord	Plutôt en accord	Tout à fait en accord
2.1 Les orthophonistes jouent un rôle important dans la prise en charge des patients atteint de la dysphagie.					
2.2 Les diététistes compétent(e)s n'ont pas besoin de consulter les autres professionnelles de la santé pour soigner les patients atteints de dysphagie.					
2.3 J'offrirais des meilleurs soins à un individu atteint de dysphagie si je collaborais avec d'autres professionnelles de la santé.					
2.4 Les infirmiers collaborent avec les diététistes et les orthophonistes dans la prise en charge de la dysphagie					
2.5 Le champ de pratique des diététistes et des orthophonistes se chevauche.					
2.6 Les infirmières n'interviennent pas de façon importante dans la prise en charge de la dysphagie.					
2.7 Puisque le rôle des diététistes et des orthophonistes sont très semblables, il n'est pas nécessaire que ces professionnels de la santé soient tous les deux impliqués dans la gestion de la dysphagie d'un patient.					

Section 3

State-Trait Anxiety Inventory, version française – tiré de:

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Section 4

Veuillez cocher une réponse pour chaque énoncé suivant :

	Je n'ai pas atteint la compétence	J'ai plus ou moins atteint la compétence	J'ai atteint la compétence
Introduction de l'entrevue			
J'ai établi le premier contact (saluer, se présenter, offre active du français)			
J'ai brisé la glace et établir le rapport			
J'ai clarifié l'objet de la rencontre			
Corps de l'entrevue **Pratique professionnelle**			
Je me suis assuré d'obtenir un consentement éclairé.			
J'ai décrit son rôle et ses responsabilités de façon claire à l'équipe de soins, au patient et à la famille.			
J'ai fait preuve de jugement professionnel			
Communication			
J'ai utilisé une terminologie appropriée.			
J'ai fourni de l'information pertinente et exacte dans la documentation donnée au patient			
J'ai parlé de manière claire et concise dans le but de répondre aux besoins de son auditoire.			
J'ai mis en pratique les principes d'offre active du français.			
J'ai mis en pratique les principes l'écoute active.			
J'ai fait preuve d'empathie.			
J'ai identifié des moyens de faire appel à l'expertise des autres personnes.			
Soins en nutrition			
J'ai identifié les données d'évaluation pertinentes à recueillir			
J'ai obtenu la perspective de la clientèle, de la famille ou des autres intervenants pertinents.			
J'ai obtenu et interprété les données sur l'apport en aliments et en nutriments			
J'ai identifié les besoins d'apprentissage de la clientèle en matière d'aliments et de nutrition.			
J'ai obtenu et interprété l'information issue d'observations effectuées lors des repas et de l'alimentation.			
J'ai identifié les signes et les symptômes de la dysphagie.			
J'ai démontré ses connaissances relatives aux principes d'évaluation de la déglutition.			
J'ai élaboré ou modifié des plans alimentaires en consultant le patient et sa famille.			
J'ai évalué les progrès de la clientèle en matière d'atteinte des résultats du plan			
Collaboration interprofessionnelle			
J'ai utilisé les techniques de communication (verbales et non verbales) de façon appropriée dans différentes situations.			
J'ai cherché à obtenir l'approbation du patient/client ou du décideur désigné lorsque certains renseignements sont transmis.			
J'ai reconnu mon rôle à titre de membre de l'équipe.			
J'ai adopté une approche centrée sur le patient			
Conclusion de l'entrevue			
J'ai résumé la rencontre et planifie le suivi			
J'ai demandé au client s'il y a des questions et vérifie sa compréhension			
J'ai offert du renforcement positif			

Merci pour votre participation ! ☺

English version

General Information

Identification number : _____ **Date:** _____

(00) **(dd/mm/yyyy)**

Student's contact information

Last Name : _____ **First Name:** _____

Phone number : **Home :** _____ **Office :** _____

Cell : _____

Email address : _____

Pre-simulation Questionnaire

Please answer the following questions by answering in the space provided or circle the correct answer. Do not hesitate to ask question if you do not understand a question.

1. Age : _____

2. Genre : _____

3. School year in the Nutrition Program at the University of Ottawa: _____

4. Are you enrolled in NUT3702 – Nutritional Assessment?
    a. Yes
    b. No

5. Have you received education/training on dysphagia previous to your NUT3702-Nutritional Assessment class? (Select all the answers that apply)
    a. No, I haven't received education/training on dysphagia.
    b. Yes, in another nutrition course at the University of Ottawa.
    c. Yes, in another course (not nutrition) at the University of Ottawa.
    d. Yes, in another post-secondary institution.
    e. Yes, according to other experiments mentioned above (specify):
    _____

6. Have you lived a personal experience with dysphagia? (Select all the answers that apply)
    a. No, I haven't lived a personal experience with dysphagia.
    b. Yes, as part of work/ volunteer work in a health facility
    c. Yes, a relative experienced from dysphagia
    d. Yes, I have dysphagia
    e. Yes, according to other experiments mentioned above (specify): _____
    _____

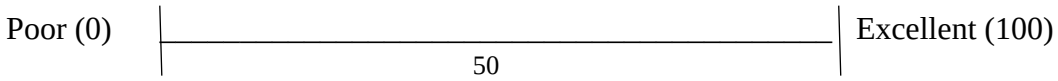
7. Have you ever participate in a simulation through one of your classes or internship?
    a. Yes,
        i. If yes, specify the context (environment, number, scenario):
        _____
    b. No

8. Have you ever work in clinical where you had to interact with patients?
    a. Yes,
        i. If yes, specify the context (environment, nature of interaction):
        _____
    b. No

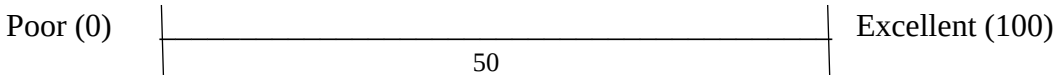
Section 1

For the following questions, please answer in accordance to your present situation:

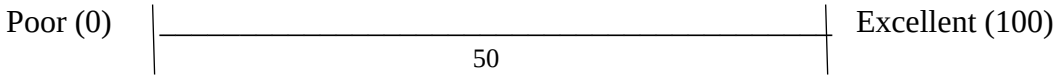
1. Please indicate on the following scale your **self-confidence level** regarding your clinical internship in 4th year.



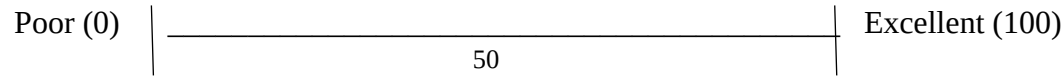
2. Please indicate on the following scale your **self-confidence level** regarding your ability to perform a nutritional assessment.



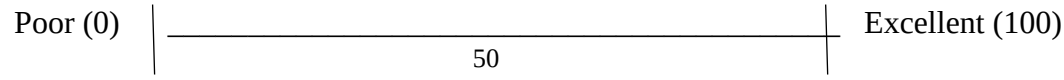
3. Please indicate on the following scale your **self-confidence level** regarding your ability to assess food intake of a patient.



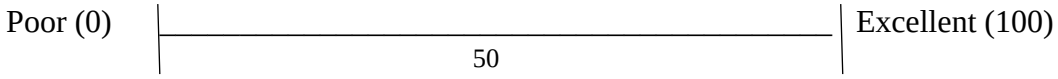
4. Please indicate on the following scale your **understanding level** of the nutritional care of dysphagia.



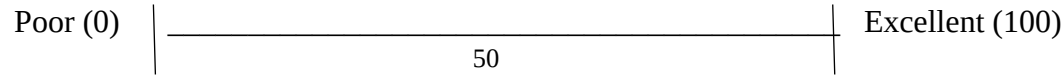
5. Please indicate on the following scale your **understanding level** in the implementation of the principles of active listening.



