Texas Chiropractic College

Quality Enhancement Plan

From Student To Clinician:

Enhancing Clinical Reasoning Across The Curriculum

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From Student to Clinician: Enhancing Clinical Reasoning Across the Curriculum

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EXECUTIVE SUMMARY

The goal of Texas Chiropractic College's Quality Enhancement Plan is to improve teaching and student learning outcomes in clinical reasoning. The topic was chosen based on input from students, faculty, the President's Cabinet, the Board of Regents and college alumni; institutional objectives set forth in the TCC Graduate document; and student performance on both internal and independent external examinations. The QEP title is **"From Student to Clinician: Enhancing Clinical Reasoning Across the Curriculum"**.

After the thorough review of the literature on clinical reasoning, a working definition was developed to guide the QEP process: **"Clinical reasoning is a problem-solving process that enhances the development of clinical thinking and decision making in patient care. It involves the movement from accumulation of knowledge to the incorporation of skill, expertise and evidence leading to sound clinical judgment."**

Programmatic outcomes related to clinical reasoning focus on integration and application of basic science knowledge with the clinical presentation; introduction and application of clinical reasoning strategies in the pre-clinical setting; and application of clinical reasoning skills in the patient care setting. Evaluation methods were identified to monitor the programmatic outcomes. These methods include, but are not limited to, student course evaluations, Diagnostic Thinking Inventory, Clinical Skills Competency Exams I and II, Core Concept Exams, Health Sciences Reasoning Inventory, National Board Exams parts I, II, III and IV, and faculty interviews.

The full curriculum was reviewed and four pilot courses were selected. The pilot courses are Spinal Anatomy, Clinical Case Applications, Clinic I, and Orthopedics III. The pilot courses will be implemented during the Summer 2009 trimester.

For successful QEP implementation, new courses are being added to the curriculum. The new courses are Clinical Case Applications I (trimester 3), Basic Communication and History-Taking Skills (trimester 3), Clinical Case Applications II (trimester 4), Advanced Communication and History-Taking Skills (trimester 4), and Clinical Case Applications III (trimester 5). Full implementation will be on a two-track basis. The full track for incoming trimester one students begins in Fall 2009 and runs from trimesters one through ten. The second track encompasses the clinical experience and continues through Clinic II, Clinic III and Clinic IV for those students enrolled in the pilot course, Clinic I, culminating in graduation from the Doctor of Chiropractic degree program.

Teaching strategies to enhance clinical reasoning are being integrated into courses by means of standardized patients, case-based learning, team-based learning, faculty modeling, SNAPPS, reflective practice and electronic real-time student feedback.

Assessment of clinical reasoning will be conducted through extended matching, key features and script concordance questions; electronic real-time student feedback; standardized patient encounters; case-based discussions; student self-evaluation; Intern Global Rating; objective structured clinical evaluation; and Diagnostic Thinking Inventory.

CHAPTER 1: INTRODUCTION AND DESCRIPTION OF TEXAS CHIROPRACTIC COLLEGE

Introduction

Texas Chiropractic College (TCC) was founded in 1908 and is one of the oldest chiropractic colleges in the nation. TCC is recognized as a leader in the advancement of chiropractic education. The College has been accredited by the Council on Chiropractic Education since 1971 and by the Commission on Colleges of the Southern Association of Colleges and Schools since 1984. TCC awards degrees at both the Baccalaureate and Doctorate levels and is recognized by the Federation of Chiropractic Licensing Boards. The College offers the unique Hospital Rotations Program. This program provides interns an opportunity to gain additional valuable experience and knowledge by rotating through private clinics and hospitals throughout the greater Houston metropolitan area.

History Of TCC

TCC was organized and founded by J. N. Stone, M.D., D.C. in San Antonio, Texas in September of l908. On April 16, 1913, the College received its charter from the State of Texas and became known as The Chiropractic College. TCC was purchased by the Alumni Association in 1948.

In 1949, the State of Texas passed the Basic Science Law. This law required two years of pre-professional college education of a liberal arts or general nature. The basic sciences included anatomy, physiology, bacteriology, pathology, chemistry and public health. Per the law, degree programs had to be of four years duration and a minimum of 120 semester hours, with each year being a minimum of eight months. In 1951, a union was formed between San Antonio Junior College and TCC, which helped students satisfy the Basic Science Law requirements.

In 1965, the College relocated to its current site in Pasadena, Texas. TCC received accreditation from The Council of Chiropractic Education in 1971. In 1974, the W. D. Harper Chiropractic Clinic and Research Center opened, providing larger facilities for patient consultation, examination and treatment. The James M. Russell Education Center was built in 1978, providing more classrooms, a library, cafeteria and auditorium. In 1979, the Turley Anatomical Building was built. The Learning Resource Center opened in 1982, adding classrooms, faculty offices, an expanded library and media center.

On May 13, 1993, Governor Ann Richards signed a law allowing state funding for chiropractic education. In January 1994, the TCC Foundation, Inc. acquired ownership of the College. The Guy and Esther Ligon Laboratory Building was completed in 1997, providing a student clinic and additional laboratory classrooms. In 1998, the William M. Harris Building opened, offering expanded administrative and student services offices.

The Moody Health Center, an 18,000-square foot, multi-disciplinary outpatient clinic was opened in June of 2000. In April 2006, the 35,000-square foot Yasunori Iwama Education Center opened, which houses a 750-seat auditorium, a science lab, faculty offices and a 4,000-square foot assessment center.

TCC was the first chiropractic institution to offer preceptorship programs, allowing interns to visit field doctors and observe treatment in private offices. Today, TCC offers both preceptorship and postceptorship programs, as well as a hospital rotation program. In January of 2006, TCC became affiliated with the Veterans Hospitals, and offers a clinical rotation with the Veterans Hospital in Temple, Texas. TCC celebrated its 100th anniversary in 2008.

Mission, Vision and Strategic Plan of TCC

The mission of Texas Chiropractic College is to provide qualified students a patient-centered educational program leading to the Doctor of Chiropractic Degree. The curriculum promotes the development of the student's attitudes, knowledge, and skills required of a chiropractor serving the public as a primary care physician. Operating within the highest levels of professionalism, the College is also committed to serving the needs of the students, the profession and the public through leadership, scholarship, research, patient care and service activities in the field of chiropractic.

The mission statement of TCC is deeply rooted in its tradition of clinical excellence. TCC offers a balanced curriculum of chiropractic principles and evidence-based approaches to health care. The direction of the College is guided by its principle core values of integrity, collegiality, stewardship, diversity and quality. These values are the foundation of the College and its vision for the doctoral student. It is the vision of TCC to be recognized for its excellence in education, patient-centered chiropractic care and scholarly activity that will produce ethical and successful graduates who are prepared to improve the health of society.

Within the College's strategic plan, goal four specifically addresses providing quality academic programs. Objective 4.1 focuses on utilization of the QEP as a basis for continuous quality improvement and educational outcomes. This goal and objective tie directly back to the College's mission and vision statement.

