CAN SCRIPT CONCORDANCE TESTING BE UTILIZED IN NURSING EDUCATION TO ACCURATELY ASSESS CLINICAL REASONING SKILLS?

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LIST OF ABBREVIATIONS/SYMBOLS

ANOVA: Analysis of Covariance
BSN: Bachelor of Science in Nursing
CAI: Caring Ability Inventory
CES: Caring Efficiency Scale
M: mean
MCQ: Multiple Choice Questionnaires
OSCE Objective Structured Clinical Examination
p value: level of significance
r value: Pearson's correlation coefficient
SCT: Script Concordance Test
SD: standard deviation
SSPS: Statistical Package for the Social Sciences

ABSTRACT

CAN SCRIPT CONCORDANCE TESTING BE UTILIZED IN NURSING EDUCATION TO ACCURATELY ASSESS CLINICAL REASONING SKILLS?

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The purpose of this tool validation study was to provide additional evidence of the validity and reliability of the Script Concordance Test (SCT) in evaluating the clinical reasoning competency of nursing students by replicating the study conducted by Deschenes, Charlin, Gagnon and Goudreau (2011). The question this researcher attempted to answer was: Can script concordance testing be utilized in nursing education to accurately assess clinical reasoning skills? The study was conducted on a convenience sample of 48 first year bachelor of nursing students. The Script Concordance Test from the Deschenes et al. (2011) study was administered to the students and 13 panel members. A scoring grid was developed using the aggregate scores method based on the modal responses of the panel. The reliability of the scores was measured by Cronbach's alpha coefficient and the scores of the students and panel were compared using a *t*-test. The difference between the panel and student scores was statistically significant and the reliability of the scores was high. The SCT provides a reliable, standardized, and easy to administer method of evaluating clinical reasoning in nursing students.

Keywords: clinical reasoning, script theory, script concordance

CHAPTER ONE: BACKGROUND AND RATIONALE FOR STUDY

Nurses today are faced with very complex clinical situations in an uncertain environment due to changing conditions in healthcare settings: higher patient acuity levels, shorter hospital length of stays, increased use of technology, and a greater emphasis on cost containment (Simmons, 2010; Benner, Hughes, and Sutphen, 2008). As a result, nurses must be able to quickly analyze clinical situations and make decisions in a timely and accurate manner in order to ensure high quality patient care and positive patient outcomes (Kuiper, 2009; Banning, 2008; Tanner, 2006; Benner et al, 2008). The expectation is that nurses entering the field will have progressively demonstrated the ability to make appropriate decisions based on sound clinical reasoning skills throughout their nursing courses.

Problem Statement

To ensure that new nurses are prepared for these practice expectations, nursing educators are challenged with developing effective methods for teaching and evaluating clinical reasoning skills in nursing students. The first step in developing an effective tool to be used for the evaluation of clinical reasoning is to establish a clear definition of clinical reasoning. Throughout nursing literature the terms used to describe the nursing thought process are used interchangeably; critical thinking, clinical judgment, decision making, problem solving, and clinical reasoning (Simmons, 2010; Tanner, 2006). For the purposes of this study the term clinical reasoning is defined as "a complex cognitive process that uses formal and informal thinking strategies to gather and analyze patient information, evaluate the significance of this information, and determine the value of

alternative actions" (Simmons, 2010). Clinical reasoning goes beyond simple application of knowledge, rules and principles.

The second step is to ensure the validity and reliability of the tool in measuring reasoning in clinical situations with a high degree of uncertainty. Clinical reasoning is an expected part of competent nursing practice; however, assessing clinical reasoning has been difficult in nursing education because no valid methods have been developed to accurately measure clinical reasoning skills in nursing students (Groves, Scott, and Alexander, 2002; Banning, 2008). Clinical reasoning has traditionally been evaluated in the clinical setting via direct observation. This has not been successful because of "lack of structure, lack of standardization, subjective marking, bias in case selection, and low inter-rater reliability" (Groves, et al, 2002; Banning, 2008).

Another limitation of traditional clinical reasoning competency tests utilized in nursing education is that they rely on the application of well-known solutions to well-defined problems. Written tests such as Multiple Choice Questionnaires (MCQs), according to Charlin and Van der Vleutin (2004), have demonstrated excellent validity and reliability in measuring technical rationality, which is part of clinical reasoning, but can not be used to assess clinical reasoning skills when there is a lack of information or a high degree of uncertainty. The ability to reason under uncertainty and solve ill-defined problems is a key component of professional competence. Oral exams offer an alternative method of assessing this knowledge, but they are difficult to standardize, lack scoring objectivity, and are not practical for large groups (Charlin and Van der Vleutin, 2004). There has been considerable difficulty in developing tools to measure clinical

reasoning and at this time, no tool has been developed that is valid, reliable and does not require considerable time and effort to administer and grade (Groves, et al, 2002).

Justification of Study

In reviewing the literature, only one study using the SCT to evaluate clinical reasoning in nursing students was found. In that study, Deschenes, et al. (2011) developed a Script Concordance Test for first year Bachelor of Science in Nursing (BSN) students and conducted a preliminary validation of its psychometric qualities in order to answer two research questions; "What is the validity of the prepared script concordance test level?"; "What is the value of the internal consistency of the test (fidelity)?" (Deschenes et al., 2011).

The original SCT scenarios and test items were created based on Watson's Theory of Human Caring and the test scoring grid was constructed using the aggregate score method, based on the response of 12 panel members. The scores of the students and the panel were compared utilizing a t-test, and the reliability of the scores was measured by Cronbach's alpha coefficient. A statistically significant difference was found between the scores of the panel and students. The score's reliability was high and it was determined that the SCT provides a standardized method for assessing nurses' clinical reasoning. While the results are promising, due to the fact that this is the only study to date to assess the validity of the SCT in assessing clinical reasoning in nursing students, there is a need for further research in this area.

Theoretical Framework

A recent tool for measuring clinical reasoning uses the Script Concordance Test (SCT), which is based on Script Theory. Grant and Marsden (1987, 1988) determined

that health care professionals make clinical decisions based on key elements of information contained in specific memory structures that relate to previous similar experiences. This idea was initially developed by Feltovich and Barrow (1984), and further developed by Schmidt, Norman, and Boshuizen (1990) and Charlin, Tardif, and Boshuizen (2000b) in the scripts theory, which asserts that mental scripts associated with repeated experiences with real world events are used in the process of clinical reasoning. These scripts are automatic, primarily unconscious, and serve to confirm or refute the individual's hypothesis about the meaning of observed events (Charlin, Boshuizen, Custers, and Feltovich, 2007). The script model for clinical reasoning, as shown in Figure 1, begins with a triggering event which leads to generation of a hypothesis then through processing of available information the hypothesis is either confirmed or refuted.

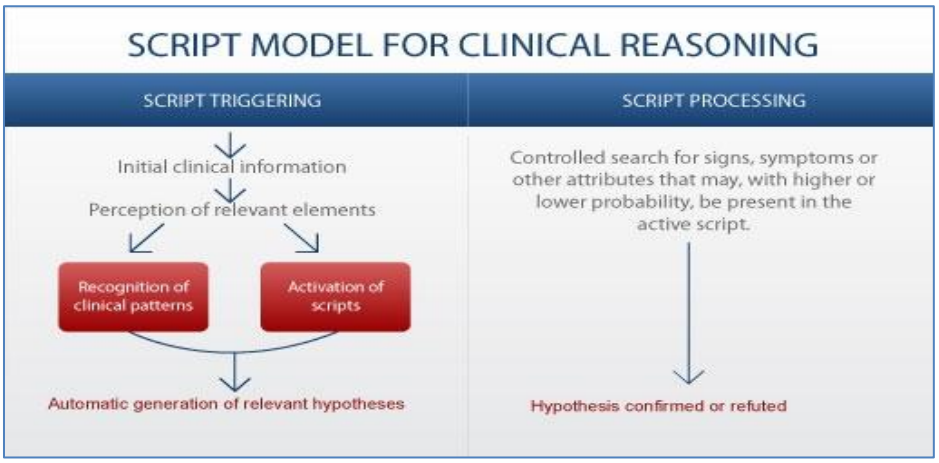

Figure 1. Script Model (taken from http://www.script.md/portal/en/script_en.html)

The SCT is a written examination that presents clinical scenarios based on real life clinical situations with information that is unclear, has a high degree of uncertainty, or is incomplete (Deschenes, Charlin, Gagnon, and Goudreau, 2011). While the SCT has been used successfully in medical schools to assess clinical reasoning in the context of

uncertainty of pre-clinical medical students, it has not been widely utilized in nursing schools. The SCT has been determined to be an easy to administer measure of problem-solving performance even in the beginning years of medical school (Lambert, Gagnon, Nguyen, and Charlin, 2009; Gagnon, Charlin, Roy, St-Martin, Sauve, Boshuizen, and Van der Vleuten, 2006; Charlin, Roy, Brailovsky, Goulet, and Vleuten, 2000a).

Assumptions

Numerous studies have been conducted to validate the use of the SCT in assessing clinical reasoning skills in medical students (Lambert, et al, 2009; Humbert, Basinger, and Meich, 2011; Boulouffe, Charlin, and Vanpee, 2010). The most recent conducted by Humbert, et al. (2011) described and validated the use of the SCT for pre-clinical medical students. Faculty from two US medical schools developed the test items in the areas of anatomy, biochemistry, physiology, and histology. Scoring procedures were developed based on input from 30 physicians. Validation was based on internal reliability and the ability of the SCT to distinguish between different cohorts. Internal consistency for the 75 item test according to Cronbach's alpha was 0.73. The SCT differentiated second from fourth year students and both student groups from the panel in a one-way analysis of variance ($F(2508)=120.4$; $p<0.0001$). It was concluded that the SCT successfully differentiated pre-clinical medical students from fourth-year medical students and both groups from the physicians across different institutions and geographic areas.

Research Question

The purpose of the current study is to provide additional evidence of the validity and reliability of the SCT for evaluation of the clinical reasoning competency of nursing students by replicating the study conducted by Deschenes et al. (2011). A secondary aim

is to determine whether or not the results can be generalized to nursing students in other nursing programs. The information gained will assist nursing educators in determining the best methods for ensuring that nursing students can apply the knowledge they have gained to clinical situations and by doing so, achieve successful patient outcomes. The question this researcher hopes to answer is, "Can script concordance testing be utilized in nursing education to accurately assess clinical reasoning skills"?

Definition of Key Terms

Clinical reasoning is the process utilized by health care professionals to collect and process information and interpret that information in order to plan and implement interventions and to evaluate the outcomes of those interventions (Simmons, 2010).

Generalizability is the ability to apply the finding from on study to other groups or settings (Polit and Beck, 2008, p.202). Generalizability is essential in nursing research and evidence based practice. Without it the data and interventions from individual nursing studies could not be applied to other settings or groups of patients.

A hypothesis is what the researcher is trying to substantiate or refute in the study (Polit and Beck, 2008, p. 66). It is predicted relationships between variables or predicted outcomes.

Reliability is how accurately and consistently an instrument measures what it was designed to measure. Reliability is assessed in terms of stability, internal consistency, and equivalence. Stability is the ability of the instrument to obtain similar results on successive trials. Internal consistency is the instruments ability to measure a particular attribute or trait and is calculated by Cronbach's alpha which estimates the extent that each test item measures the key attribute. Equivalence is the measurement of how well

two or more raters agree about the scoring and is a key factor in interrater reliability (Polit and Beck, 2008).

Scripts are structures of specific knowledge with associative links to different clinical tasks (Charlin et al., 2000b; Schmidt et al., 1990; Feltovich and Barrow, 1984). Scripts and scripts theory will be further discussed in the literature review.

Validity is the degree to which an instrument measures what it is supposed to measure. Content validity is based on judgment and there is no totally objective means of ensuring the adequate content coverage of an instrument (Polit and Beck, 2008, p. 459). One common method to assess validity is using a panel to evaluate the test items for relevance and appropriateness, as well as, whether they adequately measure all aspects of the concept. Statistical analysis can also be used to determine the validity of the instrument.

A description of Watson's Theory of Human Caring and its associated definitions will be presented in the literature review.

CHAPTER TWO: REVIEW OF LITERATURE

This chapter is based on a combination of a reexamination of the works cited from the original study by Deschenes et al. (2011) and a review of additional works that were more recently published. Included in the chapter is a review of the literature regarding Watson's Theory of Human Caring which served as the conceptual framework for nursing care and the basis for the SCT questions in the original study by Deschenes et al. (2011). A review of clinical reasoning which is essential to nursing practice and the SCT as a tool for assessing clinical reasoning in complex situations with high degree of uncertainty will be presented. In addition, scripts theory which is the framework for the SCT will be described in detail.

Watson's Theory of Human Caring

It is widely accepted that caring is the core of nursing practice. However, in the changing healthcare environment of today with increased responsibilities, heavier workloads, increased patient acuity, and economic crises, nurses struggle to maintain their caring practice and prevent dehumanization of patient care. Utilizing theories such as Watson's caring theory as the framework for nursing practice helps to preserve nursing as a caring profession.