6. Please indicate on the following scale your **understanding level** regarding providing education to patients and their families about the **different diets** for dysphagia (eg pureed, minced, soft).



7. Please indicate on the following scale your **understanding level** regarding providing education to patients and their families about the **different liquid consistencies** for dysphagia (eg nectar, honey, pudding).



8. Please indicate on the following scale your **confidence level** regarding the establishment of a treatment plan for dysphagia.

Poor (0) | ——— | Excellent (100)
50

9. Please indicate on the following scale your **understanding level** regarding the establishment of a treatment plan for dysphagia.

Poor (0) | ——— | Excellent (100)
50

10. Please indicate on the following scale your **understanding level** of the roles of various health professionals in the treatment of dysphagia.

Poor (0) | ——— | Excellent (100)
50

11. Please indicate on the following scale your **understanding level** of the the development of a treatment plan for a patient with dysphagia.

Poor (0) | ——— | Excellent (100)
50

12. Please indicate on the following scale your **knowledge level** about the risk factors to look for when screening for dysphagia.

Poor (0) | ——— | Excellent (100)
50

13. Please indicate on the following scale your **knowledge level** about the signs and symptoms of dysphagia.

Poor (0) | ——— | Excellent (100)
50

14. Please indicate on the following scale your **self-confidence level** regarding your ability to detect dysphagia.

Poor (0) | ——— | Excellent (100)
50

15. Please indicate on the following scale your **self-confidence level** regarding interprofessional practice.

Poor (0) | ——— | Excellent (100)
50

Section 2

Please check one answer for each following statement:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The speech-language pathologists play an important role in the management of patients with dysphagia.					
The competent dietitians don't need to consult other health professionals to treat patients with dysphagia.					
I will offer the best care for an individual with dysphagia if I collaborated with other health professionals.					
Nurses work with dietitians and speech-language pathologists in the treatment of dysphagia					
The scope of practice of dietitians and speech-language pathologists overlaps.					
Nurses don't intervene significantly in the treatment of dysphagia					
Since the role of dietitians and speech-language pathologists are very similar, it is not necessary that these health professionals are both involved in the management of dysphagia a patient.					

Section 3

State-Trait Anxiety Inventory retrieved from:

Spielberger, C. D. (1983a). *Manual for the State-Trait Anxiety Inventory (Form Y)*. Palo Alto: Consulting Psychologist Press.

Thank you for your participation! ☺

Post-simulation Questionnaire

Section 1

For the following questions, please answer in accordance to your present situation:

1. Please indicate on the following scale your **self-confidence level** regarding your clinical internship in 4th year.

Poor (0) ——— 50 ——— Excellent (100)

2. Please indicate on the following scale your **self-confidence level** regarding your ability to perform a nutritional assessment.

Poor (0) ——— 50 ——— Excellent (100)

3. Please indicate on the following scale your **self-confidence level** regarding your ability to assess food intake of a patient.

Poor (0) ——— 50 ——— Excellent (100)

4. Please indicate on the following scale your **understanding level** of the nutritional care of dysphagia.

Poor (0) ——— 50 ——— Excellent (100)

5. Please indicate on the following scale your **understanding level** in the implementation of the principles of active listening.

Poor (0) ——— 50 ——— Excellent (100)

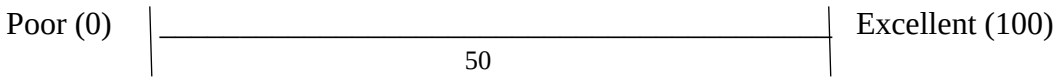
6. Please indicate on the following scale your **understanding level** regarding providing education to patients and their families about the **different diets** for dysphagia (eg pureed, minced, soft).

Poor (0) ——— 50 ——— Excellent (100)

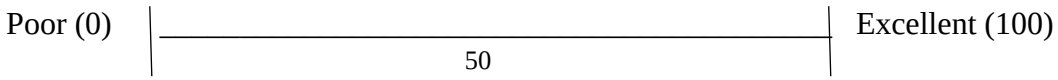
7. Please indicate on the following scale your **understanding level** regarding providing education to patients and their families about the **different liquid consistencies** for dysphagia (eg nectar, honey, pudding).

Poor (0) ——— 50 ——— Excellent (100)

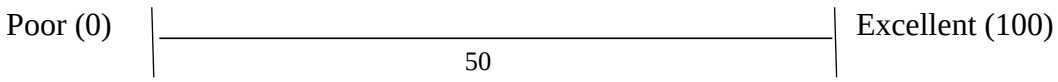
8. Please indicate on the following scale your **confidence level** regarding the establishment of a treatment plan for dysphagia.



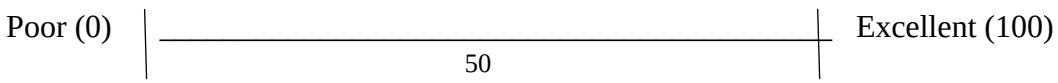
9. Please indicate on the following scale your **understanding level** regarding the establishment of a treatment plan for dysphagia.



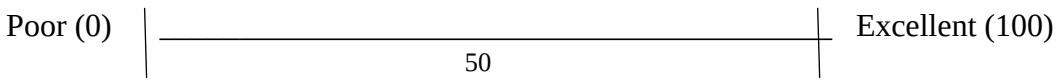
10. Please indicate on the following scale your **understanding level** of the roles of various health professionals in the treatment of dysphagia.



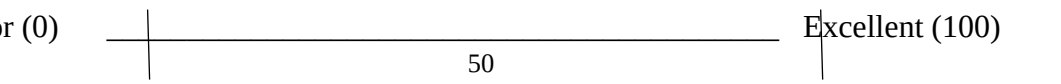
11. Please indicate on the following scale your **understanding level** of the development of a treatment plan for a patient with dysphagia.



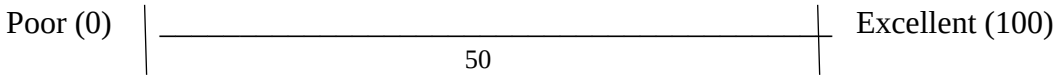
12. Please indicate on the following scale your **knowledge level** about the risk factors to look for when screening for dysphagia.



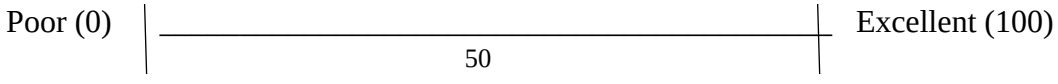
13. Please indicate on the following scale your **knowledge level** about the signs and symptoms of dysphagia.



14. Please indicate on the following scale your **self-confidence level** regarding your ability to detect dysphagia.



15. Please indicate on the following scale your **self-confidence level** regarding interprofessional practice.



Section 2

Please check one answer for each following statement:

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
The speech-language pathologists play an important role in the management of patients with dysphagia.					
The competent dietitians don't need to consult other health professionals to treat patients with dysphagia.					
I will offer the best care for an individual with dysphagia if I collaborated with other health professionals.					
Nurses work with dietitians and speech-language pathologists in the treatment of dysphagia					
The scope of practice of dietitians and speech-language pathologists overlaps.					
Nurses don't intervene significantly in the treatment of dysphagia					
Since the role of dietitians and speech-language pathologists are very similar, it is not necessary that these health professionals are both involved in the management of dysphagia a patient.					

Section 3

State-Trait Anxiety Inventory retrieved from:

Spielberger, C. D. (1983a). *Manual for the State-Trait Anxiety Inventory (Form Y)*. Palo Alto: Consulting Psychologist Press.