Educational Environment

TCC presents a comprehensive course of professional instruction in basic sciences and clinical application to prepare the graduate to receive the degree of Doctor of Chiropractic. Faculty and administration strive to develop the student into a practitioner who is knowledgeable in chiropractic and prepared to deliver quality healthcare in an interdisciplinary environment.

Improving the quality of student education is a well-established goal of TCC. Through the enhancement of clinical reasoning, the College will continue to improve decision-making skills by utilizing the students' knowledge base in clinical case applications. TCC is working toward developing future clinicians who are well-read and articulate, and who possess clinical reasoning skills that will enable them to properly diagnose and to offer the best healthcare to their community.

TCC offers two degrees, a Doctor of Chiropractic degree and a Bachelor of Science degree. The College services undergraduate professional preparation by offering education appropriate to the Bachelor of Science degree with a major in Human Biology. This degree provides the foundation for advanced study and research. The College also provides for the ongoing development of the chiropractic profession by offering

postgraduate and continuing education courses. TCC recognizes that research must be an integral part of its education process.

TCC Today

The TCC faculty consists of 45 instructors as of Fall 2008. Thirty-one are full-time instructors, of which seven are employed as attending clinicians. Ten are part-time instructors. Four are administrative faculty. There are 26 Doctors of Chiropractic, four Medical Doctors, six with both a Master's and a Ph.D. degree, one with a Ph.D. degree, and eight with a Master's degree. Richard G. Brassard, D.C., has been the President of the College since 2004.

As of the Fall 2008 trimester, there were 331 full-time students and nine part-time students enrolled in the Doctor of Chiropractic program. There were 199 males and 141 females. The ethnicity breakdown was 59.4 % Caucasian, 12.4 % African American, 12.1 % Hispanic, 14.7 % Asian, 0.3 % Native American, and 1.2 % of unknown ethnicity.

In 2007, the out-patient clinic, Moody Health Center (MHC), saw 1,436 new chiropractic patients and had a total of 17,600 chiropractic patient visits. MHC is a multidisciplinary clinic, offering both chiropractic and medical services. There are 32 treatment rooms dedicated to chiropractic care and four treatment rooms for medical services. The facility includes two x-ray rooms and a large rehabilitation suite. In 2007, the MHC was staffed by 86 interns, five attending clinicians and one medical doctor.

CHAPTER 2: HISTORY AND DESCRIPTION OF THE QEP TOPIC FOCUS

Introduction

In January 2006, TCC initiated a project aimed at improving the quality of the graduates of the Doctor of Chiropractic (DC) Program. This became known as the TCC Graduate Project, and the group formed to spearhead this project was named the TCC Graduate Task Force. The task force is composed of a group of faculty from the basic and clinical science divisions, teaching faculty from the clinics division, and several administrators with educational backgrounds. The initial charge to the task force was to review the current Council on Chiropractic Education (CCE) required clinical competencies (Table 2.1) and ensure that these competencies were sufficient to train a graduate for current chiropractic practice. The task force then identified 11 additional clinical competencies thought to be "essential attributes" of a graduate (Table 2.2).

Table 2.1: CCE Clinical Competencies

History Taking	Physical Examination	Neuromusculoskeletal Examination	Psychosocial Assessment	Diagnostic Studies
Diagnosis	Case Management	Chiropractic Adjustment or Manipulation	Emergency Care	Case Follow-Up and Review
Record-Keeping	Doctor-Patient Relationship	Professional Issues	Wellness	Ethics and Integrity

Table 2.2: TCC Clinical Competencies

Business Aspects of Practice	Communication	Complementary and Alternative Medicine	Evidence Based Practice/Research
Health Care Informatics	Nutritional Counseling	Public Health	Quality Assurance/Quality Improvement
Referral/Collaborative Care	Special Populations	Physical Therapeutic Procedures	

The task force then utilized all of the identified competencies to create a living document that details three essential components: (1) what the TCC graduate doctor is able to do; (2) how the TCC graduate doctor approaches clinical practice; and (3) a clear definition of the TCC graduate doctor as a professional. Each of the three components is characterized by domains, learning outcomes, assessment strategies and related clinical competencies.

Process for Topic Identification

During the development of this document, the task force identified three areas that need more emphasis in the curriculum: clinical reasoning, communication, and evidence-based practice. It was determined that these three areas merited consideration as potential Quality Enhancement Plan (QEP) topics. The evidence for pursuing these choices was derived from analysis of both internal and external performance measures. These measures included performance on the National Board of Chiropractic Examiners

(NBCE) examinations, parts II and III; Clinical Skills Competency Exams (CSCE) I and II; and the Intern Global Assessment (IGA). The CSCE I, CSCE II, and IGA are administered to students during various stages of their clinical experience and are the most direct institutional measures of clinical competency.

The NBCE is an organization that develops, administers and scores examinations used to evaluate various areas of competency. Licensing agencies that regulate the practice of chiropractic within each state use NBCE examination scores in their evaluation of candidates for licensure. Parts II and III of the NBCE exams address topics related to clinical competency. Analysis of data from the NBCE exams related to the potential QEP topics was analyzed where applicable. TCC students performed below the national mean scores as well as institutional expectations (Table 2.3).

Table 2.3: National Boards Mean Scores 2005 – 2007*

	Case History	Clinical Diagnosis	X-ray Diagnosis	Special Imaging	Clinical Lab	Case Mgmt
Part II						
General Diagnosis	**490**	**521**				
Neuromusculoskeletal Diagnosis	**489**	**491**				
Diagnostic Imaging			**468**	**467**		
Physiotherapy	**479**					
Part III	**442**	**447**	**426**		**468**	**443**
Composite Mean	**475**	**486**	**447**	**467**	**468**	**443**
Part IV	**80/80**		**66/67**			**79/79**

*Mean scores for Parts II and III are relative means compared to a national mean of 500.
Mean scores for Part IV are TCC Pass rate compared to the all colleges pass rate (TCC/All Colleges).

The CSCE I and CSCE II are conducted in Objective Structured Clinical Examination (OSCE) format at defined intervals during a student's clinical experience. The IGA's are summary evaluations conducted by clinic faculty. Data from these evaluations related to the specific topics of diagnostic reasoning and communication provide insight into student attainment of competency in these areas. While diagnostic reasoning is not measured directly by these assessments, several areas that require specific diagnostic reasoning skills were analyzed (see Table 2.4).

Diagnostic reasoning, as indicated in Table 2.4, consistently falls below overall performance levels on all three clinical competency measures (CSCE I, CSCE II and IGA). The students performed particularly poorly in areas such as differential diagnosis

and selecting appropriate diagnostic procedures, which require higher levels of diagnostic reasoning skills.

Performance measures related specifically to diagnostic reasoning topics are presented as mean scores in Table 2.4. The "Overall Exam Mean" indicates the combined score on all competencies measured in the specific assessment, not just those related to diagnostic reasoning. Passing scores for a given competency are set at 70%.