Overview of the Theory of Human Caring

According to Watson (1979), the development of the Theory of Human Caring "was my initial attempt to bring meaning and focus to nursing as an emerging discipline and distinct health profession that had its own unique values, knowledge, practices, and its own ethic and mission to society". There are three main conceptual elements comprising the caring theory; the Carative Factors/Caritas Process, the development and

utilization of the transpersonal caring relationship, and the caring occasion or caring event (Parker and Smith, 2010, p. 353). Watson (1979) viewed the carative factors as the framework for understanding nursing as the science of caring. As the theory evolved, the clinical caritas processes replaced the carative factors. The carative factors and the clinical caritas processes and the relationship between them are depicted in Table 1. The clinical caritas processes are a new paradigm for nursing's future that has a spiritual dimension and evokes love and caring (Cara, 2003; Parker & Smith, 2010).

TABLE 1.

THE RELATIONSHIP BETWEEN THE CARATIVE FACTORS AND CLINICAL CARITAS PROCESSES.

Carative Factors	Clinical Caritas Process
Humanistic-altruistic system of value.	Practice of loving kindness and equanimity within context of caring consciousness.
Faith-Hope.	Being authentically present, and enabling and sustaining the deep belief system and subjective life world of self and the one-being-cared-for.
Sensitivity to self and others.	Cultivation of one's own spiritual practices and transpersonal self, going beyond ego self, opening to others with sensitivity and compassion.
Helping -trusting, human care relationship.	Developing and sustaining a helping-trusting, authentic caring relationship.
Expressing positive and negative feelings.	Being present to, and supportive of, the expression of positive and negative feelings as a connection with deeper spirit of self and the one-being-cared-for.
Creative problem-solving caring process.	Creative use of self and all ways of knowing as part of the caring process; to engage in artistry of caring-healing practices.
Transpersonal teaching-learning.	Engaging in genuine teaching-learning experience that attends to unity of being and meaning, attempting to stay within others' frames of reference.
Supportive, protective, and/or corrective mental, physical, societal, and spiritual environment.	Creating healing environment at all levels (physical as well as non-physical), subtle environment of energy and consciousness, whereby wholeness, beauty, comfort, dignity, and peace are potentiated.
Human needs assistance.	Assisting with basic needs, with an intentional caring consciousness, administering "human care essentials," which potentiate alignment of mindbodyspirit, wholeness, and unity of being in all aspects of care; tending to both the embodied spirit and evolving spiritual emergence.
Existential-phenomenological-spiritual forces.	Opening and attending to spiritual-mysterious and existential dimensions of one's own life-death; soul care for self and the one-being-cared-for.

Taken from Parker & Smith, 2010, pp. 354-355.

Teaching/Learning of Caring

Deschenes et al. (2011) point out that teaching and learning involves multiple cognitive and metacognitive strategies and it is difficult to distinguish them as separate entities, therefore the teaching and learning of caring is presented jointly. The educational strategies and assessment tools covered in this section are not limited to strategies regarding human caring. The authors cite Beck (2001) who, through a meta-synthesis of qualitative studies on the education of caring, identified 14 studies related to learning and teaching caring (Deschenes et al., 2011). These studies included 30 faculty members and over 300 students and concluded that caring behaviors demonstrated in the educational setting are precursors of how the student will treat others. It is imperative that educators model caring in order for students to develop the caring skills of the professional nurse (Boykin, 1994; Cara, 2001; Duffy, 2006; Hoover, 2002).

Another phenomenological study by Simonson (1996) was conducted to determine how caring was assimilated by students. Qualitative data was collected through informal interviews, classroom observation, and review of documents. The results demonstrated that students take ownership of the concept of caring when they are in a learning environment where the educator fosters warmth and caring and encourages reflection. Simons and Cavanaugh (2000) confirmed the importance of the caring learning environment as the precursor to the development of the student's professional skills in relation to caring (Deschenes et al., 2011).

Evaluation of Caring

Watson (2002) identified 21 tools for measuring caring and the theoretical frameworks and psychometric properties of each. Several other tools, Care-Q (Larson,

1984), Caring Behavior Inventory (Wolf, 1986) and the Caring Behavior Assessment Tool (Cronin & Harrison, 1988), were the instruments most used in the studies for measuring caring but have little use in teaching. A few studies used instruments that do relate to caring amongst students. Nkongho (1990) conducted a study that utilized the Caring Ability Inventory (CAI) and noted a significant difference between the scores of students and experienced professional nurses. Sadler (2003) conducted a pilot study using the Caring Efficacy Scale, developed by Coates (1997) which is a self-assessment tool for measuring caring skills. The results were mixed and showed no significant differences between groups of students assessed.

Forbes (2004) developed and validated a scale for assessing caring behaviors. Based on the design of human caring as outlined by Watson, the instrument allowed assessment of caring behaviors by an external observer. Testing of the psychometric tool revealed that "15 out of the 28 indicators achieved a Kappa value of more than 0.41 and 33 of 38 indicators have obtained a simple agreement of 0.75 and above" (Deschenes et al., 2011). While relevant when used in the clinical setting, the tool does not directly measure clinical reasoning. The use of checklists and self-administered tools provide little information regarding the cognitive processes involved in the development and structuring of knowledge required by nurses in making clinical decisions.

According to Deschenes et al. (2011), the concept of human caring was used as the basis for the SCT because the cognitive perspective of learning in relation to assessment in nursing remains underdeveloped and potentially non-existent. The aim was to use a framework and a view of reasoning that is specific to nursing. In the context of the study conducted by Deschenes et al. (2011), "nursing clinical reasoning based on

human caring manifests itself in every reflective process in which nurses make decisions about clinical interventions and considers the unbreakable association between person and environment".

Clinical Reasoning

All health care providers are faced with making complex decisions in situations with a high degree of uncertainty. As such, it has become a focus in most training programs, including nursing, to facilitate development of clinical reasoning skills. While the study of clinical reasoning in nursing is limited, there have been numerous medical studies over the past decade involving clinical decision making that can be applied to nursing and present a better conceptualization of clinical reasoning. The difficulty in evaluating clinical reasoning has remained a persistent problem (Caire, Sol, Moreau, Isidori, and Charlin, 2004b; Charlin, Gagnon, Sibert, and Van der Vleutin, 2002b) and emphasizes the need for developing a more reliable and valid assessment tool.

Definition of Clinical Reasoning

Before a tool can be developed to assess clinical reasoning, a clear definition of clinical reasoning must be established. Deschenes et al. (2011) conducted an extensive review of the literature from 1984 to present. In one of the key studies cited, Fonteyn and Ritter (2000) summarized clinical reasoning as a process of reflection and decision making by the nurse. Frequently in the literature, clinical reasoning in nursing science is associated with clinical judgments that are critical to clinical decision making and problem solving.

In another study, Benner and Tanner (1987) established five levels of expertise in nursing. These five levels of mastery are based on the pattern of acquiring competence as

described by Dreyfus and Dreyfus (1985) and include the designations of novice, beginner, competent, effective, and expert (Deschenes et al., 2011). Through analysis of stories from expert nurses, Benner and Tanner surmised that "expert nurses are likely to act in such a way in a particular situation because they 'feel' it's the right thing to do and termed this form of intuition as the ability to understand and act effectively in ambiguous situations or sensitive practice" (Deschenes et al., 2011). It was surmised that only through experience can the nurse progress to the expert level.

Nursing studies (Banning, 2007; Tanner, 2006) suggest that nurses make decisions based on early activation of assumptions, based on intuition, and formulate clinical hypotheses based on minimal data collected from the person. This intuition is characterized by a feeling of apprehension that nurses experience when confronting situations that remind them of previous similar situations and represents subconscious script recognition of a pattern. Grant and Marsden (1987, 1988) determined that professionals make clinical decisions based on key elements of information contained in specific memory structures that relate to previous similar experiences. This idea was further developed by Feltovich and Barrow (1984), Schmidt el al. (1990) and Charlin et al. (2000b) in the scripts theory which states that in the face of clinical situations, the professional will use mental scripts in the process of clinical reasoning. These scripts are structures of specific knowledge with associative links to different clinical tasks. Scripts are the framework for the original study and will be described further in a later section.

Clinical reasoning is a reflective process and allows the nurse to perform the most appropriate intervention based on the clinical situation. It refers to any intellectual activity which summarizes the experienced practitioner's collection of information,

assimilation of knowledge and past experiences, and mobilizes more effective decision making (Charlin, Bordage, and Van der Vleutin, 2003; Kane, 1992; Newble, Norman, and Vander Vleutin, 2000). For the purpose of their study, Deschenes, et al. (2011) chose to utilize the definition of clinical reasoning as related by Simmons (2010, p. 1156) which describes clinical reasoning as "a complex cognitive process that uses formal and informal thinking strategies to gather and analyze patient information, evaluate the significance of this information, and determine the value of alternative actions". This definition will be the working definition in the current study as well.

Assessment of Clinical Reasoning

Charlin et al. (2003) reviewed and critiqued the main tools used in the health sciences to assess clinical reasoning. The tools studied were the Overall Evaluation Grid, multiple choice questionnaires (MCQ), oral examination, the Objective Structured Clinical Examination (OSCE), key elements review, and assessment in authentic situations. The reviews were performed in an attempt to determine their advantages and limitations regarding the psychometric assessment of clinical reasoning. Each of the tools studied have distinct pros and cons in terms of their ability to effectively assess clinical reasoning among students. An overview of each tool and a synopsis of the results as described by Deschenes et al. (2011) are presented in Table 2. After reviewing the pros and cons of the tools currently in use, it is evident that a more effective tool that objectively measures clinical reasoning which is less time consuming to complete and score; and assesses reasoning in complex clinical situations with a high degree of uncertainty is needed. One tool that offers promise is the Script Concordance Test.

TABLE 2.

OVERVIEW OF TOOLS USED TO ASSESS CLINICAL REASONING INCLUDING PROS AND CONS OF EACH.

Tool	Uses	Pros	Cons
Overall Evaluation Grid	List of criteria and behaviors to be observed by an outside observer.	Comprehensive assessment. Good face validity for evaluation clinical competency.	Minimal items that evaluate clinical reasoning.
Multiple Choice Questionnaires	Assesses many students and includes a broad spectrum of knowledge.	Assesses knowledge of factual data and is easy to score	Does not differentiate between novice and expert and does not assess problem-solving.
Oral Examination	Interview	Provides a more joint measurement of knowledge, skills and abilities.	Personal attributes of student can influence results (e.g. anxiety or verbal fluency)
Objective Structured Clinical Examination	Simulated situations with an outside observer. Evaluation grid with predefined expected answers.	Effectively evaluates the clinical approach through direct observation. Good inter-rater reliability.	Only evaluates observable behavior not clinical reasoning.
Key Elements Review	Written exam that includes clinical situations.	Able to assess decision making ability with many clinical cases.	Time required to complete. High number of cases required to ensure fidelity.
Assessment of Authentic Situations	Presents a task to the student involving the integration of knowledge acquired.	Allows the student to understand and solve a common real life problem.	Time required to complete. Time required to correct.

Taken from Deschenes et al. (2011)

Script Concordance Test (SCT)

The SCT has been used extensively in medical schools and other training programs such as dentistry, physical therapy, and speech therapy to measure clinical reasoning with a high degree of success. Various medical disciplines have used the SCT as a method of formative evaluation. As summarized by Deschenes et al. (2011), examples of medical disciplines that use the SCT include: general medicine (Gagnon, Charlin, Coletti, Van der Vleutin, and Suave, 2005; Labelle, Gagnon, Thiviorge, Laprise,

Saint-Marie, and Charlin, 2003), general surgery (Brailovsky, Charlin, Beausoleil, Cote, and Van der Vleutin, 2001), urology (Sibert, Charlin, Gagnon, Corcos, Khalaf and Grise, 2001; Sibert, Charlin, Gagnon, Corcos, Lechevallier and Grise, 2002; Sibert, Darmon, Dahamma, Weber and Charlin, 2005) gynecology and obstetrics (Charlin, Brailovsky, Leduc, and Blouin, 1998b; Charlin, Desaulniers, Gagnon, Blouin and Van der , 2002a), radiology (Brazeau-Lamontagne, Charlin, Gagnon, Samson and Van der Vleutin, 2004; Charlin, Brailovsky, Brazeau-Lamontagne, Samson, Leduc and Van der Vleutin, 1998a) and neurosurgery (Cairo, Sol, Charlin, Isidori and Moreau, 2004a; Cairo et al, 2004b).

The only study found in the literature which utilized the SCT to assess clinical reasoning in nursing students is the study by Deschenes et al. (2011). The results of the study found the SCT to be a valid and reliable tool for assessing clinical reasoning even in the hard to define area of caring. The study also recognized the need for further research to support the psychometric value, enhance the use in nursing education, and to broaden the application in all areas of clinical nursing practice. This tool validation study will replicate the Deschenes et al. (2011) study in an attempt to validate or refute their findings.

Theoretical Framework: Script Theory

Script Theory, which has its basis in cognitive psychology, was initially introduced by Feltovich and Barrow (1984) and was further developed by Schmidt et al. (1990) and Charlin et al. (2000b). According to the script theory, clinicians have networks of organized knowledge stored in long term memory which have accumulated over years of clinical experiences. Scripts are links between illnesses, clinical manifestations, and treatment options. Clinicians retrieve these scripts to make

judgments regarding the relevance of each new piece of information on the working diagnosis and treatment options in order to determine the appropriate interventions. The process is automatic, relatively unconscious, and continuous which facilitates rapid decision making when the clinician is facing a new situation (Charlin, et al., 2000b).