Thank you for your participation! ☺

Section 4

Please check one answer for each following statement:

Nutrition competencies	haven't reached (0)	have reached more or less (1)	have reached (2)
Introduction of the interview			
I established the first contact (greeting, presenting himself, active offer of French)			
I broke the ice and establish the report			
I clarified the purpose of the meeting			
Body of the interview			
Professional practice			
I ensured informed consent.			
I described one's own roles and responsibilities in a clear manner with the team/patient/family.			
I have demonstrated professional judgment.			
Communication			
I used appropriate terminology.			
I provided accurate and relevant information in written material given to the patient.			
I spoke clearly and concisely, in a manner responsive to the needs of the listener(s).			
I used active offer of French when speaking to others			
I used active listening when others are speaking			
I demonstrated empathy			
I identified ways to draw on the expertise of others			
Nutrition care			
I identified relevant data to perform a nutrition assessment.			
I have obtained perspective of client, family and / or relevant others			
I have obtained and interpret food and nutrient intake data.			
I identified learning needs of the client regarding food and nutrition.			
I have obtained and interpret information from observations made during meals and food.			
I identified signs and symptoms of dysphagia.			
I demonstrated knowledge of principles for swallowing assessment			
I have developed or modified meal plans by consulting the patient and family			
I evaluated client progress in achieving plan outcomes			
Interprofessional collaboration			
I used communication strategies (verbal & non-verbal) appropriately in a variety of situations			
I sought approval of the patient/client or designated decision-maker when information is shared			
I recognized my role as a member of the team.			
I adopted a patient-centered approach			
Conclusion of the interview			
I summarized the meeting and plan a follow-up.			
I asked the client if there are any questions and verify his understanding.			
I offered positive reinforcement.			

Thank you for your participation! ☺

1.2 Individual interview guide

French version

Guide d'entrevue (pré):
Heure : _____ Date : _____ Lieu :_____
Intervieweur : _____
Code du répondant : _____
Position du répondant : _____
Description du projet : L'entrevue qui suit porte sur l'apprentissage par simulation que vous allez expérimenter pendant le semestre. Cette entrevue permet de discuter du contexte d'apprentissage dans lequel vous êtes en ce moment.

Questions :

Expérience :

1. As-tu de l'expérience à faire des entrevues avec des patients?
    a. Si oui, dans quel contexte ?
    b. Si non, comment perçois-tu une telle situation ?
2. As-tu déjà participé à une simulation avec un patient par le passé ?
    a. Si oui, peux-tu m'expliquer le contexte (milieu, nombre, quel était le scénario) ?

Anxiété :

3. Comment te sens-tu face à la simulation d'entrevue avec un client qui s'en vient ?
    a. Comment définirais-tu ton niveau de confiance en toi ?
    b. Comment définirais-tu ton niveau d'appréhension face à la situation d'entrevue avec un client ?
    c. Comment définirais-tu ta capacité à gérer ce type de situation qu'est la simulation ?
4. Comment te sens-tu face au fait de faire la simulation devant tes collègues ?

Les prochaines questions portent sur ta compréhension des compétences en diététique. Je tiens à préciser qu'il n'y a pas de bonnes ou mauvaises réponses. Ceci n'est pas un examen et personne ne sera jugé sur ce qui est dit ici.

Compétences :

5. Que signifie pour toi la dysphagie ?
6. Peux-tu me parler de l'approche nutritionnelle dans les cas de dysphagie ?
    a. Quel est ton niveau de confiance à intervenir nutritionnellement avec des patients qui ont cette condition ?
7. Que signifie pour toi la pratique interprofessionnelle ?
    a. Que représente le rôle de la diététiste dans l'équipe interprofessionnelle ?
    b. Comment est-ce que la pratique interprofessionnelle influence le patient ?
8. Comment estimes-tu tes capacités à communiquer avec un patient lors d'une entrevue ?
9. Comment estimes-tu tes capacités à collaborer avec…
    a. Le patient et sa famille ?
    b. Une équipe interprofessionnelle ?
10. Comment estimes-tu tes capacités à gérer une situation problématique lors d'une entrevue ?

Merci !

Guide d'entrevue (entre):

Heure : _____ Date : _____ Lieu :_____

Intervieweur : _____

Code du répondant : _____

Position du répondant : _____

Description du projet : L'entrevue qui suit porte sur l'apprentissage par simulation que vous allez expérimenter pendant le semestre. Cette entrevue permet de discuter du contexte d'apprentissage dans lequel vous êtes en ce moment.

Questions :

Simulations :

1. Comment la simulation a influencé ton apprentissage sur les soins en dysphagie?
2. Comment la simulation a influencé ton niveau de confiance en toi ?

Anxiété :

3. Comment te sens-tu face après avoir fait les deux simulations ?
4. Comment tu sens-tu face aux deux prochaines simulations ?
    a. Comment définirais-tu ton niveau de confiance en soi ?
    b. Comment définirais-tu ton niveau d'appréhension face à la situation?
    c. Comment définirais-tu ta capacité à gérer ce type de situation qu'est la simulation?
5. Comment te sentais-tu lorsque plusieurs personnes observaient chaque simulation?
    a. Penses-tu que ça a affecté la façon que tu agissais pendant la simulation?

Les prochaines questions portent sur ta compréhension des compétences en diététique. Je tiens à préciser qu'il n'y a pas de bonnes ou mauvaises réponses. Ceci n'est pas un examen et personne ne sera jugé sur ce qui est dit ici.

Compétences :

6. Que signifie pour toi la dysphagie ?
7. Peux-tu me parler de l'approche nutritionnelle dans les cas de dysphagie ?
    a. Quel est ton niveau de confiance à intervenir nutritionnellement avec des patients qui ont cette condition ?
8. Que signifie pour toi la pratique interprofessionnelle ?
    a. Que représente le rôle de la diététiste dans l'équipe interprofessionnelle ?
    b. Comment est-ce que la pratique interprofessionnelle influence le patient ?
9. Comment estimes-tu tes capacités à communiquer avec un patient lors d'une entrevue ?
10. Comment estimes-tu tes capacités à collaborer avec…
    a. Le patient et sa famille ?
    b. Une équipe interprofessionnelle ?
11. Comment estimes-tu tes capacités à gérer une situation problématique lors d'une entrevue ?

Merci !

Guide d'entrevue (post):

Heure : _____ Date : _____ Lieu :_____

Intervieweur : _____

Code du répondant : _____

Position du répondant : _____

Description du projet : L'entrevue qui suit porte sur l'apprentissage par simulation que vous allez expérimenter pendant le semestre. Cette entrevue permet de discuter du contexte d'apprentissage dans lequel vous êtes en ce moment.

Questions :

Simulations :

1. Comment s'est passé les simulations dans le cours ? Peux-tu me décrire les cas que tu as vu ?
2. Comment la simulation a influencé ton apprentissage sur les soins en dysphagie ?
3. Comment la simulation a influencé ton niveau de confiance en toi ?

Anxiété :

4. Comment te sens-tu-maintenant que tu as terminé les quatre simulations ?
    a. Comment définirais-tu ton niveau de confiance en soi ?
    b. Comment définirais-tu ta capacité à gérer ce type de situation qu'est la simulation ?
5. Comment perçois-tu tes stages maintenant ?

Les prochaines questions portent sur des éléments qu'il y avait pendant chaque simulation, j'aimerais savoir comment chaque élément a pu influencé ton expérience

1. Les feuilles préparatoires
2. La rétroaction des acteurs et diététistes
3. Le fait d'être en équipe
4. Le local
5. Le fait d'être observé

Les prochaines questions portent sur ta compréhension des compétences en diététique. Je tiens à préciser qu'il n'y a pas de bonnes ou mauvaises réponses. Ceci n'est pas un examen et personne ne sera jugé sur ce qui est dit ici.