Table 2.4: Diagnostic Reasoning

Performance Measure	CSCE I	CSCE II	IGA
Information collected lead to diagnosis	61.3%	64.6%	75.0%
Differential diagnosis	59.2%	61.2%	69.3%
Diagnosis	68.4%	72.4%	69.3%
Appropriate diagnostic tests or procedures	57.3%	57.7%	76.2%
Case Management	69.0%	71.8%	77.0%
Overall Exam Mean	**79.0%**	**81.3%**	**78.0%**

Communication skills, indicated in Table 2.5, are measured both by faculty observation and standardized patient feedback during the CSCE I and CSCE II exams. Skills include both verbal and written communication. While there are some areas of deficiency in communication compared to overall performance, there are other areas at or above the overall exam mean. Several areas of this competency are not equally measured in the assessment methods and cannot be compared (Table 2.5).

Table 2.5: Communication

Performance Measure	CSCE I	CSCE II	IGA
Vocabulary consistent with patient understanding	69.2%	78.0%	76.0%
Clear and organized explanations	72.6%	71.4%	NA
Communicated with genuineness and empathy	83.2%	84.1%	NA
History	77.0%	78.3%	76.0%
Record Keeping	NA	NA	75.2%
Doctor Patient Relationship	NA	80.4%	81.0%
Overall Exam Mean	**79.0%**	**81.3%**	**78.0%**

In conjunction with the Southern Association of College and Schools-Commission on Colleges (SACS-COC) requirements to develop a QEP, a QEP Steering Committee (see Appendix I for list of members) was formed in January 2008. Based on two years of effort by the TCC Graduate Task Force, a recommendation was forwarded to the QEP Steering Committee that clinical reasoning, communication, and evidence-based practice be considered as three possible QEP topics. In order to select the final topic for the QEP, key focus groups were identified to review the potential topic choices, solicit additional topic choices and to rank all choices by their perceived importance. The

following groups met in January and February of 2008 either in meetings or through email and voice mail:

- Executive Committee of the TCC Board of Regents;
- Executive Committee of the TCC Alumni Association;
- TCC President's Cabinet;
- 60% of the Faculty Association membership;
- Approximately 45% of the student body leadership, representing students from each trimester who, in turn, discussed the rankings with their classmates from each term.

The complete results of these focus groups are found in Table 2.6, with "Clinical Reasoning" being the number one choice by four out of the five groups. After receiving input from all focus groups, the QEP Steering Committee reviewed the topic rankings and discussed the merits of each possible topic. Ultimately, the Committee decided upon "Clinical Reasoning" as the best choice for the QEP topic.

Table 2.6: Topic Ranking

Topic	Board of Regents	Alumni Association	Cabinet	Faculty Association	Student Leaders	Priority
Clinical Reasoning	1	2	1	1	1	**1**
Communication	2	1	2	2	3	**2**
Evidence-Based Practice	3	3	3	3	2	**3**

QEP Title and Definition

On Feb. 14, 2008, the Steering Committee met and decided on a title for the QEP topic. This proposed title was forwarded to and approved by the TCC SACS Leadership Team:

"From Student to Clinician: Enhancing Clinical Reasoning Across the Curriculum".

On March 6, 2008, after reviewing the literature on clinical reasoning, the QEP Steering Committee developed the following working definition:

"Clinical reasoning is a problem-solving process that enhances the development of clinical thinking and decision making in patient care. It involves the movement from accumulation of knowledge to the incorporation of skill, expertise and evidence leading to sound clinical judgment."

Delegation of Responsibilities

Once the working definition was determined, the QEP Steering Committee was divided into subcommittees (see Appendix II) with each subcommittee charged with writing a specific chapter for the document. However, the entire QEP Steering Committee

discussed different curricular and teaching models and other methods of incorporating or enhancing clinical reasoning into learning. Some of the ideas were: restructuring the curriculum, improving course syllabi, enhancing teaching methodology and assessment measures, and expanding the current use of standardized patients in the assessment process and in the classroom. The QEP Steering Committee also discussed the need to increase the amount of student feedback in the assessment process. The Committee stressed that assessment measures must be of sufficient quality and quantity to accurately ascertain outcomes at both the course and programmatic levels. The QEP Steering Committee and/or various subcommittees met on a regular basis to review, critique, and discuss the progress made on the plan preparation and implementation until the document was completed.

Anticipated Benefits of the QEP

While the goal of the QEP is enhancement of the students' clinical reasoning skills, the long-term effect is the benefits to the patients the graduates will treat in practice. Thus, the QEP addresses patient-centered care as expressed in the College's mission and vision statements. An important corollary of the QEP is anticipated to be increased student learning through greater focus on the active learning process and, thus, student satisfaction with the academic program. The improved curriculum should enhance the College's stature as an educational institution within the profession and enable the College to recruit and retain quality students. An associated benefit of the QEP should be an improvement in National Board Scores**.**

CHAPTER 3: LITERATURE REVIEW

Introduction

Professional judgment and decision making are inexact sciences that require basic knowledge, reflective practice and clinical reasoning. A subcommittee (Appendix II) was charged with reviewing the literature. The focus of this literature review was to identify relevant literature on theories and models of clinical reasoning, curricular and course models, instructional strategies to enhance clinical reasoning, and assessment methods. Multiple databases were searched from 1978 – 2008 using appropriate subject headings and key words. Inclusion criteria limited the search to peer-reviewed articles, books, monographs and dissertations. See Table 3.1 for a list of databases and subject headings/key words.

Table 3.1: **Databases and Subject Headings/Key Words**

Databases	Sample of Subject Headings/Key Words
CINAHL Plus ERIC Index to Chiropractic Literature (ICL) PsychINFO PubMed TimeLIT	Assessment Methods Basic Education Clinical Competence Clinical Expertise Clinical Judgment Clinical Reasoning Cognition Competency-Based Education Curriculum Decision Making Diagnosis Diagnosis Differential Education, Medical Education, Nursing Educational Measurement Health Sciences Education Judgment Knowledge Novice to Expert Reasoning Problem-Based Learning Problem Solving Research Teaching Methods

Theories and Models of Clinical Reasoning

Clinical reasoning is a complex process that brings together multidimensional components of knowledge and skill in order to achieve effective care, and it forms a central component of physician competence (Norman, 2005). It includes “the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and

community being served"(Epstein & Hundert, 2002). Synonyms associated with clinical reasoning include problem solving, decision making, and judgment.

Over the past three decades, clinical reasoning has been focused mainly on diagnosis, cognitive processes, and knowledge-based structures that distinguish between experts and novices (Papa & Harasym, 1999). Early cognitive theories of expertise development suggested that simple knowledge expansion is responsible for expert status. Subsequent research has modified this stance to theorize that expertise is related to shifts in knowledge or knowledge restructuring (Schmidt & Rikers, 2007). Theories that have been used to explain clinical reasoning and the differences between experts and novices deal with analytic processes and non-analytic resources (Moulton, Regehr, Mylopoulos, & MacRae, 2007).