Description and Applications for Script Concordance Tests

The SCT is a written test that includes clinical scenarios that are designed to test clinical reasoning under conditions of uncertainty utilizing real life professional situations (Charlin et al., 2000b; Charlin and Van der Vleutin, 2004). The situations described can even be a problem for the experienced practitioner due to the lack of information or data that is difficult to interpret, ambiguous, or incomplete (Charlin et al., 2002b; Charlin and Van der Vleutin, 2004). The SCT is designed to assess the quality of the organization of knowledge among students and how the organization impacts the student's ability to act effectively in clinical practice situations.

The test scenarios relate a clinical situation then a hypothesis or intervention is stated. Additional data is given and the student has to determine how or if this additional data affects the hypothesis or planned intervention. This approach is based on clinical reasoning as discussed previously. The student's answers are compared to the answers of the panel and the student's score is based upon the number of panel members who gave the same answer. The SCT used in the original study and which will be utilized in the current study was developed by Deschenes et al, (2011) and will be described in more detail in the methodology chapter.

The SCT was developed based on script theory and is used to evaluate the script development of students as compared to panel members and is the reason for the name

script concordance test (Charlin et al., 2002b; Charlin et al., 2000b; Charlin and Van der Vleutin, 2004). The SCT is easy to administer, flexible, and easy to build and manage. The feasibility for use is high because the SCT requires little equipment or human resources (Charlin et al., 2000b; Charlin and St. John, 2002; Marie, Siebert, Roussel, Hellott, Lechevallier and Weber, 2005). The benefit of the SCT is that it allows the evaluation of clinical reasoning at higher taxonomic levels than most traditional assessments (Cairo et al., 2004a; Charlin et al., 2000b; Charlin and Van der Vleutin, 2004). Other advantages include an increase in dynamism and support in relation to student learning (Charlin et al., 2000a), and better knowledge retention (Charlin and St. Jean, 2002). In the study conducted by Labelle et al (2003), various participants expressed a significant need for increased learning in the group that used the SCT. According to the authors of the study, it is likely that the use of the SCT induced a reflexive response where the participants identified learning needs in order to maximize professional practice.

The major disadvantage of the SCT relates to the recruitment of panel members. According to Fournier, Demeester and Charlin (2008), the difficulty in recruiting panel members makes it hard to obtain the needed 10 to 20 panel members. The reference panel has to be large enough to obtain acceptable reliability of panel scores, which in turn produces reliable student's scores. In addition, it is necessary to select panel members appropriate to the assessment goal.

Psychometric Qualities of the SCT

As outlined in Deschenes et al. (2011), numerous studies have been conducted to assess the psychomotor qualities of the SCT. The SCT had a high measure of reliability

and a Cronbach's alpha around .80, with the use of 50-60 items on the test (Brazeau-Lamontagne et al., 2004; Carriere, 2005; Charlin et al, 1998a; Charlin et al, 1998b; Fournier, Thiercelin, Pulcini, Alunni-Perret, Gilbert, Minguet and Bertrand, 2006; Gagnon et al, 2005; Lambert, 2005; Marie et al, 2005; Sibert et al, 2001; Sibert et al, 2002).

The construct validity was demonstrated by increased linear scores between groups with different levels of expertise. According to Charlin and Van der Vleutin (2004), the SCT demonstrated its ability to distinguish between different groups of participants according to their level of expertise, the scripts of those who were clinically experienced candidates was further developed than those of novice candidates. This was validated by statistically significant values between the groups being evaluated (Brazeau-Lamontagne et al, 2004; Charlin et al. 2003; Charlin et al. 1998a; Charlin et al. 1998b; Charlin et al. 2002a; Demeester, 2004, Fournier et al., 2006, Gagnon et al. 2005; Lambert, 2005, Marie et al. 2005, Sibert et al., 2001, Sibert et al., 2002). The stages of progression of clinical reasoning from student to expert are presented in Figure 2.

Figure 2. Progression of Clinical Reasoning
(taken from http://www.script.md/portal/en/script_en.html)

The system for establishing scores used for the SCT ensures validity. A study by Charlin and Van der Vleutin (2004) compared the scores of students and panel members utilizing the aggregate and consensus methods for establishing scores. The aggregate method yielded higher scores for the panel and subsequently better discrimination of scores between the students and panel. The aggregate method was also superior to the consensus method in relation to ill-defined problem assessment and under situations of uncertainty. The SCT uses the aggregate scores method (Norcini, Shea, and Day, 1990) for determining the scores of the students and is described in detail in the methodology chapter.

Research on clinical reasoning shows that experienced practitioners differ in their process of decision making in the resolution of ill-defined problems, therefore the SCT takes into consideration the normal variability of the responses made by the panel members in relation to the questions used to award a score to the student (Charlin et al., 2002b). This method of setting scores is based on the principle that the answers given by an experienced practitioner has an intrinsic value and is considered relevant, even when there is a discrepancy with other experienced practitioner on the panel (Charlin et al., 2000b; Charlin and Van der Vleutin, 2004). The recorded response to the SCT identifies the reasoning process rather than outcome because even if they arrive at the same conclusion, experienced practitioners do not generally follow the same path in the course of clinical reasoning (Elstein, Schulman and Sprafka, 1978; Grant and Marsden, 1988). There is no one correct answer for the questions in the SCT. Several conclusions are permissible when faced with an ambiguous situation (Caire et al., 2004a). The SCT is

standardized and the scoring is performed objectively without possible interpretations (Charlin and St Jean, 2002; Charlin et al., 2002b).

When the SCT was further evaluated, there was no "intermediate effect", a phenomenon where subjects at an intermediate level score higher than both the experienced practitioners and the novice students (Van der Vleutin, 1996). This is related to the amount of time given to study the scenarios and is eliminated when the study time is restricted. In 2006 Fournier et al. compared the ability of 1) multiple choice questions (MCQs) with rich content and 2) the SCT in their ability to identify the level of expertise of clinicians in emergency medicine. Three groups at different levels of expertise were evaluated; 20 first year residents, 16 students at the end of the second year, and nine physicians practicing emergency medicine. Both the MCQ and the SCT achieved a good index on the reliability coefficient (Cronbach's alpha between 0.85 and 0.95 for the SCT and between 0.92 and 0.96 for the MCQ). Only the SCT discriminated between the levels of experience of the clinicians ($p<0.0002$). The MCQ was unable to produce a significant difference between the three groups evaluated (Deschenes et al., 2011).

In another study conducted in 2001 by Brailovsky et al. the SCT based on medical surgical clinical knowledge was administered to 24 medical students. These same students were reevaluated 2 years later, while in their Family Medicine training, utilizing two other means of evaluating clinical competency, the short-answer management problems (SAMPs) and the simulated office orals (SOOs). The Pearson coefficient determined a significant correlation between performance on the SCT and the score obtained by students on other tests for evaluating clinical competence. The authors concluded that if a medical student has good organization of his thoughts, he will

demonstrate the same level of clinical reasoning in later formative stages regardless of the tool used (Brailovsky et al., 2001).

The predictive ability of the SCT is stable in Medicine across different cultures as demonstrated by Sibert et al. (2002) in a study in the field of urology. Two groups, students in France and students at a Canadian university, were evaluated utilizing the same test. The test was translated into English for use at the Canadian university. Statistical analysis performed confirmed the ability of the test to discriminate between applicants based on their level of expertise but with better discrimination within each culture as opposed to between different cultures (Deschenes et al., 2011).

The original version of the SCT which was utilized in this study was written in French and had to be translated into English. Based on the study by Sibert et al. (2002), the results should be consistent with those of the original study. The process used to translate and rephrase the original SCT from French into English will be further described in the methodology chapter.

Conclusion

Since the Deschenes et al. (2011) study, this researcher was able to find only three additional studies regarding the use of the SCT to measure clinical reasoning. These studies were conducted in the medical arena and confirmed the previous study's conclusions that the SCT is a valid and reliable tool for measuring clinical reasoning in complex situations with a high degree of uncertainty (Amini et al., 2011; Monnier, Bedard, Gagnon, and Charlin, 2011; Ramaekers et al., 2010). Since, to date, there has only been one study related to use of the SCT in nursing, further studies are indicated to

verify the validity of utilizing the SCT in undergraduate nursing program to assess clinical reasoning in first year nursing students.

CHAPTER THREE: METHODOLOGY

This chapter presents the methodology for the current study which is a tool validation study and will be conducted through replication of the original study by Deschenes et al. (2011). Development of the SCT, sample selection, protection of human subjects, data collection, data analysis, and limitations will be described. The aim of the study is twofold; first, to provide additional data to support or refute the validity and reliability of the SCT in assessing clinical reasoning in nursing students when facing complex situations with a high degree of uncertainty. Second, is to determine whether or not the results can be generalized to nursing students in other programs. The research question to be answered is: Can SCT be utilized in nursing education to accurately assess clinical reasoning skills?

Sample Selection and Criteria

Participants were selected by convenience sampling and consisted of 48 first year BSN students from Western Carolina University (WCU), Cullowhee, NC and 13 panel members selected from the Nursing faculty at WCU and Appalachian State University (ASU), Boone, NC, clinical staff at Fresenius Dialysis Center, Boone, NC and clinical nurse managers at Appalachian Regional Healthcare System, Boone, NC. The two inclusion criteria for the student participants were 1) will be a first year student in the Prelicensure Bachelor of Science in Nursing program and 2) able to read, write and understand the English language. The two exclusion criteria were 1) had already pursued academic studies in other disciplines related to nursing and 2) have completed a program in nursing. The panel consists of nursing professionals with extensive clinical experience who are knowledgeable in the theory of human caring.

Protection of Human Subjects

This study received approval from the Institutional Review Board of Western Carolina University (WCU). The WCU IRB approval letter is included in Appendix A. Students were notified of the purpose of the study and participant expectations in advance to allow time to consider participation. After agreeing to participate, each student signed the participant informed consent which can be found in Appendix B, completed the demographic questionnaire which can be found in Appendix C, and was given instructions for completing the SCT which can be found in Appendix D. During this time students were given the opportunity to ask questions or clarify information on the SCT, which is included in Appendix E. Participation was voluntary and students were told that they could withdraw from the study at any time without explanation or threat of reprisal. All individual data was kept strictly confidential: nominal data was consolidated and the data was stored in a locked area. Only the researchers had access to these data. The retention period shall be seven years after which the data will be destroyed by the principle investigator.

Script Concordance Test

This section addresses the development of the SCT by the original authors and the subsequent preparation of the SCT by this author prior to administration. A brief description of the process for selecting clinical situations under the concept of human caring, writing scenarios and test items, validation and construction of the answer grid will be reviewed. In addition, the steps required in translating the SCT will be discussed.

Development of the Original SCT

Clinical scenarios were identified by Deschenes et al. (2011) that were appropriate to the objective of assessing clinical reasoning in caring situations based on the 14 nursing activities defined by the Quebec Nurse Practice laws which are listed in the specification table in Appendix F. The scenarios were developed to ensure that the content of the SCT was representative of the10 carative factors of Watson's Human Caring. The 10 carative factors represent the human aspect of care, the therapeutic relationship, and clinical activities of the nurse (Deschenes et al., 2011).

The scenarios and items were constructed by the original investigator based on the premise that the reliability of a test is dependent upon the number of test items contained in it (Deschenes et al., 2011). Previous medical studies demonstrated that a minimum of 60 items were needed to obtain a Cronbach's alpha of greater than 0.80 (Charlin et al., 2002b). Deschenes et al (2011) took this into consideration when determining the number of items to include on the SCT.

Each scenario briefly describes a common clinical situation which is realistic and credible. Each item requires reflection and contains enough information to allow for assumptions on the part of the student regarding the impact of new information on the hypothesis or proposed intervention (Charlin et al., 2000a; Charlin et al., 2002b; Charlin and van der Vleutin, 2004). As shown in Table 3, each scenario is followed by a series of items containing three parts: a hypothesis or nursing intervention, new information, and a Likert scale with 5 entries. The student must determine the effect of the new information on the proposed hypothesis or nursing intervention. The items in each

scenario are interdependent, requiring the student to reflect on every item to respond (Charlin et al., 2000a; Charlin et al., 2002b).

TABLE 3

CLINICAL SCENARIO EXAMPLE

78 year old, Ms. Davis presents to the hospital with complaints of difficulty breathing which has gotten worse over the past few days. She has suffered with COPD (pulmonary bronchitis) (obstructive chronic) for several years. She asks you if she can go outside to smoke without the oxygen.

If you thought :	And then you found:	The relevance of this intervention becomes:
That Mrs. Davis is not aware of the seriousness of her condition and that she denies her state of health.	Oxygen saturation of 91% with oxygen in place.	-2 -1 0 1 2
Mrs. Davis has the right to give up as she is aware of her health status over the past several years.	A history of compliance with treatment as ordered by the pulmonologist written in the file.	-2 -1 0 1 2

Legend:
-2: rejected
-1: less relevant or possibly less appropriate
0: the information has no effect on the assumption
1: needs to be explored in the near future
2: needs to be explored in the immediate future

The content validity was established by two expert judge collaborators who were selected based on a high degree of knowledge regarding the theory of human caring and having received a Masters or Doctorate degree. The judges verified that the scenarios were accurate, correctly formulated, and easily understood. They also validated that the options were relevant, decision making was required, and there was a connection to the theory of human caring (Deschenes et al., 2011). In order to establish a connection to human caring, each of the 92 test items was mapped to the 14 nursing activities included in the Quebec Nurse Practice Act under one of the dimensions of human caring. The mapping is displayed in the specification table in Appendix F. After validation by the expert judge collaborators, fifteen additional experts from various health care backgrounds including direct patient care, management, research and education were

selected to serve as the panel members. Each member of the panel completed the SCT individually (Deschenes et al., 2011).