Compétences :

6. Que signifie pour toi la dysphagie ?
7. Peux-tu me parler de l'approche nutritionnelle dans les cas de dysphagie ?
    a. Quel est ton niveau de confiance à intervenir nutritionnellement avec des patients qui ont cette condition ?
8. Que signifie pour toi la pratique interprofessionnelle ?
    a. Que représente le rôle de la diététiste dans l'équipe interprofessionnelle ?
    b. Comment est-ce que la pratique interprofessionnelle influence le patient ?
9. Comment estimes-tu tes capacités à communiquer avec un patient lors d'une entrevue ?
10. Comment estimes-tu tes capacités à collaborer avec…
    a. Le patient et sa famille ?
    b. Une équipe interprofessionnelle ?
11. Comment estimes-tu tes capacités à gérer une situation problématique lors d'une entrevue ?

Merci !

English version

Interview guide (pre):

Time: _____ Date: _____ Location:_____
Interviewer: _____
Participant's code: _____
Participant's position : _____
Project description: The following interview focuses on simulation-based learning that you will experience during the semester. This interview allows you to discuss the learning context in which you are currently.

Questions:

Experience:

11. Do you have experience in interviewing patients?
    a. If so, in what context?
    b. If not, how do you perceive such a situation?
12. Have you ever participated in a simulation with a patient in the past?
    a. If so, can you explain the context (location, number, scenario)?

Anxiety:

13. How do you feel about the simulated interview with a client coming up?
    a. How would you define your level of self-confidence?
    b. How would you define your level of apprehension about the interview with a client?
    c. How would you define your ability to handle this type of situation, which is a simulation?
14. How do you feel about doing a simulation in front of your colleagues?

The next questions are about your understanding of dietetic skills. I would like to point out that there are no good or bad answers. This is not an exam and no one will be judged on what is being said here.

Competencies:

15. What does dysphagia mean to you?
16. Can you tell me about the nutritional approach in cases of dysphagia?
    a. What is your level of self-confidence in intervening nutritionally with patients who have this condition?
17. What does interprofessional practice mean for you?
    a. What is the role of the dietitian in the interprofessional team?
    b. How does interprofessional practice affect the patient?
18. How do you rate your ability to communicate with a patient during an interview?
19. How do you rate your ability to collaborate with...?
    a. The patient and his family?
    b. An interprofessional team?
20. How do you rate your ability to handle a problem situation during an interview?

Thank you !

Interview guide (middle):

Time: _____ Date: _____ Location:_____

Interviewer: _____

Participant's code: _____

Participant's position: _____

Project description: The following interview focuses on simulation-based learning that you will experience during the semester. This interview allows you to discuss the learning context in which you are currently.

Questions:

Simulations:

12. How did the simulation influence your learning about dysphagia care?
13. How did the simulation influence your level of self-confidence?

Anxiety:

14. How do you feel after facing both simulations?
15. How do you feel about the next two simulations?
    a. How would you define your level of self-confidence?
    b. How would you define your level of apprehension about the next situation?
    c. How would you define your ability to handle this type of situation, which is simulation?
16. How did you feel when several people watched each simulation?
    a. Do you think it affected the way you were acting during the simulation?

The next questions are about your understanding of dietetic skills. I would like to point out that there are no good or bad answers. This is not an exam and no one will be judged on what is being said here.

Competencies :

17. What does dysphagia mean to you?
18. Can you tell me about the nutritional approach in cases of dysphagia?
    a. What is your level of self-confidence in intervening nutritionally with patients who have this condition?
19. What does interprofessional practice mean for you?
    a. What is the role of the dietitian in the interprofessional team?
    b. How does interprofessional practice affect the patient?
20. How do you rate your ability to communicate with a patient during an interview?
21. How do you rate your ability to collaborate with...?
    a. The patient and his family?
    b. An interprofessional team?
22. How do you rate your ability to handle a problem situation during an interview?

Thank you !

Interview guide (post):

Time: _____ Date: _____ Location:_____
Interviewer: _____
Participant's code: _____
Participant's position : _____
Project description: The following interview focuses on simulation-based learning that you will experience during the semester. This interview allows you to discuss the learning context in which you are currently.

Questions:

Simulations:

1. How did the simulations go during the course? Can you describe to me each case that you did?
2. How did the simulation influence your learning about dysphagia care?
3. How did the simulation influence your level of self-confidence?

Anxiety:

4. How do you feel about the four simulations?
    a. How would you define your level of self-confidence?
    b. How would you define your ability to handle this type of situation, which is simulation?
5. How do you feel about your internship now?

The next questions are about what was in each simulation, how would each element have influenced your experience?

1. The preparatory sheets
2. Feedback from actors and dietitians
3. Being in a team
4. The room
5. Being observed

The next questions are about your understanding of dietetic skills. I would like to point out that there are no good or bad answers. This is not an exam and no one will be judged on what is being said here.

Competencies :

6. What does dysphagia mean to you?
7. Can you tell me about the nutritional approach in cases of dysphagia?
    a. What is your level of self-confidence in intervening nutritionally with patients who have this condition?
8. What does interprofessional practice mean for you?
    a. What is the role of the dietitian in the interprofessional team?
    b. How does interprofessional practice affect the patient?
9. How do you rate your ability to communicate with a patient during an interview?
10. How do you rate your ability to collaborate with...?
    a. The patient and his family?
    b. An interprofessional team?
11. How do you rate your ability to handle a problem situation during an interview?

Thank you !

1.3 Focus group – Interview guide and protocol

French version

Groupe focus avec les questions d'entrevues pour les participants

Bonjour à tous et bienvenue à ce groupe focus. Mon nom est _____, et je vais être la modératrice pour la discussion d'aujourd'hui. Je vais avoir une assistante avec moi, qui pendre des notes durant nos discussions, voici _____. Le but du groupe focus d'aujourd'hui est de discuter de votre expérience vécue lors des simulations effectuées dans le cadre du cours Évaluation nutritionnelle à l'automne dernier.

Prendre en note qu'il n'y a pas de bonnes ou mauvaises réponses aux questions que je vous poserai. Les questions seront posées en français et en anglais. Vous pouvez répondre dans la langue de votre choix, ma collègue et moi sommes bilingues et pouvons traduire l'information au besoin. Tous les participants à ce groupe focus sont bilingues. La discussion d'aujourd'hui sera enregistré pour nous assurer de ne manquer aucun commentaire et de rapporter le plus exactement possible les discussions. Les informations recueillies seront réunies par thème et ne permettront pas d'identifier la personne, donc sentez-vous à l'aise de nous donner votre opinion la plus juste possible.

Ce groupe focus présente certaines limites concernant la confidentialité des participants. Tous les commentaires émis de la part des participants devraient demeurer confidentiels. On vous demande de ne pas parler de cet entretien à l'extérieur de cette session. Bien que nous puissions assurer le respect de la confidentialité de la part de notre équipe de recherche, nous ne pouvons pas garantir le respect de la confidentialité par tous les participants. Soyez conscient de la possibilité que d'autres participants puissent répéter vos commentaires en dehors de cette discussion. Nous vous demandons de bien comprendre l'importance du respect de la confidentialité dans ce contexte.
Y-a-t-il des questions? Si non, commençons.