Early clinical reasoning research led to the development of a clinical problem-solving model referred to as the hypothetico-deductive method (Norman, 2005). This approach relates to the way a doctor processes patient-relevant information. These analytic processes require greater mental demand and increased cognitive load. Hypothesis generation in clinical reasoning is theorized to be related to the directionality of inference. Forward reasoning is defined as hypothesis generation based upon the data presented in a clinical problem. Backward reasoning is defined as data generation on the basis of a hypothesis. Using the hypothetico-deductive method, an expert uses forward reasoning while a novice uses backward reasoning (Patel, Groen, & Arocha, 1990; Schmidt & Rikers, 2007).

Subsequent research into the hypothetico-deductive method gave rise to other phenomena related to diagnostic accuracy referred to as 'content specificity' or 'case specificity' (Bordage, 2007; Norman, 2005). Content specificity observes that the successful solving of one specific clinical problem does not accurately predict the successful solving of another clinical problem, even within an area of specialization (Eva & Norman, 2005). Conversely, diagnostic accuracy is strongly related to the context in which a clinical problem is being addressed. Context specificity relates to the environment (context) in which the clinical cases occurred and the number of cases encountered in that environment. Context specificity in clinical reasoning requires the student to build an adequate database, through many clinical examples, to engage in problem solving. These examples should represent a variety of specific condition presentations (Eva, 2005).

Non-analytic resources are automatic and are associated with pattern recognition, heuristics, encapsulation and scripts. Experts use these mechanisms daily with minimal mental demand or cognitive load (Moulton et al., 2007).

Pattern recognition represents a non-analytical resource related to clinical reasoning and improved diagnostic accuracy. It is derived from clinical knowledge accumulated from multiple past instances or examples (Papa, Shores, & Meyer, 1990). Research has shown improved differential diagnostic accuracy with instruction focused on pattern recognition when compared to traditional classroom instruction (Papa, Oglesby, Aldrich, Schaller, & Cipher, 2007). Akin to pattern recognition, prototype theory focuses on the organization of memory around representative cases. The use of clinical cases exhibiting prototypical signs and symptoms of a disease (typical) combined with more difficult cases (atypical) leads to improved diagnostic accuracy (Bordage, 2007).

Heuristics, used in information processing, allow clinicians to "estimate the degree that signs/symptoms match prototypical signs/symptoms in a given disease category" (Papa et al., 2007). Heuristics are shortcuts to reasoning. As the use of heuristics evolves, they have been seen to yield better clinical reasoning outcomes in some instances (Eva, Neville, & Norman, 1998).

In the course of their training, students develop mental structures that explain disease causes in terms of general biology or pathophysiological processes (Schmidt & Rikers, 2007). As they start their clinical learning journey, students engage in error-prone processes that focus on isolated signs and symptoms rather than symptom patterns. Through repetition and application of acquired knowledge, their knowledge structures change. Detailed causal, pathophysiological knowledge becomes encapsulated(Schmidt & Rikers, 2007). Encapsulated knowledge reorganizes into 'illness scripts' as students practice with actual patients. Illness scripts contain relatively little knowledge about pathophysiological causes of symptoms but are rich with clinically relevant information about the disease (Irby, 1994; Schmidt & Rikers, 2007). Scripts develop from repeated experiences with real clinical problems resulting in specific organization of clinical information (Charlin, Boshuizen, Custers, & Feltovich, 2007).

When considering the appropriate approach for our QEP, it was determined that the methodology should easily integrate into the existing curricular plan as set out in "The TCC Graduate: An Educational Blueprint for the 21st Century". This document was developed as a plan to guide the College's doctoral curriculum and was heavily influenced by the cognitive science research literature in health education. Literature focused on the contextual approach to clinical reasoning was also reviewed. The contextual approach is referred to as tacit, imagistic and a "deeply phenomenological mode of thinking". The focus is not on disease but on the "human world of motives and values and beliefs", or the "illness experience" (Mattingly, 1991). Additional favorable factors in selecting the cognitive approach were the existing knowledge base of the faculty, previous experience with instructional strategies, and the availability of educational resources.

Curricular and Course Models of Clinical Reasoning

A key goal in the early stages of health professions education is integration of clinical information into basic science courses. Recent research (Woods, 2007) has demonstrated the importance of basic science knowledge in the development of clinical reasoning skills. The ability to use basic science to explain the causal relationships and explanatory pathways for clinical features is essential for the clinical novice (Woods, Brooks, & Norman, 2007). Curricular models such as Problem-Based Learning (PBL), Case-Based Learning (CBL), Clinical Presentation Curriculum, Application-Oriented Curriculum, An Integrated Medical Encounter (AIME), and Team-Based Learning (TBL) provide opportunities for integration.

Problem-Based Learning (PBL)

Following the lead of cognitive science, medical curriculum has been reorganized around the context of clinical problems. PBL was pioneered by Dr. Howard Barrows and McMaster's University in the 1970's (Papa & Harasym, 1999). In PBL, students are presented with a case or a problem that they might encounter in their daily practice, and they establish objectives that will help them achieve their learning goals. The primary

educational objectives of PBL are the acquisition of an integrated body of knowledge to the problems, and the development of problem-solving skills (Mandin, Jones, Woloschuk, & Harasym, 1997). The PBL environment is designed to help students construct an extensive and flexible knowledge base, become effective collaborators, develop self-directed learning skills, develop effective problem-solving skills and become intrinsically motivated to learn (Loyens, Rikers, & Schmidt, 2006).

Case-Based Learning (CBL)

CBL is a relatively new variation of PBL in health professions education. As with PBL, learners in CBL are presented with a clinical problem and are provided time to define and resolve the problem (Slavin, Wilkes, & Usatine, 1995). CBL can be utilized to assist students in both attaining requisite knowledge and enhancing clinical reasoning skills. The benefits of CBL include: 1) contribution to students' appropriate organization of information for retention and later use in clinical reasoning situations; 2) generation of experiences that students would not otherwise have; 3) increased visibility of students' clinical reasoning processes; and 4) enhancement of student confidence (Thomas, O'Connor, Albert, Boutain, & Brandt, 2001)

There are important differences between CBL and PBL. First, in CBL students are required to do some advance preparation on the topic prior to the discussion. This may entail reading general articles on the topic, or some students may be asked to read specific articles to facilitate the encounter. Second, the facilitator in CBL plays a more active role in keeping the discussion on track and for making sure that the students are correctly answering the objectives. Finally, there typically is very little post-session work to be performed by the students. CBL is considered by many to be a 'guided inquiry approach' and PBL is considered an 'open inquiry approach' (Srinivasan, Wilkes, Stevenson, Nguyen, & Slavin, 2007).