Translation of the SCT

The final version of the SCT from the Deschenes et al. (2011) study was utilized for the current study. The SCT consists of 29 clinical scenarios and 92 items of assessment, which are subdivided in three dimensions of human caring: human aspect of care, clinical activities, and the therapeutic relationship. Since the original version of the SCT was in French, for the current study the SCT had to be translated into English which required several steps.

The first step was to translate the test items into English using translation software. This was a rough translation which was not structurally or grammatically correct. The second step was to enlist a Registered Nurse who is fluent in both French and English to read the items in French then to formulate each item into grammatically correct English. The phrasing was structured in terms that English speaking nurses would readily understand. Finally, the translated version was sent to one of the original authors for review. The purpose of the review was to ensure that in the process of translating the test items that the intent of the questions and the meaning under the concept of human caring was not altered. After the review, the content was verified and the English version was approved for use in this study.

Construction of the Scoring Grid

As in the original study, this author developed the scoring grid in collaboration with 13 panel members who have extensive clinical experience and are knowledgeable in the theory of human caring. Participation on the panel was voluntary and all prospective

members received a letter describing the research project, the purpose of the SCT, and instructions for completing the SCT, details of which can be found in Appendix G. The panel completed the SCT individually in paper and pencil format and returned them to the investigator. The responses of the panel were used to develop the participant scoring grid based on the modal response method. The complete scoring grid for the 92 items included on the SCT is listed in Appendix H.

Calculation of Scores

The aggregate method of scoring (Norcini et al., 1990; Norman, 1985) was used which accounts for the normal variability of responses among the panel when determining the scores given to each participant (Charlin et al., 2000b; Charlin and van der Vleutin, 2004). The score attributed to each participant response is calculated based on the number of Panel members who selected that response. Participants who selected the modal response, the response selected by a majority of the panel, receive 1 point; the other choices receive partial credit (Charlin et al., 2000b; Charlin and Van der Vleutin, 2004). An example of the method for calculating the scores, for a group of 10 panel members, is shown in Table 4. The total score is then calculated by adding the score for each item and dividing by the total number of items then multiplying by 100 to get a percentage score.

TABLE 4
Method for Calculating Scores for the SCT

	-2	-1	0	1	2	
Number of panel who selected the response	8	2	0	0	0	Identify the answer selected by the most panel (-2)
Mechanism for creation of scores	8/8	2/8	0	0	0	Dividing by the number of members who selected the most (8)
Credit per item	1	0.25	0	0	0	Points received by the student

Data Collection

After the purpose of the SCT was explained to the study participants, informed consent was obtained and the demographic questionnaires were completed, each participant then received instructions on how to complete the SCT. The test was administered in a classroom setting within the nursing department at Western Carolina University, Cullowhee Campus. The test was administered in two sessions to ensure that the students had equivalent nursing courses and clinical experiences. The first, was conducted on February 14, 2012 for students who entered the program in Fall 2011and the second, was conducted on April 26, 2012 for students who entered the program in Spring 2012. All students had completed one semester in the nursing program and had the same nursing educator for classroom instruction. Each participant completed the test individually and the time to complete the SCT was approximately one hour.

Prospective panel members were sent a letter describing the nature and purpose of the research study, which can be found in Appendix H, instructions for the SCT, and a written copy of the SCT. Participation was voluntary and it was requested that the SCT o be returned by February 6, 2011 to the thesis chair. On that date, only three WCU nursing faculty members had returned the exam. As a result this researcher sought additional panel participants from ASU nursing faculty and nursing professionals from local healthcare facilities to ensure the recommended number of panel members. According to Gagnon, et al. (2005), "any number over 10 is associated with acceptable reliability and good correlation between the samples". The preferred number of panel members is 10 to 15 and for high stakes exams, the recommendation is 20 panel

members. Beyond 20 only marginal benefits are achieved in terms of psychometric properties (Gagnon, et al., 2005.

Optimization of Panel and Test Items

The first step toward optimization was to determine the final panel members by analyzing the distribution and variance of the scores of the 13 panel members who completed the SCT, which is depicted in Figure 3. The outlier method was used where, based on the scores for the total test, members whose scores exceed 2 standard deviations from the mean are excluded (Gagnon et al., 2011). The mean score was 78.85 and since all panel member scores fell within 2 standard deviations from the mean (66.37 to 91.33), no panel members were excluded.

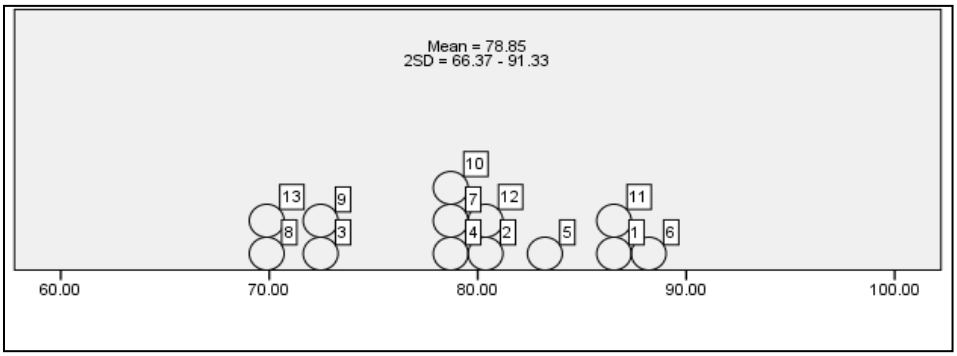

Figure 3. Distribution and Variance of Panel Member Scores

The second step toward optimization was to analyze the test items to determine if any items were problematic. As in the original study, items with a weak item-total correlation ($r<0.05$), zero, or negative statistical analyses were removed (Deschenes et al., 2011). The analysis conducted for the current study for each of the three dimensions and the total test resulted in the removal of 16 items. Items removed from each dimension were; six from the Human Care Aspect, seven from Therapeutic Relationship, and two

from the Clinical Activities. After optimization, the final reference panel consisted of 13 panel members and the final test consisted of 29 clinical scenarios and 76 items.

CHAPTER FOUR: RESULTS

The results from this study were evaluated for reliability and validity of the SCT in measuring the clinical reasoning of the nursing students as compared to the panel. The results were then compared to the Deschenes, et al. (2011) study to determine the reliability of the tool across diverse groups of Bachelor of Science (BSN) students. The statistical analyses were performed using SPSS software (Statistical Package for the Social Sciences), version 20.

Sociodemographic Data

Forty-eight first year BSN students at Western Carolina University participated in the study. Three participants were removed after completing the SCT; one due to no demographic data and two due to no responses to some of the test items. One participant withdrew from the study at the time of taking the SCT due to fatigue affecting their ability to think through the items. Of the remaining 44 participants, 2% were under 20 years of age, 63% were 20-25 years, 14% 26-30 years, 14% 31-35 years, and 7% over 35 years. Nineteen of the 44 remaining participants had completed studies at the college level; 9 in general studies, 3 in education, and 1 each in religion, mathematics, business, engineering, psychology, biology, and athletic science. None of the 44 had taken nursing courses but 10 were Certified Nursing Assistants and 3 were Emergency Medical Technicians. All participants had introductory level clinical experience as part of their first year nursing courses; 34% had worked in both the hospital and skilled nursing facility, 15% hospital only, and 51% skilled nursing facility only.

Thirteen panel members completed the SCT to develop the scoring grid. The locations of practice included Western Carolina University, Appalachian State

University, Appalachian Regional Healthcare System, and Fresenius Dialysis Center. The distribution of the current areas of practice for the 13 panel members that contributed to construction of the scoring grid is depicted in Figure 4. Sixty-nine percent are engaged in teaching at the university level in the prelicensure, BSN, and MSN programs, 23% direct patient care as a nurse practitioner or dialysis nurse, and 8% in nursing management.

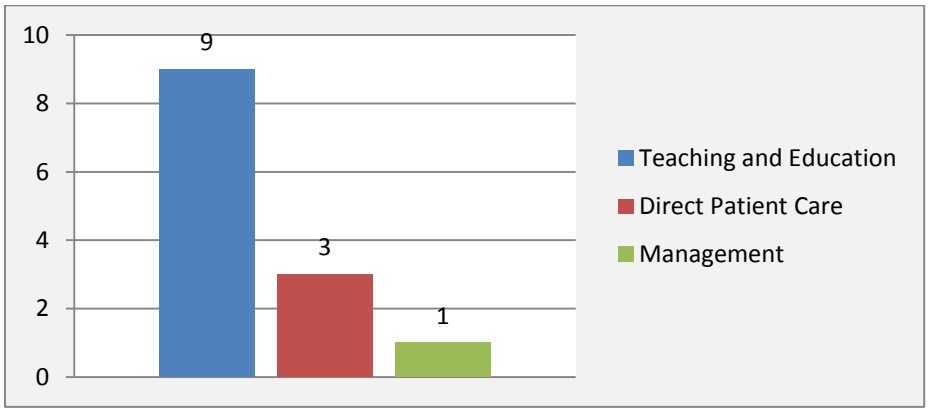

Figure 4. Distribution of Current Practice of Panel Members

Data Analysis

After all participants and panel members completed the SCT, the data was analyzed and interpreted using statistical methods consistent with the original study. Internal consistency for each test item was evaluated by Cronbach's alpha. Typically, a minimum value of 0.80 is required for a scale to be considered reliable. Cronbach's alpha is based on average test items and it is presumed that the value will be positive (greater than zero) since they are designed to measure the same concept. A value that approximates 1 indicates a perfect correlation between the test items (Streiner and Norman, 1995). As presented in Table 5, the Cronbach's alpha for the total test was .855

which meets the reliability factor of greater than .80 and indicates good internal consistency of the items in the SCT. The internal consistency of the items for each dimension is below .80. While this does not affect the reliability of the total test, the results for the subscales should be interpreted with caution.

TABLE 5
Cronbach's Alpha Coefficient

Dimensions of Human Caring	Number of Items	Cronbach's Alpha
Total Test	76	.855
Human Aspect	29	.701
Clinical Activities	27	.650
Therapeutic Relationship	20	.615

The Pearson's coefficient which describes the strength of the relationship between two variables was also calculated for each dimension and the total test. A positive value indicates variation in the same direction while a negative value indicates variation in an opposite direction. A zero denotes an absence of a relationship between two items. The result is considered statistically significant at a threshold of $r > 0.5$ (Streiner and Norman, 1995). Table 6 shows the relationship between the total test and each dimension; and between dimensions. The relationship between the total test and each dimension, as well as between dimensions, is greater than the threshold of 0.5 which indicates the strength of the associations is high.

TABLE 6
Correlation Between Assessment Dimensions of Human Caring and the Test as a Whole

Dimensions of Human Caring	Total	Human Aspect	Clinical Activities
Human Aspect of Care	.898	_	_
Clinical Activities	.898	.686	_
Therapeutic Relationship	.853	.663	.671

The normality of distribution of total test scores was tested with Kolmogorov-Smirnov. It is necessary to ensure that the samples are normally distributed before proceeding with analysis as parametric statistical analysis assumes normal distribution. If this assumption is ignored, interpretation of results may not be valid or reliable (Razali and Wah, 2011). As shown in Table 7, the *p*-value for both the panel and students for total scores is 0.200 which is not significant and indicates that both samples are normally distributed.

TABLE 7
Kolmogorov-Smirnov Test for Normality

Total Score	Statistic	df	Sig
Panel	0.118	13	0.200*
Students	0.056	44	0.200*

* Lower bound of the true significance. $p < 0.2$ is considered significant
a Lilliefors Significance Correction

Levene's statistic was used to test the hypothesis of homogeneity of variance for the panel and student scores. If the significance is > .05, there is no significant difference in variance between the panel and students. The Levene's test for the overall test revealed that the two groups are approximately equal (Sig. = .843). The descriptive analyses of the distribution of SCT scores for the panel and students for the overall test and for each of the three dimensions are presented in Table 8.

The mean scores of both groups were compared with an independent samples *t*-test. The mean scores of the students for the overall test (63.71; SD = 8.5) were significantly lower than the panel mean scores (78.52; SD = 8.09). The difference in distribution of the scores for the panel members and students is clearly demonstrated in Figure 5.