1. Quelles étaient vos attentes avant de faire la simulation ?
2. Comment vous sentiez-vous avant de faire la simulation face à l'expérience qui vous attendait ?
    a. Quelles étaient vos principales appréhensions ?
3. Qu'avez-vous ressenti lorsque vous avez terminé la simulation ?
    a. Par exemple, au niveau de vos inquiétudes, de la fierté ou votre niveau de confiance ?
4. Que pensez-vous du travail interprofessionnel ?
    a. Quelles sont les avantages rattachés au travail en équipe interprofessionnelle ?
    b. Quelles sont les difficultés rattachées au travail en équipe interprofessionnelle ?
        i. Au niveau de la communication ?
        ii. Au niveau de la gestion de conflits ?
5. Comment la simulation a influencé votre apprentissage concernant la gestion de la dysphagie ?
6. Comment la simulation a influencé votre apprentissage concernant le rôle de l'infirmière ?
7. Comment la simulation a influencé votre apprentissage concernant le rôle de l'orthophoniste ?
8. Y-a-t-il quelque chose que vous souhaitez ajouter avant qu'on termine la rencontre ?

Merci de votre participation!

English version

Focus group script with participants' interview questions

Hello everybody and welcome. My name is _____, and I will serve as the moderator for today's focus group discussion. Assisting me is _____. The purpose of today's discussion is to find out your thoughts and ideas about the simulations used in your Nutritional Assessment class.

Please be aware that there are no right or wrong answers to the questions being asked. I will ask all the questions in French and English. You can answer in your preferred language. My colleague and I are bilingual, so we can translate information as needed. All participants to this focus group are bilingual. We will be recording this discussion to ensure that we do not miss any of your comments and that we can report your comments accurately. The information that you provide will be grouped together as themes and not identifiable to any one participant, so please feel free to be as open and honest as you wish with your answers.

Please keep in mind the following limits regarding the confidentiality of this focus group discussion. All participants' comments made during this discussion should be kept confidential. We ask you all to refrain from talking about this exchange outside of this focus group session. Although our research team can promise to maintain confidentiality, we cannot guarantee that all focus group participants will do so. Be aware of the possibility that other participant may repeat your comments outside of this discussion. We ask you to understand the importance of confidentiality in this context.

Are there any questions? If no, okay, let's begin.

1. What were your expectations before experiencing the simulations?
2. How did you feel before the simulation?
    a. What were your main apprehensions?
3. How did you feel right after the simulation?
    a. In terms of concerns, pride, confidence levels
4. What do you think of interprofessional work?
    a. What are the benefits of interprofessional teamwork?
    b. What are the challenges of interprofessional teamwork?
        i. Regarding communication?
        ii. Regarding conflict management?
5. How did the simulation influence your learning about the management of dysphagia?
6. How did the simulation influence your learning about the role of the nurse?
7. How did the simulation influence your learning about the role of the speech-language pathologist?
8. Is there anything you would like to add before we finish the meeting?

Thank you for your participation!

1.4 Scoring tool - *French version*

Grille d'observation des compétences en diététique
Participant : _____ Simulation : _____

Compétences en nutrition	N'atteint pas (0)	Atteint plus ou moins (1)	Atteint (2)
Introduction de l'entrevue			
Établit le premier contact (saluer, se présenter, offre active du français)			
Brise la glace et établir le rapport			
Clarifie l'objet de la rencontre			
Corps de l'entrevue - Pratique professionnelle			
S'assure d'obtenir un consentement éclairé.			
Décrit son rôle et ses responsabilités de façon claire à l'équipe de soins, au patient et à la famille.			
Fait preuve de jugement professionnel			
Communication			
Utilise une terminologie appropriée.			
Fournit de l'information pertinente et exacte dans la documentation donnée au patient			
Parle de manière claire et concise dans le but de répondre aux besoins de son auditoire.			
Mets en pratique les principes d'offre active du français.			
Mets en pratique les principes l'écoute active.			
Fait preuve d'empathie.			
Identifie des moyens de faire appel à l'expertise des autres personnes.			
Soins en nutrition			
Identifie les données d'évaluation pertinentes à recueillir			
Obtient la perspective de la clientèle, de la famille ou des autres intervenants pertinents.			
Obtient et interprète les données sur l'apport en aliments et en nutriments			
Identifie les besoins d'apprentissage de la clientèle en matière d'aliments et de nutrition.			
Obtient et interprète l'information issue d'observations effectuées lors des repas et de l'alimentation.			
Identifie les signes et les symptômes de la dysphagie.			
Démontre ses connaissances relatives aux principes d'évaluation de la déglutition.			
Élabore ou modifie des plans alimentaires en consultant le patient et sa famille.			
Évalue les progrès de la clientèle en matière d'atteinte des résultats du plan			
Collaboration interprofessionnelle			
Utilise les techniques de communication (verbales et non verbales) de façon appropriée dans différentes situations.			
Cherche à obtenir l'approbation du client ou du décideur désigné lorsque certains renseignements sont transmis.			
Reconnait son rôle à titre de membre de l'équipe.			
Adopte une approche centrée sur le patient			
Conclusion de l'entrevue			
Résume la rencontre et planifie le suivi			
Demande au client s'il y a des questions et vérifie sa compréhension			
Offre du renforcement positif			

English version

Dietary Skills Observation Grid
Participant : _____ Simulation : _____

Nutrition competencies	Doesn't reach (0)	Reached more or less (1)	Reached (2)
Introduction of the interview			
Establish the first contact (greeting, presenting himself, active offer of French)			
Break the ice and establish the report			
Clarify the purpose of the meeting			
Body of the interview Professional practice			
Ensure informed consent.			
Describe one's own roles and responsabilities in a clear manner with the team/patient/family.			
Demonstrate professional judgment.			
Communication			
Use appropriate terminology.			
Provide accurate and relevant information in written material given to the patient.			
Speak clearly and concisely, in a manner responsive to the needs of the listener(s).			
Use active offer of French when speaking to others			
Use active listening when others are speaking			
Demonstrate empathy			
Identify ways to draw on the expertise of others			
Nutrition care			
Identify relevant data to perform a nutrition assessment.			
Obtain perspective of client, family and / or relevant others			
Obtain and interprets food and nutrient intake data.			
Identify learning needs of the client regarding food and nutrition.			
Obtain and interpret information from observations made during meals and food.			
Identify signs and symptoms of dysphagia.			
Demonstrate knowledge of principles for swallowing assessment			
Develop or modify meal plans by consulting the patient and family			
Evaluate client progress in achieving plan outcomes			
Interprofessional collaboration			
Uses communication strategies (verbal & non verbal) appropriately in a variety of situations			
Seeks approval of the patient/client or designated decision-maker when information is shared			
Recognize his/her role as a member of the team.			
Adopt a patient-centered approach			
Conclusion of the interview			
Summarize the meeting and plan a follow-up.			
Ask the client if there are any questions and verify his understanding.			
Offer positive reinforcement.			