Both the University of California, Los Angeles and the University of California, Davis changed their curriculums from PBL to CBL between 2001 and 2004. Students in that time frame were exposed to both forms of learning and the overwhelming majority of students preferred the CBL format over the PBL format. The students at both institutions felt that CBL was a better use of time, that they had fewer tangents to deal with, and that it decreased the amount of outside work and busy work associated with the PBL format. Additionally, the learners felt they had more time to problem-solve (Srinivasan et al., 2007).

Clinical Presentation Curriculum

In the mid 1990s the University of Calgary Medical School modified its curriculum to what is called a "Clinical Presentation" curriculum. The first iteration was administered in the fall of 1994 (Woloschuk, Harasym, Mandin, & Jones, 2000). This model organized teaching around 120 common clinical presentations seen by physicians. These Clinical Presentations could take the form of historical points (e.g. chest pain), physical examination signs (e.g. hypertension), or laboratory abnormalities (e.g. elevated serum lipids) (*University of Calgary Faculty of Medicine: Operating philosophy*, 2008). Each presentation is organized according to a variable number of causal diagnostic categories. Each category is prototypical and exhaustive lists of differential diagnoses for each category are avoided (Mandin et al., 1997).

Application-Oriented Curriculum

Literature reviews performed by Papa have shown that two major themes appear in medical education: 1) expertise tends to be task- and problem-specific, so it is dependent on the development of the task- and problem-specific knowledge base; and 2) the development of expertise depends upon the student receiving enough focused practice. But expertise is also about how the knowledge is integrated and organized by the learner; thus, a successful medical curriculum must emphasize gaining knowledge, practicing skills, and integration and organization of material around specific problems (Papa, 2008). One way to achieve this is for faculty to place greater import upon comprehension and application-oriented instruction. This reduces the time spent on information acquisition, allowing for greater time on task-focused, deliberate practice. By working through multiple cases, the students use prior knowledge gained from previously solved problems when solving new problems.

Application-Oriented Curriculum is based on several elements: 1) the development of clinical competencies as a progression of intellectual processes and knowledge-based capabilities; 2) the use of Bloom's conceptualization of information acquisition, comprehension and application as both the core objectives of preclinical instruction and the order by which to sequence preclinical instruction; and 3) the adoption of emerging, evidence-based learning theories and instructional methodologies demonstrating ways to improve information acquisition, comprehension and application-oriented activities (Papa, 2008).

An Integrated Medical Encounter (AIME)

AIME was developed at Johns Hopkins University School of Medicine in 2003 to teach the students communication and clinical reasoning skills in an integrative format. The curriculum's objectives were for students to demonstrate strategies for patient-centered communication, demonstrate strategies for clinical reasoning, understand the link between communication and clinical reasoning, and appreciate both biomedical and psychosocial issues in patient care (Windish, Price, Clever, Magaziner, & Thomas, 2005). The clinical reasoning aspect of the curriculum was focused on developing a patient-specific problem list and differential diagnosis.

Team-Based Learning (TBL)

Team-based learning is a specialized, in-depth approach to the use of small groups in teaching. It calls for restructuring a course in a way that facilitates the development of newly formed groups into teams and then challenges those teams with complex learning tasks. As members of a team, individual students commit to a higher level of effort in their learning, and learning teams are able to solve problems beyond the capabilities of the individual team members (Michaelsen, Knight, & Fink, 2004).

There are three keys to using learning teams effectively (Michaelsen et al., 2004). The first key is promotion of ongoing accountability. TBL holds both individuals and groups accountable for learning and performance through the use of the individual and group Readiness Assessment Test (RAT). The second key is the use of linked and mutually reinforcing cases. These clinical cases are related to the concepts that were assessed in the RAT. The third key is the group discussion as a vehicle for both individual and team expression of ideas and opinions regarding the cases.

Challenging instructional situations, such as large class size, high level of student diversity, and courses that emphasize thinking skills, can be helped through TBL. Practical application of previously gained knowledge is another advantage of TBL (Michaelsen et al., 2004).

In summary, aspects of CBL, TBL and Application-Oriented Curriculum have been incorporated into the College's curricular approach to enhance clinical reasoning. These curricular models were chosen because of a greater emphasis on structured active learning. Additionally, research has shown greater student satisfaction with these methods.

Instructional Strategies to Enhance Clinical Reasoning

There are many studies that advocate teaching of various clinical reasoning strategies, including specific types of knowledge representation, schema, algorithms and disease patterns (Ark, Brooks, & Eva, 2006; Bowen, 2006; Eva et al., 1998). A major factor in successful teaching of clinical reasoning is the difficulty of recognizing and applying relevant knowledge learned in a situation to other similar situations, i.e., analogic transfer (Eva et al., 1998). Two approaches appear effective to facilitate transfer: the use of multiple cases, and deliberate practice (Ericsson, 2007; Eva, 2005). As Norman suggests, "Focusing instruction on one processing strategy or another may be less important than engaging students with many problems which are carefully sequenced to optimize learning and transfer" (Norman, 2005).

There are a variety of instructional strategies that can be applied to the curricular models TCC is adopting. Written cases can be analyzed by individual learners or by small groups with either verbal or written discussion. Standardized patient cases can take place with live interviews or video-recorded viewing. Web-based cases are interactive and can link to multiple resources.

An example of a web-based case resource for teaching clinical reasoning is the Knowledge Based Inference Tool (KBIT). KBIT simulates the differential diagnostic performance of clinicians by creating knowledge-based structures and decision-making processes used by clinicians (Papa, Stone, & Aldrich, 1996). KBIT uses artificial intelligence algorithms to:

- transform an expert's knowledge-base for a given problem and its associated disease differential into a web-based instructional tool.
- construct and present disease prototypes as well as numerous samples and practice cases for the problem and differential at hand.
- assign a typicality estimate to all constructed cases.
- use those typicality estimates to sequence the order of each disease case presentation.
- construct and deliver pattern-recognition-oriented feedback that addresses each student's specific diagnostic error.

A recent study demonstrated students' enhanced ability to perform a differential diagnosis using KBIT (Papa et al., 2007).

Reflective practice has been suggested to be an important instrument in improving clinical judgment and developing clinical expertise. Reflective practice is defined as the

ability of clinicians to think critically about their own reasoning and decisions (Mamede & Schmidt, 2004). The construct of reflective practice is largely influenced by the work of Schön (Schön, 1987). Reflective clinicians demonstrate a willingness and ability to reflect about their own thinking processes and to critically examine conclusions and assumptions about a particular clinical problem. Reflective practice had a positive effect on diagnosis of complex, unusual cases. Non-analytical reasoning was shown to be as effective as reflective reasoning for diagnosing routine clinical cases. The findings of Mamede's study in 2008 support the idea that reflective practice may particularly improve diagnoses in situations of uncertainty and uniqueness, reducing diagnostic errors (Mamede, Schmidt, & Penaforte, 2008).