TABLE 8
Descriptive Analyses of the Distribution of SCT Scores for Panel and Students

Results	n	Mean	SD	Levene's Test F	Levene's Test Sig.	t-Test t	t-Test Sig.	Cohen's *d*	Effect Size *r*
Total test:									
Panel	13	78.52	8.09	.040	.843	5.581	.000	1.51	0.60
Students	44	63.71	8.50						
Human Aspect:									
Panel	13	77.79	10.88	.424	.518	4.641	.000	1.25	0.53
Students	44	63.48	9.43						
Clinical Activities:									
Panel	13	81.21	7.68	1.456	.233	4.697	.000	1.27	0.54
Students	44	66.02	10.86						
Therapeutic Relationship:									
Panel	13	75.96	9.63	.214	.646	4.676	.000	1.26	0.53
Students	44	57.78	10.33						

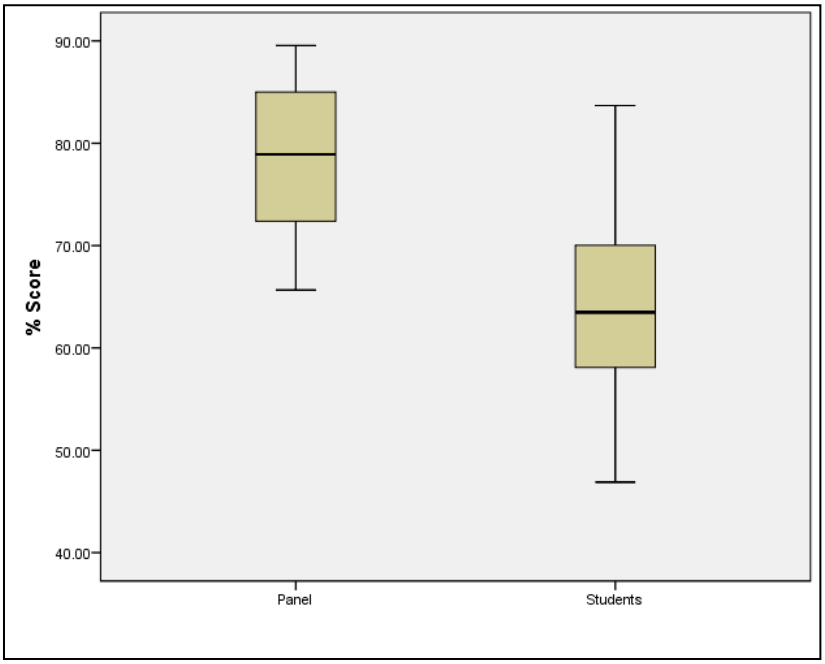

Figure 5. Distribution of Panel Member's and Student's Scores. Each box represents the variance in scores and the line within each box is the mean score.

The effect size of comparison, which represents the size of the difference between the panel and student scores, was calculated using Cohen's *d*. The effect size for the overall test ($d = 1.51$) revealed a high significance between the groups. This demonstrates that the SCT is able to differentiate between the panel and the students.

CHAPTER FIVE: DISCUSSION

Comparison of Results to Original Study

For the most part, the results from this study were consistent with results from the Deschenes et al. (2011) study. Internal consistency for the SCT, as measured by Cronbach's Alpha, was the same (.86) and the Pearson's coefficient for the strength between items for the total test was .90 and .91 respectively. The effect size as measured by Cohen's *d* was also equal (1.5). The t-test comparison of the means revealed a significant difference in the means between the panel and students scores.

The differences related to the number of student participants, normality of distribution, and homogeneity of variance. The Deschenes et al. (2011) study had 30 student participants and the current study had 44. In the previous study the normality of distribution for the panel and students, as measured by the Kolmogorov-Smirnov test, were .200 and .020 respectively. The Mann-Whitney nonparametric test was used to verify that, even in the presence of non-normality in distribution, the same statistically significant differences between the two groups were observed (Deschene's et al. 2011). In the Kolmogorov-Smirnov test for this study, the results for both the panel and students were .200 indicating that both groups were normally distributed.

The results of the Levene's test for homogeneity of variance in the Deschenes et al. (2011) study showed a significant difference in group variance; however, in this study the variances were not significant. The variance in panel member scores was greater in the current study than in the original study which accounted for the difference. The variance in student scores was also somewhat higher in the current study as well.

The differences related to the distribution and variance of the scores, while noteworthy, did not alter the overall outcome of this study. The descriptive data related to reliability, validity, and the strength of the test-item relationship of the SCT was consistent between the studies. This study provided additional evidence for the use of the SCT in evaluating clinical reasoning in nursing students.

Summary of Major Findings

The results of this study substantiated the reliability and validity of the SCT in measuring clinical reasoning in nursing students and the ability of the SCT to differentiate between the panel and students. A linear relationship between clinical experience and scores on the SCT was demonstrated which confirms that experience is a key factor in the development of clinical reasoning in nursing. Based on the results of the Deschenes et al. (2011) study and this study, it also appears that the SCT generalizes appropriately across differing academic environments and demographic areas. These findings are similar to those found in previous medical studies, general medicine (Gagnon et al., 2005; Labelle et al., 2003), general surgery (Brailovsky et al., 2001), urology (Sibert et al., 2001; Sibert et al., 2002; Sibert et al., 2005) gynecology and obstetrics (Charlin et al., 1998b; Charlin et al., 2002a), radiology (Brazeau-Lamontagne et al., 2004; Charlin et al., 1998a) and neurosurgery (Cairo et al., 2004a; Cairo et al, 2004b).

Limitations

The limitations of the current study relate to panel composition, translation of the SCT, and an error in one scenario which may have impacted the responses to the related items. In regards to panel composition, Fournier, Demeester, and Charlin (2009) stated,

"The basic idea behind SCT is to compare students' performance with a group of persons who are legitimate representatives of the profession to which they wish to belong". With this in mind, the panel should be made up of nurses with a high degree of clinical experience in the nursing area being evaluated (Fournier, Demeester, and Charlin, 2009). In the current study, 69% of the panel members were nursing faculty and only 23% were involved in direct patient care. While it is generally assumed that the degree of clinical experience among nursing faculty is high, the question is, have the faculty remained up to date in their knowledge and skills in current clinical practice? Is it possible that including more panel members actively involved in direct patient care change the outcome of the students' scores? Criteria related to current area of practice and years of clinical experience may increase the reliability of panel responses. Further research is indicated in this area to determine the optimal panel composition for evaluating clinical reasoning in nursing students.

Another area of concern is that the method of translation used was direct translation. In this method one translator translates the items in the traditional method to the best of their ability. There is no defined translation process or support material provided to the translator. The only instructions given to the translator of the SCT utilized in this study was to translate the items from French into English in a format that an English speaking nurse would relate to and understand. Disadvantages of this approach as described by Behling and Law (2000) include relying on one person's perception and skills, potential lack of equivalence in regards to semantic, cultural and normative differences between populations, and data quality risks. In order to reduce the impact of these disadvantages, this author submitted the translated document to the

original authors for review to ensure that the content and meaning of each item was consistent with the original items.

Lastly, there was an error in one scenario that may have had an impact on how the respondents answered the related items. In scenario #5, the patient's blood sugar was given as 22 mmol/L which is not the scale commonly used in the United States. It should have been given in the equivalent value of 396 mg/dl. This was discovered and changed after 23 students and 8 panel members had completed the SCT. The effect this had on the responses to the 4 items in the scenario is unknown. One of the items, number 17, was removed after optimization of the test due to a low correlation on the item-test analysis and can be found in Appendix E.

Implications for Nursing Education

The current study provided additional evidence for the use of the SCT in nursing education. The SCT provides a more reliable and objective means of assessing clinical reasoning and it is easier to administer and score than the traditional methods; clinical observation, multiple choice questionnaires, and oral examinations. Within nursing education a change may be needed in the strategies for assessing clinical reasoning in nursing students. A shift from measurements that focus on general problem-solving toward a focus on use of knowledge, memory organization, and clinical presentation will provide a more accurate measure of clinical reasoning. The assessment should also measure how these change over time with experience. The script concordance test is valid, reliable, standardized tool designed to meet these objectives (Charlin and Van der Vleutin, 2004).

Implications for Future Research

As this is only the second study involving the use of the SCT in evaluating clinical reasoning in nursing students, further research is needed to substantiate the use of the SCT in nursing education. There is also a need to develop more scenarios and questions that relate to current nursing practice. The items on the SCT for both studies were based on the Theory of Human Caring as defined by Watson (1979) which focuses on the nurse-patient relationship and nursing interventions. This makes it difficult to compare the results from the nursing studies to those in the medical arena where the emphasis was on clinical diagnosis and treatment. The development of scenarios and items that represent each clinical area of nursing with an emphasis on knowledge, skills, and assessment is warranted in order to fully evaluate the reliability and validity of the SCT in assessing clinical reasoning skills in nursing students.

As stated earlier, additional research is also needed to determine the criteria for optimal panel makeup. Should the emphasis be on direct clinical care experience, academic standing, or a combination of both? The studies up to now have been conducted in the medical field with very limited information available regarding panel size and composition for nursing, therefore, further research in this area is warranted.

Conclusion

The purpose of this study was to validate a tool for evaluating clinical reasoning in nursing students in terms of human caring. A secondary aim was to determine the generalizability of the tool to nursing students from different academic settings and regions. As evidenced by the results of both the original study and the current study, both of these goals were met.

While script concordance testing is new in nursing, it has been clearly documented as a valuable tool for assessing clinical reasoning in medical schools. Development of more scenarios and items based on clinical nursing practice areas and the establishment of criteria for the optimal panel makeup will enhance the use of the SCT in nursing education. The SCT will provide nursing educators with a reliable, standardized, and easier to administer and grade method of assessing clinical reasoning skills in nursing students under situations that are ambiguous or have a high degree of uncertainty.

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Appendix A

WCU IRB Letter

Western Carolina University
Institutional Review Board
c/o Office of Research Administration
109 Camp Building
Cullowhee NC 28723
irb@wcu.edu | 88-227-7212

IRB number: #2012-0092 Date of review: November 11, 2011
Investigators: Tyla Dawson; Linda Comer
Project Title: Can Script Concordance Testing be used to Accurately Assess Clinical Reasoning Skills in Nursing Students?

Your IRB protocol has been approved, effective with today's date, under the following category of expedited review, as authorized by 45 CFR 46.110 and 21 CFR 56.110:

- ☐ Clinical studies of drugs and medical devices (a) when an investigational new drug application (21 CFR Part 312) is not required or (b) medical devices for which (i) an investigational device exemption application (21 CFR Part 812) is not required; or (ii) the medical device is cleared/approved for marketing and the medical device is being used in accordance with its cleared/approved labeling
- ☐ Collection of blood samples by finger stick, heel stick, ear stick, or venipuncture
- ☐ Prospective collection of biological specimens for research purposes by noninvasive means
- ☐ Collection of data through noninvasive procedures (not involving general anesthesia or sedation) routinely employed in clinical practice, excluding procedures involving x-rays or microwaves
- ☐ Research involving materials (data, documents, records, or specimens) that have been collected, or will be collected solely for nonresearch purposes (such as medical treatment or diagnosis)
- ☐ Collection of data from voice, video, digital, or image recordings made for research purposes
- **XX** Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies
- ☐ Continuing review of research previously approved by the convened IRB

Your protocol is approved for one year and may be renewed annually. If you wish to make changes to your protocol, including recruitment procedures, sampling, consent, interventions, data collection methods, and investigators, please use the amendment request located on the IRB website (http://www.wcu.edu/6801.asp) to submit your request in advance.

This approval does not cover research conducted prior to the approval date. Please remember that you are responsible for reporting adverse events or unanticipated risks to the IRB immediately.

IRB representative: Marianne Hollis Date: 11/14/11

Appendix B

Participant Informed Consent

Principal Investigator (PI):
Tyia Dawson, BSN, RN
MSN Student
Western Carolina University
School of Nursing
1459 Sand Hill Road, G-33
Candler, NC 28715
Phone: 828-773-1395

Project Title:
Can Script Concordance Testing Be Utilized to Accurately Assess Clinical Reasoning Skills in Nursing Students?

Purpose of Study:

You are invited to participate with no obligation in a research study intended to evaluate the psychometric properties of the Script Concordance Test (SCT) and its ability to assess clinical reasoning with human caring as the framework. Currently there is no tool available that accurately and reliably evaluates the clinical reasoning of nursing students under conditions of uncertainty. The script concordance approach is designed to allow a standardized assessment in areas where differences of opinion exist. It is designed to measure the student's ability to act effectively in a context of uncertainty in the tasks of clinical reasoning.

Description of Participation:

To participate in this study, you must be:

-A first year pre-licensure baccalaureate nursing student
-Able to read, write and understand the English language

The exclusion criteria are:

-Have already pursued academic studies in other disciplines related to nursing
-Completed courses in another nursing program

If you choose to participate in this research you will be asked to complete the Script Concordance test which will be submitted as paper/pencil. This test is used to assess the clinical reasoning in situations of caring. It includes 29 diversified clinical scenarios. Each scenario is followed by 3-4 items surveyed. Scenarios refer to activities commonly encountered by professional nurses and nursing judgment regarding caring.

Completing the test should take about one hour. Subsequently, you will need to fill out a brief demographic questionnaire. Once completed, the questionnaire will be encoded and the test will then be processed anonymously.

Benefits of participation:

Contribute to the development of and the conditions of use of a test to be used in the evaluation of the clinical reasoning process.
Each student participant will receive a $10.00 Campus Bookstore gift certificate as an incentive for participating in the research study.

At the end of the study, an optional meeting will be offered to all students to review the overall results of the group in connection with the results of the panel. The investigator and the panel members who participated in the study will be present at this meeting to provide feedback and answer questions regarding specific test items.