Appendix 2 – Description of performance indicators of PDEP' ICDEP and behavioral indicators of ICAR used to create the observation tool

The Competency Indicator Grid adapted from on Integrated Competencies for Dietetic Education and Practice Partnership for Dietetic Education and Practice. (2013). *Les compétences intégrées pour l'enseignement et la pratique de la diététique*. Partnership for Dietetic Education and Practice. Retrieved from www.pdep.ca.					
Areas #	**Areas of practice**	**Competency #**	**Practice competency**	**Indicator #**	**Performance indicators**
1.	Professional practice *Demonstrate professionalism*	1.02	Comply with regulatory requirements relevant to dietetic practice	l.	Ensure informed consent
2.	Communication and collaboration *Communicate effectively and practice collaboratively*	2.01	Select appropriate communication approaches	g	Use appropriate terminology
		2.02	Use effective written communication skills	f	Provide accurate and relevant information in written material
		2.03	Use effective oral communication skills	b	Speak clearly and concisely in a manner responsive to the needs of the listener(s)
		2.04	Use effective interpersonal skills	b	Utilize active listening
				f	Demonstrate empathy
		2.06	Contribute productively to teamwork and collaborative processes	e	Identify ways to draw upon the expertise of others
3.	Nutrition care	3.01	Assess nutrition-related risks and needs	d	Identify relevant assessment data to collect
				e	Demonstrate knowledge of methods to obtain perspective f client, family and/ or relevant others

	Provide services to meet the nutrition-care needs of individuals			n	Obtain and interpret food and nutrient intake data
				p	Identify client learning needs related to food and nutrition
				w	Obtain and interpret information from mealtime/feeding observations
				aa	Identify signs and symptoms of dysphagia
				bb	Demonstrate knowledge of principles for swallowing assessment
		3.02	Develop nutrition care plans	h	Develop of modify meal plans
		3.04	Evaluate and modify nutrition care plan as appropriate	a	Evaluate client progress in achieving plan outcomes

Behavioural indicators adapted from Interprofessional Collaborator Assessment Rubric

Curran, V., Casimiro, L., Hospital, M., Banfield, V., Simmons, B., Wagner, S., & Slp, R. (2010). *Interprofessional Collaborator Assessment Rubric*. Retrieved from https://www.med.mun.ca/getdoc/b78eb859-6c13-4f2f-9712-f50f1c67c863/ICAR.aspx

Competency category Descriptor	**Dimension**	**Behavioural indicators**
Communication Ability to communicate effectively in a respectful and responsive manner with others	Communication strategies	Uses communication strategies (verbal & non-verbal) appropriately in a variety of situations
Collaboration Ability to establish/ maintain collaborative working relationships with other providers, patients/ clients and families	Information sharing	Seeks approval of the patient/client or designated decision-maker when information is shared
Roles and responsibility Ability to explain one's own roles and responsibilities related to patient/client and family care (e.g. scope of practice, legal and ethical responsibilities); and to demonstrate an understanding of the roles, responsibilities and relationships of others within the team.	Roles and responsibilities	Describe one's own roles and responsibilities in a clear manner with the team/patient/family.
	Accountability	Demonstrate professional judgment

Team functioning Ability to contribute to effective team functioning to improve collaboration and quality of care.	Team discussion	Recognize his/her role as a member of the team.
Collaborative Patient/Client-Family Centred Approach Ability to apply patient/client-centred principles through interprofessional collaboration		Adopt a patient-centered approach

Appendix 3 – Category for theme analysis

Categories	Anticipated	Final

Pre simulation (T1)	- Anxiety
	  - Sources
	  - Variation
	  - Confidence
	- Satisfaction regarding simulations
	- Learning the competencies
	  - Nutrition care
	  - Communication
	  - Professional practice
	  - Clinical reasoning
	  - Interprofessional collaboration
		- Anxiety
		  - Sources
		  - Variation
		  - Confidence
		- Satisfaction regarding simulations
		- Learning the competencies
		  - Nutrition care
		  - Communication
		  - Clinical reasoning
		  - Interprofessional collaboration
		- Pre simulation experience
		- Understanding of interprofessional role

After two simulations (T2)		Same as pre simulation + - Preparation - Observation by dietitians and peers
After four simulations (T3)		Same as after two simulations + - Received feedback from dietitians and actors - Preparation for clinical internship
Focus group categories (T4)		Same as after four simulations

Appendix 4 – Ethics approval

Numéro de dossier: H10-15-34B **Date (mm/jj/aaaa):** 04/07/2016

Université d'Ottawa University of Ottawa

Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

Certificat d'approbation éthique

CÉR Sciences et science de la santé

Chercheur principal / Superviseur / Co-chercheur(s) / Étudiant(s)

Prénom	Nom de famille	Affiliation	Rôle
Isabelle	Giroux	Sciences de la santé / Nutrition	Chercheur principal

Numéro du dossier: H10-15-34B

Type du projet: Professeur

Titre: Développement, implémentation et évaluation de simulations interprofessionnelles pour l'apprentissage de compétences professionnelles dans la formation clinique des étudiants en diététique - Phase 1

Date d'approbation (mm/jj/aaaa)	Date d'expiration (mm/jj/aaaa)	Approbation
04/07/2016	04/06/2017	Ia

(Ia: Approbation complète, Ib: Autorisation préliminaire de libération de fonds de recherche)

Conditions Spéciales / Commentaires: N/A

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http://www.recherche.uottawa.ca/deontologie/

550 Cumberland Street
Ottawa, Ontario K1N 6N5 Canada
http://www.research.uottawa.ca/ethics/index.html

Numéro de dossier: H10-15-34B **Date (mm/jj/aaaa):** 04/07/2016

Université d'Ottawa University of Ottawa

Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

La présente confirme que le Comité d'éthique de la recherche (CER) de l'Université d'Ottawa identifié ci-dessus, opérant conformément à l'Énoncé de politique des Trois conseils et toutes autres lois et tous règlements applicables de l'Ontario, a examiné et approuvé la demande d'approbation éthique du projet de recherche ci-nommé. L'approbation est valide pour la durée indiquée plus haut et est sujette aux conditions énumérées dans la section intitulée "Conditions Spéciales / Commentaires".

Lors de l'étude, le protocole ne peut être modifié sans approbation préalable écrite du CER sauf si le participant doit être retiré en raison d'un danger immédiat ou s'il s'agit d'un changement ayant trait à des éléments administratifs ou logistiques de l'étude comme par exemple un changement de numéro de téléphone. Les chercheurs doivent aviser le CER dans les plus brefs délais de tout changement pouvant augmenter le niveau de risque aux participants ou affecter considérablement le déroulement du projet. Ils devront aussi rapporter tout évènement imprévu et / ou dommageable et devront soumettre toutes les nouvelles informations pouvant nuire à la conduite du projet et/ou à la sécurité des participants. Toutes modifications apportées au projet, aux lettres d'information / formulaires de consentement ainsi qu'aux documents de recrutement doivent être soumises pour approbation à ce Service en utilisant le document intitulé "Modification au projet de recherche" au: http://recherche.uottawa.ca/deontologie/submissions-and-reviews.

Veuillez soumettre un rapport annuel au responsable de l'éthique de la recherche, quatre semaines avant la date d'échéance indiquée afin de fermer le dossier ou demander un renouvellement de l'approbation éthique. Le document nécessaire est disponible en ligne au: http://recherche.uottawa.ca/deontologie/submissions-and-reviews.

Pour toutes questions, vous pouvez communiquer avec le bureau d'éthique en composant le poste 5387 ou en nous contactant par courriel à: ethique@uOttawa.ca.

Germain Zongo
Responsable de l'éthique de la recherche
Pour Dr. Daniel Lagarec, président du CÉR en Sciences de la santé et Sciences

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Appendix 5 – Consent form

French version

uOttawa
Faculté des sciences de la santé
Faculty of Health Sciences

Université d'Ottawa

Faculté des sciences de la santé
École des sciences de la nutrition

University of Ottawa

Faculty of Health Sciences
School of Nutrition Sciences

Lettre d'information de consentement
Projet de recherche

Titre du projet: Développement, implémentation et évaluation de simulations interprofessionnelles pour l'apprentissage de compétences professionnelles dans la formation clinique des étudiants en diététique

Isabelle Giroux, PhD, DtP, BÉd, ÉFI

Mylène Rosa

Invitation à participer: Je suis invité(e) à participer à la recherche nommée ci-haut qui est menée par Isabelle Giroux. Ce projet de recherche est financé par le Consortium national pour la formation en santé - Volet Université d'Ottawa.