A learner-centered model of clinical education has been developed based on cognitive learning and reflective practice that focuses on a collaborative model for case presentations in the clinical outpatient setting (Wolpaw, Wolpaw, & Papp, 2003). This model links learner initiation and faculty facilitation in an active learning conversation. A mnemonic for this model called SNAPPS consists of six steps:

- S - summarize briefly the history and examination findings.
- N - narrow the differential diagnosis to two or three relevant possibilities.
- A - analyze the differential list by comparing and contrasting the possibilities.
- P - probe the learner by asking questions about uncertainties, difficulties or alternative approaches.
- P - plan management for the patient's health related issues.
- S - select a case-related issue for self-directed learning.

Teaching students to present cases in this SNAPPS format encourages them to reflect on the clinical problem and possible solutions before questioning the faculty supervisor. It appears to be a useful way to promote higher-level clinical reasoning skills.

Assessment Methods

Assessment influences students' learning processes (Newble & Jaeger, 1983). Health professions educational programs use many different methods to meet their various assessment needs. A commonly used approach for assessment of clinical reasoning is the use of an authentic clinical scenario as a stimulus format, usually in the form of a simulation. This simulation is accomplished, most commonly, through the use of standardized patient encounters and written simulation. The literature also identifies various methods of written assessment effective for evaluation of clinical reasoning. These written assessments include extended matching questions (EMQ), key features questions, and script concordance questions.

Extended Matching Questions (EMQ) (Case & Swanson, 1993) are a form of multiple choice questions that are widely used because they are highly reliable, easy to score and offer broad sampling. In a recent study, EMQ provided higher scores for pattern recognition than hypothetico-deductive reasoning (Beullens, Struyf, & Van Damme, 2005). The authors concluded that EMQ could be used to assess cognitive skills because the participants who scored the most correct responses were more likely to demonstrate forward reasoning. In other words, the students are working from the data to a diagnostic hypothesis. A year later, the same investigators compared EMQ and the Diagnostic Thinking Inventory (DTI). They reported that there was a relationship between those assessment tools and reported that the EMQ could be used to assess clinical reasoning ability (Beullens, Struyf, & Van Damme, 2006).

Bordage and Page (Page & Bordage, 1995) developed key features problems that test clinical decision-making skills by focusing on only the critical steps of each decision. These steps are divided into two types. The first type is a step in the decision-making process that is essential for an accurate diagnosis. The second type is a step that focuses on an area where common errors related to the case would be made. This assessment approach can test a large number of clinical problems in any one examination with acceptable reliability and validity.

The Script Concordance Test (SCT) (Charlin, Roy, Brailovsky, Goulet, & Van Der Vleuten, 2000) is based on the illness scripts theory of clinical expertise development (Schmidt, *et al.*, 1990); (Charlin, Tardif, & Boshuizen, 2000) and is designed to assess the extent of knowledge organization by measuring the level of script development. The SCT consists of short clinical scenarios, each containing all the relevant clinical information needed to respond to sets of test items designed to assess the diagnostic, investigative or therapeutic knowledge of the subject. Each item posits several diagnostic hypotheses. New information is presented that may validate or alter the hypothesis. The examinee selects the likelihood of changing his/her hypothesis and that selection is compared to the selection of a panel of experts. Each item is scored using a five-point Likert scale that prevents cueing. Thus, the SCT focuses on the interpretation of clinical information as part of the clinical reasoning process. It is easily administered with a consistent and straightforward scoring system, and is reliable and valid (Carriere, Gagnon, Charlin, Downing, & Bordage, 2008).

Case-based Discussion (CbD), or chart-stimulated recall, uses the patient's health record to assess clinical judgment and reasoning (Norcini & McKinley, 2007). CbD enables a faculty rater to assess a student's rationale for diagnostic and treatment decisions. The CbD has acceptable reliability and validity (Goulet, Jacques, Gagnon, Racette, & Sieber, 2007).

In addition to all the assessment tools mentioned above, Bordage, *et al.* developed the Diagnostic Thinking Inventory (DTI) in 1990 to provide insight into the clinical reasoning process (Bordage, Grant, & Marsden, 1990). The DTI is designed to evaluate reasoning style and attitudes and assumes that skill in diagnosis is related to these characteristics. A major advantage of this instrument is that it is independent of textbook knowledge. Thus, it is able to provide direct insight into the nature of the subject's clinical reasoning process. The DTI is a self-evaluation questionnaire of 41 items, each intended to assess one of two aspects of diagnostic thinking: 1) flexibility of thinking, or 2) knowledge organization. All items consist of two opposing statements separated by a six-point semantic scale representing a continuum between the two statements. The DTI has been shown by its developers and others (Jones, 1997; Rahayu & McAleer, 2008; Round, 1999) to have acceptable reliability and validity.

The Health Sciences Reasoning Test (HSRT) was developed for use by educators to assess the critical thinking skills of health sciences students and professionals. The HSRT is comparable to other widely used critical thinking skill tests. It consists of 33 multiple-choice questions that target those core critical thinking skills regarded to be essential elements in a health science educational program. No discipline-specific health sciences content knowledge is presumed on the HSRT. The primary use of the HSRT is to gather valid and reliable data about group baseline, entrance- or exit-level critical thinking skills. This measurement tool appears to have acceptable reliability and

validity. It can also be used in program evaluation with focus on effectiveness (Facione & Facione, 2006).

Objective Structured Clinical Evaluations (OSCE) are a commonly used form of assessment in health professions education. These assessments use standardized patients (SP) to present life-like case scenarios in a clinical context and/or written stations in order to assess knowledge and decision making (Harden & Gleason, 1979). An SP is a person trained to enact a case scenario, or an actual patient using his/her own history and physical exam findings, for the instruction, assessment, or practice of communication, examination and decision making. OSCE formatted assessments provide a platform to observe clinical decisions in a controlled environment. Stations can be designed to lead the examinee to a crossroad at which point a clinical decision is required through employment of reasoning skills. It has been demonstrated that repeated exposure to clinical decision making and reasoning scenarios in OSCE format assessments increases the ability and desire of students to problem solve (Durak, Caliskan, Bor, & Van Der Vleuten, 2007).

Summary

Sound clinical reasoning is a vitally important requirement for clinical expertise, which is a fundamental component of clinical competence. This literature review presents current theories and models of clinical reasoning; curricular and course models to facilitate clinical reasoning; effective instructional strategies that increase clinical reasoning ability; and multiple assessment methods that, when applied appropriately, can provide insight into the clinical reasoning process.

CHAPTER 4: DEVELOPING THE QEP

Introduction and Conceptual Model

After selecting the topic and conducting a thorough literature review, a conceptual model for the QEP was developed. Consideration was given to the necessary steps to create an instructional model that would foster higher level learning, specifically in the area of clinical reasoning. It became apparent that to accomplish the desired student learning, a series of steps increasing complexity would be required. These steps would need to build upon each other and progressively develop clinical reasoning skills in order to lead a student from novice to expert.

Clinical reasoning first requires that a learner have a certain knowledge base from which to draw. Step one of the conceptual model is the foundation. This level is designed to develop a base of knowledge for the learner to later use when applying decision-making skills. This step is targeted during the first year of instruction in the curriculum. It focuses primarily on the acquisition of basic science knowledge and its relevance to clinical practice.