Disadvantages of participation:
None

Confidentiality:

All information obtained and the results of the study are strictly confidential. The test was designed specifically for the purposes of the research project and will not be used for any purpose other than this study. All data will be stored in a locked filing cabinet in my office, accessible only by me, the Principal Investigator.

Voluntary Participation:

Your participation is strictly voluntary. If you decide not to participate there will be no penalties or negative consequences. You may choose to withdraw from the study at any time. If you choose to withdraw, all data concerning you will be destroyed.

Do you have any questions? (Circle one) NO YES

If you circled YES, please contact the Principal Investigator, Tyia Dawson, at the above phone number or by email at tedawson1@catamount.wcu.edu before signing this form. If you have questions or concerns regarding your rights as a research participant, you may also contact the chair of the WCU Institutional Review Board at 828-227-7212. Do not sign this form until these questions have been answered to your satisfaction.

YOU ARE MAKING A DECISION WHETHER OR NOT TO ALLOW THE PRINCIPAL INVESTIGATOR TO USE THE RESULTS FROM YOUR TEST AND QUESTIONNAIRE FOR RESEARCH AND PRESENTATION PURPOSES ONLY. YOUR SIGNATURE BELOW ALSO INDICATES THAT YOU ARE OVER THE AGE OF 18.

I AGREE DO NOT AGREE (Circle one) to participate in this research study.

Participant's name (please print) _____ Date: _____

Participant's Signature: _____

Appendix C

Demographic Questionnaire

Age: _____

Previous college studies/degrees: _____
Year Completed: _____

Number of courses completed towards Bachelor's degree in Nursing: _____

Type of clinical settings as a student: □ Hospital □ Nursing Home

Do you believe that your previous training or other experience related to nursing may have contributed to increase your performance compared to your peers? □ No □ Yes
If yes, explain: _____

Was your performance influenced by a language barrier? □ No □ Yes
If yes, selection from the following: □ Comprehension of English
□ English is my Second Language
□ Other (specify): _____

Appendix D

Script Concordance Test Instructions

Instructions:

This test is to assess the clinical reasoning in situations of caring. It contains 29 clinical scenarios with 3 or 4 items each. Each scenario describes a clinical situation, but with insufficient information or conflicting data so that you cannot give a final opinion single reading of the scenario.

• In the first column, we suggest a hypothesis or nursing intervention.

Example: in the scenario below, under the column, If you thought.

• In the second column, additional information regarding the person is provided. What you are looking to know is how this new information will influence your hypothesis.

• A legend is provided at the bottom of each scenario. You select the answer that best describes your opinion.

• Each item relates to the clinical scenario and is independent of other items. In the example below, you can confirm both your hypothesis of the denial of medical diagnosis (1 item) and Ms. Davis is aware of her health status.

* The items retained for statistical analyses are preceded by an asterisk

CASE EXAMPLE:
78 year old, Ms. Davis presents to the hospital with complaints of difficulty breathing which has gotten worse over the past few days. She has suffered with COPD (pulmonary bronchitis) (obstructive chronic) for several years. She asks you if she can go outside to smoke without the oxygen.

If you thought :	And then you found:	The relevance of this intervention becomes:
*That Mrs. Davis is not aware of the seriousness of her condition and that she denies her state of health.	Oxygen saturation of 91% with oxygen in place.	-2 -1 0 1 2 Means that you consider the hypothesis valid according to the new information received and it
*Mrs. Davis has the right to give up as she is aware of her health status over the past several years.	A history of compliance with treatment as ordered by the pulmonologist written in the file.	-2 -1 0 1 2 Means that you do not think the information received in the second column, has any influence on your starting hypothesis (opinion)

Legend:
-2: rejected
-1: less relevant or possibly less appropriate
0: the information has no effect on the assumption
1: needs to be explored in the near future
2: needs to be explored in the immediate future

Appendix E

Script Concordance Test

(*Items marked with an asterisk were used in the data analysis)

SCENARIO # 1:

Mrs. Bergeron has had a recurrence of breast cancer. She presents to the Breast Clinic to receive her chemotherapy treatments. When you meet, she has tears in her eyes and she tells you: "I have not been very well for two weeks"; "I have the impression that I have no control over what happens to me".

If you thought to:	And then, she says to you:	The relevance of this intervention becomes:
* 1 - Talk to Mrs. Bergeron about support groups with other people who live with the same situation as she.	"I have been sick for many years. I'm not dead yet".	-2 -1 0 1 2
* 2 - Encourage Mrs. Bergeron to use her social network (family, friends) to help her.	"I feel that I am a burden for my family and friends. In addition, I am going to be a grandmother in a few weeks. They need me."	-2 -1 0 1 2
* 3 - Encourage Mrs. Bergeron to make decisions concerning her care.	"It seems to me that I have received a lot of attention in recent years. I do understand that I am still "sick".	-2 -1 0 1 2
* 4 - Allow Mrs. Bergeron to obtain spiritual assistance.	"Buddhist meditation gives me a little bit of serenity in my life."	-2 -1 0 1 2

Legend:

-2: completely or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 2:

You work in an Assisted Living residence for the elderly. In November, all residents are encouraged to receive influenza vaccine. You meet Mrs. Fournier, 83 years old, to offer the vaccination. Mrs. Fournier is lucid and autonomous in her ADL (activities of daily living). She suffers from diabetes and high blood pressure.

If you thought to:	And then you learn:	The relevance of this intervention becomes:
* 5 - Verify that Mrs. Fournier knows the benefits and risks of the vaccination.	Mrs. Fournier is concerned about Guillian-Barré Syndrome.	-2 -1 0 1 2
* 6 - Explain the dangers linked to the risks of the flu virus in the elderly person.	That Mrs. Fournier has no history of respiratory problems in her record.	-2 -1 0 1 2
* 7 - Immediately get the free and informed consent of Mrs. Fournier.	Her daughter is against this vaccination and that she wanted to be present for this discussion.	-2 -1 0 1 2

Legend:

-2: completely or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 3:

Mr. Johnson had surgery to place a prosthesis in his right hip two days ago. This morning, he still refuses to stand, saying he is unable to. You notice that Mr. Johnson refuses the help of his spouse who is present at the bedside. He also refused an analgesic medication prior to mobilization.

If you think that:	And that then you point out:	This hypothesis is::
* 8 - Mr. Johnson is suspicious of side effects of opioids.	Mr. Johnson refused any analgesic medication for more than 24 hours.	-2 -1 0 1 2
9 - Mr. Johnson is fearful to move his hip.	Mr. Johnson suffers from osteoarthritis and chronic pain.	-2 -1 0 1 2
* 10 - Mr. Johnson is concerned about being a burden on his family at home.	That the spouse of Mr. Johnson was diagnosed with cancer within the last 6 months.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 4:

Mrs. Caron, 70, was hospitalized for a planned gynecological surgery tomorrow. Her daughter has come to see her tonight, but leaves her mother's room abruptly, slamming the door. At your arrival in the room, Mrs. Caron said to you: "For 5 minutes, I have been sick to my stomach. I am nervous about tomorrow".

If you think :	And then you find :	This hypothesis is:
* 11 - That Mrs. Caron presents signs of mild anxiety and she needs comfort.	Mrs. Caron has not eaten her dinner and that she was previously a little nauseated.	-2 -1 0 1 2
* 12 - Mrs. Caron is disturbed by the visit of her daughter.	Mrs. Caron has a history of angina pectoris in her record.	-2 -1 0 1 2
* 13 - That Mrs. Caron is not ready to undergo this surgery.	Mrs. Caron wants to see her daughter before the operation.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 5:

You work at Rosemont homecare. You visit Mr. Peters who has had Type 2 Diabetes for 10 years and began to take insulin two weeks ago. On your visit this morning, you see that he has a blood glucose level of 396 mg/dl. Other than the presence of polydipsia (increase in the need to drink liquids), Mr. Peters has no signs of hyperglycemia. His wife is present during the visit. She usually administers insulin according to the scale prescribed by the doctor.

If you thought to:	And then you find:	The relevance of this intervention becomes:
* 14 - Explore with Mr. Peters and his wife the meaning of his health condition and control of diabetes.	Mr. Peters becomes aggressive as soon as you mention the control of his diabetes.	-2 -1 0 1 2
* 15 - Verify the knowledge of the couple regarding the signs and symptoms to watch for.	Mr. Peters is not listening to the recommendations and suggests his wife take the necessary information.	-2 -1 0 1 2
* 16 - Ask Mr. Peters' wife if this situation arises frequently, and how they usually manage the administration of insulin.	That Mr. Peters gave himself an increased dose of insulin last night.	-2 -1 0 1 2
17 - Reassure the couple that there are no signs of hyperglycemia, except for polydipsia.	That Mr. Peters has high blood pressure.	-2 -1 0 1 2

Legend:

-2: completely or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 6:

Mr. Rivers, 62, was hospitalized for 3 days following left middle cerebral artery stroke. He is suffering from Broca aphasia, hemianopia (loss of sight up to one half of the visual field) and paralysis of the right side. Mr. River's spouse admits to that she does not know how to communicate with her husband.

If you thought to suggest to Mrs. Rivers to:	And then you notice:	The relevance of this intervention becomes:
* 18 - Move into the intact part of her husband's visual field during exchanges.	Mr. Rivers is tired and impatient with her.	-2 -1 0 1 2
* 19 - Speak normally expressing one idea at the time.	Mrs. Rivers uses a childlike tone in her exchanges with her spouse.	-2 -1 0 1 2
* 20 - Ask closed ended questions.	Mr. Rivers responds by nods of the head or by gestures.	-2 -1 0 1 2
* 21 - To use pictures to express needs.	Mr. Rivers cries when seeing the poster.	-2 -1 0 1 2

Legend:

-2: completely or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 7:

Responsible for the Diabetes Clinic, you hold an information session with a group of people newly diagnosed with the disease.

If you thought to:	And then, one of the persons says to you:	Your intervention becomes:
* 22 - Offer a brochure with information about diabetes and food while inviting the people to watch an informative video.	"My food and my blood sugar is not a problem. I am not on the verge of "death".	-2 -1 0 1 2
* 23 - Begin teaching by inviting participants to express their experiences/concerns in dealing with diabetes.	"I have no problem, you take care of me and it is very "good like that".	-2 -1 0 1 2
* 24 - Evaluate what people know about diabetes before starting to teach.	"I don't do anything to change my eating habits and I always smoke two packs of cigarettes per day. I know that it does not help me".	-2 -1 0 1 2

Legend:

-2: completely or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 8:

Mr. Gordon was admitted to the psychiatric hospital's Emergency Department. After your initial assessment, you note that Mr. Gordon presents several behaviors likely to put his health and safety in danger.

If you thought to:	And then you notice:	The relevance of this intervention becomes:
* 25 - Request private attendants to ensure a constant presence with Mr. Gordon	Mr. Gordon has a history of episodes of self-harm in his record.	-2 -1 0 1 2
* 26-Apply physical restraints to Mr. Gordon's wrists.	Mr. Gordon is agitated during interactions. He threatens to hit the attendant.	-2 -1 0 1 2
* 27 - Initiate measures for chemical restraints as agreed to and ordered by the physician.	Mr. Gordon emphatically refuses medication and in his apparent displeasure hits the wall.	-2 -1 0 1 2

Legend:

-2: completely or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 9:

After having an appendectomy, Mr. Porter complains of continued pain in his abdomen. Despite the pain medication he received 3 hours ago, he complained of a persistent pain at 9-10/10. He was exhausted from pain and lying in a fetal position in bed.

If you think:	And then you find:	This hypothesis is:
* 28 - Mr. Porter has pain 9-10/10 not relieved by the analgesics and requires a medical evaluation.	That the attending doctor anticipated reducing medication as soon as the next day because Mr. Porter will be discharged.	-2 -1 0 1 2
* 29 - That Mr. Porter can use other measures of pain management (ex. rest, relaxation, imagery).	Mr. Porter has slept all the day according to the notes of the nurse who worked the previous shift.	-2 -1 0 1 2
* 30 - The pain of Mr. Porter is a result of the normal healing process and post-operative inflammation.	That Mr. Porter has a history of drug addiction.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 10:

Mrs. Picard is suffering from breast cancer with advanced bone metastases. She suffers acute pain in the spinal column, limiting her movements but refuses the analgesic medication. When you give explanations on the importance of pain relief, the mechanism of action of analgesics and the frequency of taking them, Mrs. Picard begins to cry.

If you thought to:	And then you note:	The relevance of this intervention becomes:
* 31 - Give Mrs. Picard a sense of hope by pointing out that she could live more easily with this health condition by controlling the pain.	That Mrs. Picard believes that she must accept her approaching death. That this situation is inevitable.	-2 -1 0 1 2
32 - Explore the meaning of pain in Mrs. Picard's experience.	Mrs. Picard is very Catholic and believes that her pain comes from God and must necessarily accompany the disease.	-2 -1 0 1 2
33 - Implement other measures of pain relief.	Mrs. Picard wants her acupuncturist , Vienna, to come to the hospital to give her a treatment.	-2 -1 0 1 2

Legend:

-2: complete or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 11:

Mr. Boyd, 57 years old, has undergone an abdominal-perineal resection following a diagnosis of cancer of the rectum. He has a permanent colostomy. Mr. Boyd spends much of his time in bed, with his eyes closed or gazing into nothingness. He hides his colostomy from his companion when in the room. This morning, you plan to start colostomy care education according to your nursing treatment plan.