But de l'étude: Le but de l'étude est de développer et implémenter des simulations interprofessionnelles axées sur le dépistage et le traitement de la dysphagie, puis d'évaluer leur impact sur le processus d'apprentissage de compétences et du niveau d'anxiété des étudiants en nutrition dans le cadre de leur formation en diététique

Participation: Ma participation consistera essentiellement à répondre à deux questionnaires dont un qui sera complété avant les simulations et le deuxième qui sera complété après les simulations. Ces questionnaires prendront environ 30 à 45 minutes chacun à répondre et peuvent être complétés en personne ou en ligne, selon ma préférence. De plus, je pourrai participer à trois entrevues, avant, après deux simulations et après les quatre simulations, qui dureront environ 30 à 45 minutes chacune. Après la fin des simulations au début de la session d'hiver, je participerai également à un groupe de discussion d'environ une heure pour donner ma rétroaction sur mon expérience d'apprentissage de compétences professionnelles par simulations dans le cadre de ma formation en diététique. Dans le cadre des activités prévues du cours d'Évaluation nutritionnelle, les simulations seront également filmées à des fins éducatives. De plus, au cours des simulations, une diététiste donnera de la rétroaction formative qui sera documentée sur une grille de compétences. En participant à l'étude, j'accepte que ces grilles de compétences et ces enregistrements soient gardés et analysés à des fins de recherche. Ceci permettra de mesurer l'apprentissage de compétence par simulation plus objectivement. Les composantes du projet de recherche (questionnaires, entrevues, groupe de discussion et conservation des grilles de compétences et enregistrements) sont dissociables. Il est donc possible pour moi de choisir les composantes du projet auxquelles je souhaite participer.

Risques : Je comprends que ma participation à cette recherche implique que je donne de la rétroaction personnelle sur mon apprentissage et que cela représente peu de risque pour moi. J'ai reçu l'assurance des

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chercheurs que tout se fait en vue de minimiser ces risques incluant le respect de la confidentialité des informations personnelles. Mes réponses aux questionnaires, ma participation aux entrevues, ma participation au groupe de discussion, mes enregistrements vidéo et l'évaluation de mon apprentissage de compétences sont des informations confidentielles et la professeure du cours Isabelle Giroux, n'aura accès aux données qu'une fois celles-ci soient anonymisées et/ou encodées. Professeure Giroux n'aura accès à ces données que lorsque les notes du semestre seront officielles.

Bienfaits: Ma participation à cette recherche aura pour effet d'aider à documenter la perception des étudiants sur leur expérience d'apprentissage par simulations interprofessionnelles. Ma rétroaction aidera à améliorer l'expérience d'apprentissage de futurs étudiants et à documenter l'impact de l'apprentissage par simulations en diététique. Que je choisisse de participer au projet de recherche ou non, je bénéficierai de la rétroaction d'une diététiste et des simulations interprofessionnelles organisées dans le cadre du cours d'Évaluation nutritionnelle grâce au financement du projet par le CNFS – Volet Université d'Ottawa.

Confidentialité et anonymat: L'information que je vais partager ne sera utilisée que pour étudier l'apprentissage de compétences professionnelles dans la formation clinique des étudiants en diététique. Je comprends qu'il n'est pas possible d'assurer la confidentialité de ma participation au groupe de discussion. Toutefois, je comprends qu'il est de ma responsabilité d'assurer la confidentialité. Je comprends également que la confidentialité des informations soumises par questionnaires électroniques ne peut pas être garantie puisque les informations sont collectées à l'aide de Survey Monkey, un outil américain qui est assujetti au Patriot Act. Même si ces données sont encryptées, il y a un risque, comme pour toutes informations transmises par Internet, qu'elles soient interceptées par des tiers partis. Afin de minimiser les risques d'atteinte à votre sécurité et pour assurer votre confidentialité nous vous recommandons d'utiliser des mesures de sécurité standard, telles que mettre fin à la session, fermer votre navigateur Internet et verrouiller votre écran ou appareil lorsque vous ne les utilisez plus ou une fois un questionnaire complété.

L'anonymat est garanti de la façon suivante : un code me sera attribué et il sera utilisé pour la complétion du questionnaire. J'ai reçu l'assurance que dans les rapports écrits, mon nom ne sera pas mentionné, en aucun cas il ne sera possible de m'identifier.

Conservation des données: Les données recueillies avec le questionnaire seront conservées de façon sécuritaire. Les enregistrements vidéo seront conservés électroniquement et seront supprimés de la caméra après chaque simulation. Les données électroniques seront conservées dans un ordinateur avec un mot de passe sécuritaire. Les formulaires papiers, les enregistrements audio et les notes prises lors des entrevues et groupe de discussion seront conservés dans des classeurs à fermeture à clé. Les ordinateurs et les classeurs seront dans des bureaux verrouillés dans le bureau ou l'espace de recherche de la chercheure principale accessible seulement par cette dernière et les membres de son équipe.

Si des personnes autres que les chercheurs nommés dans la présente demande aident aux activités du projet (étudiants aidant lors de la compilation des données), elles devront au préalable signer une entente de confidentialité et être sous la responsabilité d'un des chercheurs de cette demande. Les données seront conservées pour une période de 25 ans suivant la fin du projet.

Participation volontaire: Ma participation à la recherche est volontaire et je suis libre de me retirer en tout temps, et/ou refuser de répondre à certaines questions, sans subir de conséquences négatives. Si je choisi de me retirer de l'étude, les données recueillies jusqu'à ce moment seront conservées ou détruites selon ma volonté. Toutefois, vu la dynamique de la discussion en groupe, il n'est pas possible de retirer les propos après leur transcription puisque les retirer rend inutilisable les autres données.

Il est possible pour moi de choisir les composantes du projet auxquelles je souhaite participer. Dans le tableau suivant, veuillez cocher si vous consentez à participer ou non aux différentes activités.

	Je consens à participer	**Je ne consens pas à participer**
Deux questionnaires en ligne ou en personne		
Trois entrevues (avant, pendant et après)		
Groupe de discussion		
Conservation des grilles de compétences et des enregistrements pour analyse		

Compensation: Pour ma participation aux trois entrevues et au groupe de discussion, séparément, j'aurai droit à un dédommagement pour mon temps et les frais de déplacement associés à ma participation. Cette compensation d'une valeur de 25$ me sera remise sous forme de carte cadeau pour une épicerie pour ma participation aux trois entrevues et/ou au groupe de discussion. Si je décide de me retirer avant la fin la discussion de groupe, j'aurai tout de même droit à cette compensation.

Acceptation: Je, _____ accepte de participer à cette recherche menée par la professeure Isabelle Giroux du programme de Baccalauréat spécialisé en sciences de la nutrition à la Faculté des sciences de la santé.

Pour tout renseignement additionnel concernant cette étude, je peux communiquer avec la chercheure ou ses assistantes de recherche.

Pour tout renseignement sur les aspects éthiques de cette recherche, je peux m'adresser au Responsable de l'éthique en recherche, Université d'Ottawa, Pavillon Tabaret, 550, rue Cumberland, pièce 154, (613) 562-5387 ou Email: ethics@uottawa.ca

Il y a deux copies du formulaire de consentement, dont une copie que je peux garder.

Signature du participant: _____ Date: _____

Signature du chercheur : _____ Date : _____

English version

uOttawa
Faculté des sciences de la santé
Faculty of Health Sciences

Université d'Ottawa
Faculté des sciences de la santé
École des sciences de la nutrition

University of Ottawa
Faculty of Health Sciences
School of Nutrition Sciences

Consent Form

Title of the study: Development, implementation and evaluation of interprofessional simulations in the learning of professional skills during clinical education of dietetics

Isabelle Giroux, PhD, DtP, BÉd, PHEc

Mylène Rosa

Invitation to Participate: I am invited to participate in the research study mentioned above conducted by Isabelle Giroux. This project is funded by *Consortium national de formation en santé – Volet Université d'Ottawa.*

Purpose of the Study: The purpose of the study is to develop and implement interprofessional simulations about dysphagia management, and evaluate the impact of this teaching approach on the learning of professional skills and on the level of anxiety of dietetic students.