Once a sufficient level of knowledge is obtained, the basic concepts of clinical reasoning are then introduced. This process begins with a blending of the acquisition of knowledge and the incorporation of that knowledge into a decision-making process. This transition period, while subtle, is critical to the future development of clinical reasoning skills. This second step in the model is implicitly included in the development of appropriate courses.

The third step of the model is demonstration. Patient cases, requiring the use of both basic science knowledge and fundamental clinical skills, are introduced. These cases allow the expert to “think out loud” and demonstrate the critical reasoning process. A learner then applies these abilities, with guidance, to similar cases. When the skills required for clinical reasoning are modeled by experts, the learner is expected to begin recognizing relevant aspects of the steps necessary in making sound clinical decisions.

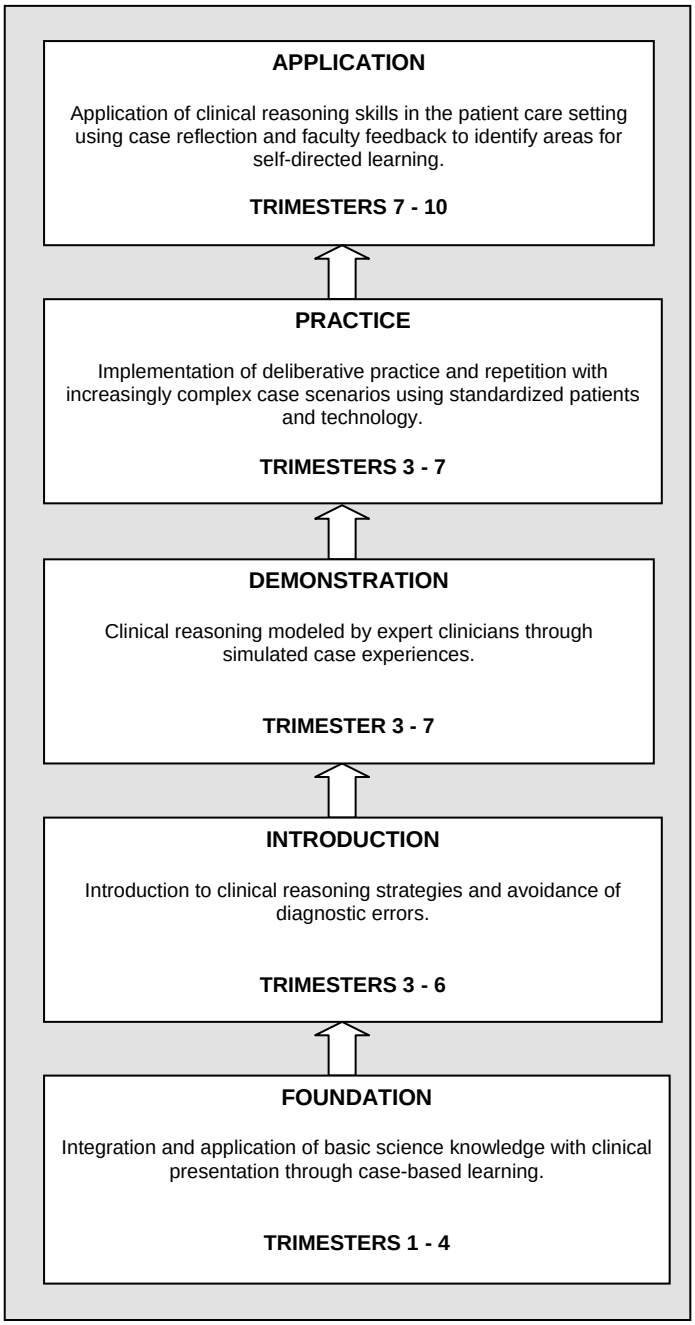
Once basic clinical reasoning skills have been developed, step four of the conceptual model is repetition and practice of the skills. Multiple cases are presented to the learner in various formats that require the use of previously developed clinical reasoning skills. This process provides repetitive practice that leads to the recognition of patterns related to case presentation. Pattern recognition is a critical step in clinical reasoning. It has been demonstrated that physicians rely upon the recognition of elements seen in previous cases, combined with their knowledge base, to ultimately form a diagnostic impression. Steps two, three, and four are targeted in the second year and the beginning of the third year of instruction in the curriculum.

The final step in the model, in the last year of the curriculum, is application of the clinical reasoning process in real world settings. Students engaged in patient management will be expected to integrate clinical reasoning into the decision-making process related to patient care. Direct patient care allows the student to experience increasingly subtle variations in patient presentations, leading to a higher level of reasoning. Additionally, previous knowledge and experiences can be drawn upon to distinguish the key, differentiating elements used to make clinical decisions. This final step is seen as the

capstone experience, utilizing all of the tools acquired during each step of the clinical reasoning development process.

Taking a student from novice to expert in any skill requires a deliberate and sequential approach. This model, as illustrated in the steps below, begins with a solid foundation of appropriate, relevant knowledge and culminates with the direct, practical application of clinical reasoning skills.

STEPS TO CLINIAL REASONING



QEP Design Plan

A subcommittee of the QEP Steering Committee (see Appendix II for subcommittee members) was charged with the responsibility to develop effective methods for integrating clinical reasoning across the curriculum. The first step was to determine programmatic outcomes. The programmatic outcomes were derived from the clinical decision making, clinical reasoning, and judgment domains found in the "The TCC Graduate: An Educational Blueprint for the 21st Century".

The programmatic outcomes are:

1. Integration and application of basic science knowledge with clinical presentations.
2. Introduction and application of clinical reasoning strategies in pre-clinical settings.
3. Application of clinical reasoning skills in patient care settings.

The second step was to develop Student Learning Outcomes (SLOs) that would lead to the fulfillment of each programmatic outcome. For the first programmatic outcome the following SLOs were formulated. The student will:

a. Acquire requisite basic science knowledge as a foundation for clinical reasoning.
b. Demonstrate the relevance of basic science information to clinical application.
c. Understand the basic science mechanisms that relate to clinical presentation and findings.

For the second programmatic outcome, the following SLOs were formulated. The student will:

a. Demonstrate history-taking, examination and diagnostic skills as a foundation for clinical reasoning.
b. Incorporate basic science knowledge to formulate a diagnosis based on acquired patient information.
c. Demonstrate the use of analytic processes (hypothetico-deductive reasoning) and non-analytic resources (pattern recognition) when solving clinical problems;
d. Apply various decision aids and evidence to the clinical decision process.

For the third programmatic outcome, the following SLOs were formulated. The student will:

a. Demonstrate the ability to manage clinical uncertainty in the decision-making process.
b. Identify common errors in clinical reasoning and provide strategies to avoid them.
c. Demonstrate the use of regular self reflection in the clinical learning setting.
d. Effectively utilize clinical reasoning in patient diagnosis and treatment.