If you think:	And then, he says to you:	This hypothesis is:
* 34 - That Mr. Boyd is suffering from an alteration of his body image.	"I feel dirty and I'm no good".	-2 -1 0 1 2
* 35 - That Mr. Boyd is not ready to receive teaching regarding his colostomy.	"My ostomy is a real wound whose care requires the intervention of a professional".	-2 -1 0 1 2
36 - That Mr. Boyd is concerned that this surgery will affect his sexual life.	That Mr. Boyd has a new life companion who is 34 years old.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 12:

You give an information session on breast cancer risks and prevention. You teach a group of women preventive measures and you teach, among other things, the self breast examination.

If you thought to:	And then, one of the ladies said to you:	The relevance of this intervention becomes:
* 37 - Ask the ladies to discuss the meaning and the importance they give to their breasts.	"Losing a breast is to lose all my femininity."	-2 -1 0 1 2
* 38 - Instruct participants on the importance of eating a healthy diet, including various vitamins and minerals.	"Phyto-estrogens are extraordinary. I take soy every day".	-2 -1 0 1 2
* 39 - Promote exchange of information between the participants on methods that they use to reduce their daily stress.	"There is nothing better than a good meal with a good bottle of "wine".	-2 -1 0 1 2

Legend:

-2: completely or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 13:

Luke, 13 months, presents to the Emergency Department with a fever at 39.5° C for three days. Luke is eating and drinking well and remains cheerful when fever is controlled. Luke's parents (Marie and Maxim) are worried about the fever and their son's state of health. In addition, they express they have little support from family and friends in regard to their respective jobs.

If you thought:	Then you learn:	This hypothesis is:
40 - The parents of Luke are having difficulty in adapting to their new parenting roles.	Luke is the third child of Mary and Maxim.	-2 -1 0 1 2
* 41 - The parents of Luke have a lot of responsibilities and concerns and that they must make responsible choices.	That the parents of Luke must work full time to meet the material needs of their children.	-2 -1 0 1 2
* 42 - That Luke's fever is clearly a sign of an infection of the respiratory tract.	That Luke is in his third hospitalization in 3 months.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 14:

Catherine, 26 years old, comes to the Emergency Department for lower abdominal pain. The pain is constant, with average intensity. Diagnostic tests revealed an ectopic pregnancy. Catherine has had two miscarriages.

If you think:	And then she says to you:	This hypothesis is:
* 43 - Only Catherine can resolve this situation.	"It is my fault. I don't take the time to think about in my health. I feel guilty."	-2 -1 0 1 2
* 44 - Catherine needs to discuss her choice of becoming a mother.	"I think that I must understand the message that this sends me: I can never have children".	-2 -1 0 1 2
* 45 - That Catherine may develop depressive signs.	"I have no dark thoughts at the moment. I'm still young. I can cope."	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 15:

Mrs. Pinson, 62 years old, learns that she is suffering from cancer of the lungs. The doctor has also detected bone metastases. He offers an adjunctive treatment but the chances of survival of Mrs. Pinson are thin.

If you thought to:	And then you find:	The relevance of this intervention becomes:
* 46 - Relate to Mrs. Pinson your own feelings of sadness at the announcement of this diagnosis.	Mrs. Pinson remains stoic to the announcement of diagnosis. Her face remains neutral but tense.	-2 -1 0 1 2
*47 - Explain to Mrs. Pinson the progress of treatment and its side effects.	Mrs. Pinson formally denies this diagnosis. She repeats that she has never smoked in her life.	-2 -1 0 1 2
48 - Tell Mrs. Pinson this is the time she needs the most help.	Mrs. Pinson wishes to be left alone for a while.	-2 -1 0 1 2

Legend:

-2: completely or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 16:

Mrs. Oliver, 84 years old, fell at home resulting in a fracture of the hip. She lives with her only son, Paul, on the second floor of a duplex. During her hospitalization, you schedule the discharge of Mrs. Oliver in collaboration with her son. Accommodation in a nursing home is planned.

If you think:	And then you find:	This hypothesis is:
* 49 - Mrs. Oliver feels a loss of control and a loss of her autonomy.	That Mrs. Oliver has refused the assistance of the social worker this morning.	-2 -1 0 1 2
50 - Paul feels guilty for put ting his mother in a nursing home.	That Mrs. Oliver tells you that her son promised never to put her in a nursing home.	-2 -1 0 1 2
* 51 - That Mrs. Oliver can return home with the help of her son.	Paul had already mentioned the heavy workload required to care of his mother at home.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 17:

Linda, 24 years old, is in short stay post partum. She gave birth yesterday to a little girl. On entering in the room, you find her in tears and trying to offer the breast to the infant. She explains that breastfeeding is more difficult than she thought. Her husband, Louis is at her side and is fearful of his wife's discharge planned for tomorrow.

If you think:	And then you note:	This hypothesis is:
52 - That Linda has a hormonal imbalance which emphasizes her feelings that it's difficult to breastfeed.	That Louis is not very responsive to breastfeeding but he respects the choice of Linda.	-2 -1 0 1 2
* 53 - That Linda will need support after her release from the hospital.	That the couple need to adapt to a new area and that the parents of Linda are in Florida for the winter.	-2 -1 0 1 2
54 - Linda is not ready to be discharged from the hospital.	That Linda is concerned by the frequent awakenings of her baby. It needed to breastfeed every two hours.	-2 -1 0 1 2
*55 - Linda will need your help in refining her technique of breastfeeding.	That Linda is having breast pain during breastfeeding. The nipples are sensitive with the presence of redness and chapping.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 18:

You work in the Youth Health clinic. A girl of 17 years, Joannie, presents with her boyfriend. She is panicked because following unprotected sexual intercourse; she fears she may become pregnant.

If you think:	And then you note:	This hypothesis is:
* 56 - Joannie uses no method of contraception because of lack of knowledge on the topic.	Joannie's partner does not like the reduction of sensations caused by the use of condoms.	-2 -1 0 1 2
57 - Joannie uses the Morning After pill as a regular contraceptive method.	Joannie took the Morning After pill a few times in the last 10 months.	-2 -1 0 1 2
* 58 - Joannie is not aware of the dangers related to the unprotected sexual intercourse.	The couple is concerned about the costs of recommended methods of contraception.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 19:

You work in palliative care. Having reached advanced stage lung cancer, Mr. Leon presents with a stage II pressure wound of the coccyx area, requiring regular treatment. When you change the dressing, you notice that Mr. Leon fights tears. He asks to smoke despite the fact that he must receive oxygen at 2 L/m continuously 24 hours a day.

If you think:	And then he said:	This hypothesis is:
* 59 - That Mr. Leon denies his health condition because of the fact that he wants to smoke.	"Smoking is all that is left to give me pleasure in live".	-2 -1 0 1 2
* 60 - That Mr. Leon is not ready to die and that he needs spiritual assistance.	"It is very difficult for me to think of dying in this facility. I am tired of all these treatments".	-2 -1 0 1 2
* 61 - That Mr. Leon has the perception he is losing control of his health situation.	"I am indifferent to the state of my wound. Do not waste your time trying to heal it".	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 20:

Mrs. Jordan, 84 years, is in the Emergency Department due to deterioration in her general state and hyperthermia. In addition she is suffering from Alzheimer's disease, making interactions difficult. You must initiate diagnostic measures according to physician orders. The daughter of Mrs. Jordan, who lives with her mother at home is present and shows her dismay over her mother's situation and is exhausted.

If you thought to:	And then she says to you:	The relevance of this intervention becomes:
* 62 - Discuss with Mrs. Jordan's daughter the resources in the community for support and care services.	"This is my mother and I have promised to take care of her. I'm going to handle this myself."	-2 -1 0 1 2
* 63 - Ask Mrs. Jordan's daughter what would be the best way to help in the immediate future.	"I don't know what to do" and she starts to cry.	-2 -1 0 1 2
* 64 - Establish with Mrs. Jordan's daughter a consistent care plan and be realistic about the health situation of her mother.	"I find it so hard that she doesn't recognize me anymore!"	-2 -1 0 1 2

Legend:

-2: complete or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 21:

Mr. Gagnon, 62, has benign prostatic hypertrophy and has undergone a transurethral resection of the prostate, two days ago. His urinary catheter was removed yesterday and since then, Mr. Gagnon monitors his diuresis. He complies with the prescribed postoperative hydration and has received much relief with pain medication.

If you think to:	And then you find:	The relevance of this intervention becomes:
* 65 - Discuss with Mr. Gagnon the effect of this surgery on his sexual life.	Mr. Gagnon made jokes regarding this topic and became uncomfortable.	-2 -1 0 1 2
* 66 - Reassure Mr. Gagnon about the possible urinary issues after undergoing this surgery.	That Mr. Gagnon is concerned about this situation; he has wet his pants this morning.	-2 -1 0 1 2
* 67 - Verify Mr. Gagnon's fears regarding the possibility of prostate cancer in men with benign prostatic hypertrophy.	Mr. Gagnon knows that prostatic hypertrophy has no link with cancer of the prostate.	-2 -1 0 1 2

Legend:

-2: complete or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 22:

Admitted for a decline in his overall condition, Mr. Brooks, 83 years, manifests episodes of confusion since his admission. He has tried repeatedly to get off of his stretcher. Since he fell 4 times over the course of 48 hours, a physical restraint was applied by the staff on the previous shift. Indignant, the son of Mr. Brooks asks for an explanation.

If you think to:	And then you notice:	The relevance of this intervention becomes:
* 68 - Admit to Mr. Brooks's son your own helplessness in addressing this situation.	That the son of Mr. Brooks wants to make a formal to complaint about the health care facility.	-2 -1 0 1 2
69 - Ask Mr. Brooks son's advice on the care that his father should receive.	The relationship between Mr. Brooks and his son is not harmonious. They have not seen each other for 3 years.	-2 -1 0 1 2
70 - Ask Mr. Brooks's son about his fears and concerns regarding the health of his father.	Mr. Brooks's son is closed to any discussion. He says: "it is up to you to explain to me what is happening."	-2 -1 0 1 2
*71 - Take action to remove the restraints and increase monitoring of Mr. Brooks.	Mr. Brooks's son links this situation to the violence against the elderly, which has been denounced by the media.	-2 -1 0 1 2

Legend:

-2: complete or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 23:

You work in the Coronary Care unit. Mr. Marcus, 54, complained of sudden overwhelming epigastric pain of 10/10. Anxious, he becomes more and more dyspneic (SOB). You initiate diagnostic measures as ordered. You, among other things, obtain an electrocardiogram and assay cardiac enzymes.

If you think to:	And then you noticed:	The relevance of this intervention is:
* 72 - Support Mr. Marcus by saying that we can help you deal with this sudden pain.	Mr. Marcus believes that this time, it is too hard for him. He will not take the blow.	-2 -1 0 1 2
73 - Contact the family of Mr. Marcus.	That Mr. Marcus wishes to be alone. He does not want his family to see him in this state.	-2 -1 0 1 2
* 74 - Explain your diagnostic interventions.	Mr. Marcus shows a marked increase of his anxiety with the explanations received.	-2 -1 0 1 2

Legend:

-2: complete or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 24:

Mrs. Corbeil, 45 years, comes to the pre-admission surgery clinic. She will have a bilateral total abdominal hysterectomy in 2 weeks. She expressed concern about the surgery. You plan pre-operative education in view of the upcoming surgery.

If you think to:	And then you learn:	The relevance of this intervention becomes:
75 - Ask Mrs. Corbeil the meaning and the importance that she gives her uterus.	That Mrs. Corbeil did not have children and does not wish to have any.	-2 -1 0 1 2
* 76 - Suggest to Mrs. Corbeil hormone replacement therapy after the operation in accordance with the doctor.	Mrs. Corbeil has had a benign right breast tumor.	-2 -1 0 1 2
* 77 - Relate to Mrs. Corbeil your own experience with this surgery because you had it 3 years previously.	Mrs. Corbeil is concerned about surgical menopause. She believes she is losing her femininity.	-2 -1 0 1 2

Legend:

-2: complete or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 25:

You are working in the Pediatric Emergency Department. Nicolas, 2 1/2 years, is admitted for bronchospasm. You constantly monitor Nicholas' respiratory status and he exhibits subcostal and xiphoid retractions, oxygen saturation of 92% on room air, breathing at 42 RPM. Concerned, Nicolas' mother is at his bedside.

If you think to:	And then you find:	The relevance of this intervention becomes:
* 78 - Ask Nicolas' mother what she usually does to control the asthmatic attacks of her son.	That Nicolas' mother feels overwhelmed by these events. As a single parent, she seeks support.	-2 -1 0 1 2
* 79 - Instruct Nicolas' mother of measures to treat an asthma attack. Among other things, the administration of drugs.	Nicolas' mother fears a slowing of the growth of her child, a side effect of glucocorticoid drugs used in asthma attacks.	-2 -1 0 1 2
* 80 - Ask Nicolas' mother what would be the most helpful at the moment to deal with the situation.	Nicolas' mother administers doses between the prescribed doses despite explanations on this subject	-2 -1 0 1 2

Legend:

-2: complete or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 26:

Mr. Bond, 34, is in the Emergency Department for pain of cardiac origin. His electrocardiogram shows some irregularities. You have clinical data regarding his state of health through frequent measures of his vital signs and a reading of the electrocardiogram monitor. While under observation, Mr. Bond wants to use his laptop and his cell phone despite the restrictions imposed on this. He also asks to remove electrodes to go outside to smoke.