Participation: My participation consists of answering two online questionnaires. One will be completed before the simulations and the second will be completed after. These questionnaires will take approximately 30 to 45 minutes each to complete. In addition, I will participate in three interviews, before, after two simulations and after the four simulations, which will last about 30 to 45 minutes each. After the simulations, I will also participate in a focus group discussion lasting about an hour to give my feedback on my experience learning professional competencies with simulations. Note that each interview and focus group will be recorded using audio recorders to facilitate analysis of the research data. As part of the planned activities for your Nutritional Assessment class, the simulations will be filmed for educational purposes. I will also be given formative feedback that will be documented on an evaluation grid. By participating in the study, I accept that this evaluation form and these video recordings will be kept and analyzed for research purposes. This will allow researchers to measure more objectively the impact of using simulations on learning dietetic skills. The components of the research project (questionnaires, interviews, focus group and retention of the evaluation grids and recordings) can be dissociated. It is therefore possible for me to choose the components of the project to which I wish to participate.

Risks: My participation in this study will entail that I give feedback on my learning and this represents a low risk for me. I have received assurance from researchers that every effort will be made to minimize these risks. My responses to the questionnaires, my participation in the interviews, and in the focus group discussion, my audio recordings of the interviews and focus group, my video recordings as well as my formative learning assessment constitute confidential information. The professor, Isabelle Giroux, will have access to the data only once all identifying information have been removed and/or encoded and once the course is completely ended.

Benefits: My participation in this study will help documenting the benefits of learning with interprofessional simulations from a student perspective. My feedback will help to enhance the learning experience for future students

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and document the impact of simulations on learning experiences in dietetics. Whether I choose to participate in the study or not, I will receive feedback from a dietitian and I will benefit from interprofessional simulations organized thanks to funding from CNFS – Volet Université d'Ottawa.

Confidentiality and anonymity: The information that I will provide will only be used for understanding how simulations enhance the learning experience of dietetic students. I understand that it is not possible for the research team to ensure confidentiality if I participate in the focus group discussion. However, I understand that it is my responsibility to ensure confidentiality. In addition, I understand that the confidentiality of the information submitted with electronic questionnaires also cannot be guaranteed. Even if the data is encrypted, there is a risk, as for all information transmitted through the Internet, of it being intercepted by third parties.

Anonymity will be protected by manner of putting a code on my questionnaire. I also have the insurance that my name will not be used in any reports, nor in the transcription of the focus group and that it will not be possible to identify me otherwise.

Conservation of data: Data collected will be kept in a secure manner. The video recordings will be kept electronically and will be deleted from the camera after each simulation. All electronic data will be kept on a secured computer and will be protected with a password. The paper forms as well as interviews and focus group tape recordings and notes will be kept in a secure manner in a locked cabinet. All computers and the locked cabinet are located in a locked office where only the principal researcher and her research team have access.

If any other persons are asked to help with the project (students helping with data compilation), they will have to sign a confidentiality agreement beforehand and the will be under the responsibility of one of the researchers. All the data will be kept for a period of 25 years after the end of the project.

Voluntary Participation: I am under no obligation to participate and if I choose to participate, I can withdraw from the study at any time and/or refuse to answer any questions, without suffering any negative consequences. If I choose to withdraw, all data gathered until the time of withdrawal will be kept or dismissed as I wish. I understand that once the coding of the transcriptions of the focus group discussion will begin, it will not be possible to withdraw my comments.

It is possible for me to choose the components of the project in which I wish to participate. In the following table, please check whether you agree to participate in the various activities.

	I agree to participate	**I do not agree to participate**
Two questionnaires (online or in person)		
Three interviews ($25 compensation)		
Focus group ($25 compensation)		
Retaining evaluation grids and recordings for analysis		

Compensation: For my participation in the three interviews and in the focus group, I will be entitled to compensation for my time and the travel expenses associated with my participation. This $ 25 compensation will be given to me as a gift card for a grocery store for my participation in each interview and for the focus group. If I decide to withdraw the group discussion before the end, I shall still be entitled to this compensation. The same applies to interviews, if I decide to withdraw before the end of the interview, I will still be entitled to this compensation.

Acceptance: I, _____ agree to participate in the above research study conducted by Isabelle Giroux of the Honours Bachelor in Nutrition Sciences of the Faculty of Health Sciences at the University of Ottawa.

If I have any questions about the study, I may contact the researcher or her research assistant.

If I have any questions regarding the ethical conduct of this study, I may contact the Protocol Officer for Ethics in Research, University of Ottawa, Tabaret Hall, 550 Cumberland Street, Room 154, Ottawa ON K1N 6N5 Tel.: (613) 562-5387 Email: ethics@uottawa.ca

There are two copies of the consent form, one of which is mine to keep.

Participant's signature: _____ Date: _____

Researcher assitant's signature: _____ Date: _____

Appendix 6 – Abstract presented to Jean-Paul Dionne Symposium 2019

PERCEPTIONS DES SUPERVISEURS DE STAGE CLINIQUE FACE À UNE ACTIVITÉ D'APPRENTISSAGE INNOVATRICE

Rosa, Mylène[1]; Leclerc, Alexie[2]; Giroux, Isabelle[2,3]
[1]Faculté d'éducation [2]Faculté des sciences de la santé [3]École des sciences de la nutrition

uOttawa

CONSORTIUM NATIONAL DE FORMATION EN SANTÉ
Volet Université d'Ottawa

INTRODUCTION :

Le programme de Baccalauréat spécialisé en sciences de la nutrition de l'Université d'Ottawa a intégré l'utilisation des simulations dans l'enseignement des compétences requises pour l'entrée à la pratique des futurs diététistes. Cette activité met en place un scénario où l'étudiant doit agir en tant que professionnel de la santé avec un patient-acteur (Levett-Jones et Lapkin, 2014). Il est attendu des étudiants qu'ils aient acquis les compétences (ex. professionnalisme) et la confiance pour les appliquer une fois en stage (Gibson, Dart, Bone et Palermo, 2015).

OBJECTIF :

Explorer l'effet de la simulation comme nouvelle activité d'enseignement sur le niveau de préparation au stage clinique des étudiants.

MÉTHODES :

Nous avons envoyé un questionnaire en ligne aux superviseurs cliniques après le début des stages de nutrition clinique (janvier-août 2017). Les participants devaient répondre aux énoncés sur une échelle de Likert à 5 points (1-totalement en désaccord à 5-totalement en accord) et pouvaient laisser un commentaire après chaque énoncé.

RÉSULTATS :

En moyenne, les participants (n=28) avaient supervisé 14 étudiants chacun. Selon nos résultats, les superviseurs étaient en moyenne en accord (4,0±0,9) qu'en « *imitant une diététiste dans un contexte clinique lors de simulations, les étudiants arrivent mieux préparés pour leur stage clinique* ». En général, les répondants ont indiqué que les stagiaires ont une attitude plus professionnelle et ont plus confiance en eux depuis l'intégration des simulations. Ils rapportent qu'il y a un progrès remarquable chez les stagiaires, d'année en année.

DISCUSSION/ CONCLUSION :

En conclusion, les simulations ont permis d'améliorer la préparation aux stages selon le point de vue des superviseurs cliniques. Les stagiaires sont plus professionnels et confiants. Cette étude permet de renforcer l'intégration des simulations aux programmes de diététique grâce aux effets positifs observés chez la population étudiante et la satisfaction des superviseurs cliniques.

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Financement : CNFS-Volet Université d'Ottawa

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