If you think:	And then, he said to you:	This hypothesis is:
* 81 - Mr. Bond is not aware of the seriousness of his condition. He denies his health situation.	That his father died of a myocardial infarction at the age of 40 years.	-2 -1 0 1 2
* 82 - That Mr. Bond is a man stressed by spending a lot of time at work.	That Mr. Bond has lost his employment and needs to contact the Union agent. This situation has him concerned.	-2 -1 0 1 2
* 83 - That Mr. Bond is not ready to change his lifestyle.	Mr. Bond suffered a major depression, a year ago.	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

SCENARIO # 27:

You are visiting the home of Mr. and Mrs. LaFrance. Mrs. LaFrance suffers from terminal cancer of the bone. She wants to die in her home surrounded by her family. You need to give her regular injections of painkillers. Upon your arrival, Mr. LaFrance has a tense face and tears in his eyes. He is overwhelmed by the situation and believes that his wife is very ill.

If you thought to:	And then, he said to you:	The relevance of this intervention becomes:
* 84 - Ask Mr. LaFrance the best way to help him and his wife at this time.	He feels that his wife receives too many injections of painkillers and he's afraid that the drug is accelerating her death.	-2 -1 0 1 2
85 - To discuss with Mr. LaFrance his own perception of the death.	That only God can decide the hour of death of a person.	-2 -1 0 1 2
* 86 - Propose to Mr. LaFrance additional services for care and support.	The assistance is ample and that he wants the two of them to remain alone together..	-2 -1 0 1 2

Legend:

-2: whole or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 28:

Éva is a 13 year-old girl who comes to the Youth Clinic for the purpose of receiving a consultation on contraception. In the consultation, she melts into tears and admits to you that she is pregnant. She does not know if she must have an abortion or not.

If you thought to:	And then you notice:	The relevance of this intervention becomes:
* 87 - Ask Eva what is expected of you and how you can help in light of the situation.	That Eva says that she cannot not make any decision at this time and she wants someone to decide for her.	-2 -1 0 1 2
* 88 - Identify if the community resources in the area that will be able to provide support and assistance.	Eva cannot tell her family of her condition because they will disapprove of her pregnancy.	-2 -1 0 1 2
* 89 - Make Eva discuss the significance she attaches to having a child.	That Éva wishes to continue her pregnancy to term despite her young age and without the help of the father.	-2 -1 0 1 2

Legend:

-2: complete or partially contraindicated

-1: not very useful or possibly harmful

0: neither more nor less useful

1: useful

2: necessary or absolutely necessary

SCENARIO # 29:

Mr. Fletcher, 78 years old, had surgery for a replacement of his right hip. In his health assessment, you note a stage 2 pressure wound at the level of the coccyx. Mr. Fletcher moves with difficulty. For now, he wants to stay on his back. He refuses to move despite the presence of the wound to the coccyx.

If you think:	And then, he said to you:	This hypothesis is:
* 90 - Mr. Fletcher does not have the information necessary in regards to his wound care.	"I want to heal my hip first. I will take care of my wound later."	-2 -1 0 1 2
* 91 - That Mr. Fletcher refuses to move because he is suffering.	"I become too sleepy if I take medication for the pain".	-2 -1 0 1 2
* 92 - Mr. Fletcher has fear of moving the hip that was operated on.	"The staff does not help me enough to move. They are short of staff. I do not want to disturb them".	-2 -1 0 1 2

Legend:

-2: rejected

-1: less relevant or possibly less appropriate

0: the information has no effect on the assumption

1: needs to be explored in the near future

2: needs to be explored in the immediate future

Appendix F

Specification Table: Use of SCT for Evaluation of Clinical Reasoning

Quebec Nurse Practice Act, 14 Nursing Activities	Assessment Domains		
	Human Care Aspects	Therapeutic Relationship	Nursing Activities
1 Evaluate the status of a person's mental and physical symptoms (scenario 4, 13 and 14)	Items 11, 12, 13, 40, 41, 43, 45	42, 44	
2.Implement clinical monitoring of the status of persons in unstable states of health, including the monitoring and adjustment of the nursing therapeutic plan (scenarios 3, 25 and 26)	8, 9. 10. 80. 81. 82. 83	78	79
3. Initiate diagnostic and therapeutic interventions, according to specific orders (scenario 22)	72		73, 74
4. Initiate diagnostic measures for screening purposes in an event resulting from the application of the public health law (12 and 18 scenarios)		37, 56, 57, 58	38, 39
5. Perform examinations and invasive diagnostic treatments, according to an order			
6. Make and adjust the medical treatment, according to a scope of practice			
7. Determine wound treatment plan related to alterations of the skin and associated care and treatments (scenarios 19 and 29)	61, 91, 92	59, 60	90
8. Use invasive techniques (scenario 20)	63	64	62
9. Contribute to the monitoring of pregnancy, child birth practices and post-natal monitoring (17 scenarios and 28)	54, 87	52, 89	53, 55, 88
10. Monitor nursing of persons with complex health problems (scenarios 1,5,6,7,11,15,16,21,24 and 27)	20, 34, 35, 36, 46, 48, 49, 50, 77, 84	4, 14, 16, 19, 23, 51, 65, 67, 75, 85	1, 2, 3, 15, 17, 18, 21, 22, 24, 47, 66, 76, 86
11. Administer and adjust medications or other substances, when ordered (scenarios 9 and 10)	28, 31	29, 30, 32, 33	
12. Carry out vaccination as part of an activity resulting from the application of public health law (scenario 2)			5, 6, 7
13. Mix substances to complement the preparation of a drug, according to an order			
14. Decide the use of restraint measures (scenarios 8 and 22)	68, 69, 71	70	25, 26, 27
Percentage in each of the field of Human caring	**36/92=39%**	**27/92=29%**	**29/92=32%**

Deschenes et al. (2011)

Appendix G

Invitation to Panel Members

Dear Panel Member:

For my master's thesis I have chosen to replicate a study conducted at the University of Montréal, in which the researchers developed an instrument, a Script Concordance Test (SCT)*, for evaluating clinical reasoning of nursing students in the context of human caring. Script Concordance Tests are meant to measure the degree of concordance between examinees and a reference panel concerning clinical decisions and actions under uncertainty. In my research, I will be administering the SCT to 30 first year baccalaureate nursing students in an effort to determine whether or not the SCT is a reliable and valid means of evaluating clinical reasoning. This requires the participation of panel members, like you, who will provide the scoring grid against which the student scores will be compared.

As a participant, you will be asked to complete the SCT under the same circumstances as the students evaluated so that I can build the grid of correction for the test. The SCT uses a method of combined scores to account for variability in the responses made by the panel to determine the score awarded to the student. The score given to each response is calculated according to the number of panel members who chooses it. Fifteen (15) panel members are involved in the development of the scoring grid.

Instructions:

- Complete the SCT on an individual basis without consultation with your colleagues. It is normal to perceive a lack of information in the clinical scenarios in the test items, as it is specifically designed to assess the reasoning of the nurse in a context of uncertainty.
- Respond directly on the test sent by using color shading, bold formatting, or highlighter to identify your choice of response.
- Return the completed test to me within the designated time frame.

I know that your time is precious and that your participation indicates a concern for scientific and professional advancement. To date research on clinical reasoning and its evaluation in nursing are rare. Clinical reasoning is a necessary component of nursing practice, therefore, it is important to develop and validate an instrument that would meet the needs of nursing educators in evaluating clinical reasoning skills in nursing students.

I would greatly appreciate your returning the Script Concordance Test as soon as possible or by May 9, 2012 at the latest. I am available to provide any information or assistance required to facilitate your collaboration.

Sincerely,
Tyia Dawson, RN, MSN Student
Western Carolina University
Email: tedawson1@catamount.wcu.edu
828-773-1395

*To learn more about SCT, its construction and validation and recent publications on the subject, consult the following website: http://www.cpass.umontreal.ca/sct.html

Appendix H

SCT Scoring Grid

Item	-2	-1	0	1	2
1	0.20	0.40	0.40	1.00	0.60
2	0.00	1.00	0.25	1.00	1.00
3	0.00	0.00	0.10	1.00	0.20
4	0.00	0.00	0.00	0.44	1.00
5	0.00	0.00	0.00	0.44	1.00
6	0.00	0.00	0.67	1.00	0.50
7	1.00	1.00	0.25	0.25	0.75
8	0.00	0.00	0.11	0.33	1.00
9	0.00	0.00	0.00	0.44	1.00
10	0.00	0.00	0.00	1.00	0.63
11	0.00	0.14	0.14	1.00	0.57
12	0.00	0.17	0.17	0.83	1.00
13	0.00	0.00	0.00	0.30	1.00
14	0.20	0.40	0.20	0.80	1.00
15	0.20	0.00	0.40	1.00	1.00
16	0.00	0.00	0.00	0.63	1.00
17	0.60	0.00	1.00	0.60	0.40
18	0.00	0.00	0.14	0.71	1.00
19	0.13	0.13	0.13	0.25	1.00
20	0.00	0.00	0.00	0.86	1.00
21	0.00	0.75	1.00	1.00	0.50
22	0.00	0.00	0.43	0.43	1.00
23	0.00	0.00	0.00	1.00	0.44
24	0.00	0.00	0.29	0.57	1.00
25	0.00	0.00	0.00	0.08	1.00
26	0.17	0.17	0.00	0.83	1.00
27	0.00	0.29	0.14	0.43	1.00
28	0.00	0.00	0.00	0.30	1.00
29	0.00	0.40	0.40	0.80	1.00
30	0.33	0.17	0.33	1.00	0.33
31	0.00	0.14	0.00	0.71	1.00
32	0.00	0.00	0.17	1.00	1.00
33	0.00	0.00	0.29	1.00	0.57
34	0.00	0.00	0.00	0.30	1.00
35	0.00	0.00	0.00	0.86	1.00
36	0.00	0.00	0.14	1.00	0.71
37	0.00	0.00	0.13	1.00	0.50
38	0.00	0.00	0.11	1.00	0.33
39	0.00	0.00	0.43	1.00	0.43
40	0.40	1.00	0.20	0.80	0.20
41	0.00	0.00	0.33	1.00	0.11
42	0.00	0.14	0.29	0.43	1.00
43	0.40	0.60	0.40	1.00	0.20
44	0.00	0.00	0.00	1.00	0.63
45	0.14	0.00	0.43	1.00	0.29
46	0.33	0.50	0.00	1.00	0.33

Item	-2	-1	0	1	2
47	0.67	1.00	0.67	1.00	1.00
48	0.75	1.00	0.50	0.75	0.25
49	0.00	0.00	0.33	1.00	0.83
50	0.00	0.00	0.00	1.00	0.63
51	0.60	0.60	0.00	0.40	1.00
52	0.00	1.00	0.75	1.00	0.50
53	0.00	0.00	0.17	1.00	1.00
54	0.00	0.17	0.50	1.00	0.50
55	0.00	0.00	0.00	0.18	1.00
56	0.67	0.00	0.00	0.50	1.00
57	0.00	0.17	0.17	1.00	0.83
58	0.00	0.40	0.40	1.00	0.80
59	1.00	0.60	0.00	0.20	0.80
60	0.00	0.40	0.20	1.00	1.00
61	0.00	0.29	0.00	1.00	0.57
62	0.00	0.00	0.33	0.83	1.00
63	0.00	0.00	0.22	0.22	1.00
64	0.00	0.14	0.14	0.57	1.00
65	0.14	0.00	0.14	1.00	0.57
66	0.00	0.00	0.00	0.30	1.00
67	0.14	0.29	0.14	1.00	0.29
68	1.00	0.50	0.50	0.50	0.75
69	1.00	1.00	1.00	1.00	0.33
70	0.25	1.00	1.00	0.25	0.75
71	0.00	0.20	0.40	1.00	1.00
72	0.00	0.00	0.00	0.18	1.00
73	0.75	1.00	0.50	0.25	0.75
74	0.14	1.00	0.00	0.14	0.57
75	0.00	0.20	0.60	1.00	0.80
76	0.80	0.20	0.20	1.00	0.40
77	0.33	0.17	0.17	1.00	0.50
78	0.00	0.40	0.80	0.40	1.00
79	0.00	0.17	0.17	1.00	0.83
80	0.50	0.50	0.50	0.75	1.00
81	0.33	0.17	0.17	0.50	1.00
82	1.00	0.00	0.00	0.67	0.50
83	0.00	0.14	0.14	1.00	0.57
84	0.00	0.00	0.00	0.86	1.00
85	0.00	0.00	0.13	1.00	0.50
86	0.20	0.60	0.00	0.80	1.00
87	0.40	0.20	0.40	0.60	1.00
88	0.00	0.00	0.13	0.50	1.00
89	0.17	0.00	0.17	0.83	1.00
90	0.00	0.00	0.00	0.18	1.00
91	0.00	0.20	0.60	0.80	1.00
92	0.40	0.20	0.40	0.60	1.00