These SLOs, or a variation of them, are found in the QEP-focused courses where appropriate. In addition, some of the courses have additional clinical reasoning SLOs that are course-specific.

The third step in the development of the QEP was to identify potential pilot courses. The full curriculum was reviewed and four pilot courses were chosen based upon their sequencing in the curriculum, their clinical application capabilities, and the feasibility of incorporating instructional methods appropriate for fostering clinical reasoning. The four courses are:

- Spinal Anatomy (trimester one)
- Clinical Case Applications (trimester six)
- Clinic I (trimester seven)
- Orthopedics III (trimester eight)

The fourth step in the process was integration of clinical reasoning throughout the curriculum. Course syllabi were extensively reviewed and additional courses were then selected to be part of the plan. These courses were selected because they were either natural building blocks for knowledge or courses where clinical reasoning could be demonstrated and/or applied. The Steering Committee anticipates that the implementation of the selected courses and the demonstrated beneficial effects will motivate other faculty members to incorporate many of the teaching and assessment strategies into their own courses. The existing courses in the curriculum to be included in the overall QEP integration are:

- Gross Human Anatomy I (trimester one)
- Human Biochemistry (trimester one)
- Gross Human Anatomy II (trimester two)
- Spinal Biomechanics (trimester two)
- Cellular and Cardiovascular Physiology (trimester two)
- Clinical Neurology (trimester six)
- Case Management I (trimester seven)
- Clinic II (trimester eight)
- Clinic III (trimester nine)
- Clinic IV (trimester ten)

There was determined to be a need for new courses specifically addressing clinical reasoning early in the educational process. Three new courses were thus placed in trimesters three, four and five and were modeled on the concepts presented in the pilot course, Clinical Case Applications (CCA). These three new courses are: CCA I (trimester three), CCA II (trimester four) and CCA III (trimester five). To maintain a reasonable course load within trimesters 3-5, contact hours for CCA I, II and III were drawn from existing courses. The newly established CCA courses will incorporate material from the affected courses within a clinical context.

Effective communication and history-taking skills are intrinsically linked to clinical reasoning skills. Therefore, two new courses in communications and history-taking have been added to the curriculum. They are: Basic Communication and History-Taking Skills (trimester three) and Advanced Communication and History-Taking Skills (trimester four).

Table 4.1 reflects the entire QEP curriculum.

Table 4.1: Courses in the QEP Curriculum

Courses	Trimester
Gross Anatomy I Spinal Anatomy Human Biochemistry	1
Gross Anatomy II Spinal Biomechanics Cellular & Cardiovascular Physiology	2
Clinical Case Applications I Basic Communication and History Taking Skills	3
Clinical Case Applications II Advanced Communication and History Taking Skills	4
Clinical Case Applications III	5
Clinical Case Applications IV Clinical Neurology	6
Clinic I Case Management I	7
Orthopedics III Clinic II	8
Clinic III	9
Clinic IV	10

The fifth step in the process was identification of teaching strategies to promote clinical reasoning. After an exhaustive review of the literature, a variety of instructional and curricular models were selected. Examples of strategies that may be utilized are outlined in Table 4.2.

Table 4.2: Teaching Strategies

Standardized patients (SP) (Ainsworth et al., 1991; Brownell Anderson, Stillman, & Wang, 1994) Definition: A method that uses individuals who have been trained to portray various clinical conditions and scenarios or actual patients who have been trained to standardize their responses about their respective conditions. Description: SP are used in both teaching and assessment. The encounter closely mirrors an actual patient interaction and, therefore, offers a more authentic presentation of clinical reality.
Case-based learning (Mandin, Harasym, Eagle, & Watanabe, 1995; Mandin et al., 1997; Papa & Harasym, 1999; Patel, Groen, & Norman, 1991; Schmidt, Dauphinee, & Patel, 1987; Schmidt, Vermeulen, & Van Der Molen, 2006; Srinivasan et al., 2007) Definition: A learner-centered approach to building knowledge that requires students to solve clinical problems using real world examples. Description: Varied case formats are utilized, including written, standardized patients and computer-based. Written cases range from brief scenarios used to illustrate a point to elaborate unfolding cases with integrated questions to help students develop clinical reasoning patterns and apply knowledge. Standardized patient cases are designed to fit specific objectives, where emphasis and complexity can be controlled. Computer-generated cases increase the variability in presentation of case details and allow the incorporation of visual and auditory media.
Team-based learning (Meeuwsen, 2002; Michaelsen et al., 2004; Sweet & K., 2007) Definition: A faculty-directed active learning instructional strategy where students apply and integrate knowledge in interactive groups to master concepts and develop problem-solving abilities. Description: Students are assigned to learning teams. All students have specific learning objectives regarding a topic. Prior to the team learning activity, all students are assessed on the assigned learning objectives. Student teams engage in the learning activity. All teams then share the results of their learning activity in the ensuing discussion.
Faculty modeling Definition: An instructional approach in which faculty think out loud to justify or explain case-related clinical decisions. Description: A clinician models a history and physical examination on an SP based on the clinical presentation. There are scripted “time outs” for the clinician to provide his/her rationale for asking specific history questions, performing specific diagnostic procedures, and/or developing a diagnosis and patient care decisions.
SNAPPS (Wolpaw et al., 2003) Definition: A learner-centered approach to clinical teaching that promotes higher-level clinical reasoning skills by having learners reflect on the clinical problem and possible solutions, justify their clinical decisions, and explore unanswered questions. • S – Summarize the history and physical findings. • N – Narrow the differential to two or three relevant possibilities. • A – Analyze the differential by justifying, comparing and contrasting the possibilities. • P – Probe the student/intern by asking questions about uncertainties, difficulties or alternative approaches. • P – Plan the management for the patient’s health issues. • S – Select a case-related issue for self-directed learning. Description: Students present multiple cases in the SNAPPS format to understand the

logic and rationale of the clinical thought process in formulating the diagnosis and plan of care. Students are exposed to increasingly complex cases as their clinical reasoning skills develop.
Application Oriented Teaching (Coderre, Mandin, Harasym, & Fick, 2003; Ericsson, 2004; Oglesby et al., 2008; Papa, 2008; Papa & Harasym, 1999; Papa et al., 2007) Definition: A teaching method emphasizing comprehension and application of knowledge and skills over information acquisition. Description: This method can be accomplished by task-focused, deliberate practice. By utilizing multiple cases, the students demonstrate the use of prior knowledge in solving new problems similar to previously solved problems.
Reflective practice (Moulton et al., 2007; Schön, 1983, 1987) Definition: Critical self-assessment of past actions and their consequences to gain understanding and to generate new knowledge and insights that enhance clinical reasoning in practice. Description: Reflection enhances learning through experience. Students are stimulated by faculty to systematically assess and critically analyze their clinical reasoning and formulate alternative approaches. Reflection best occurs in a challenging, but safe, learning environment through open-ended questioning and by appropriate feedback.
Electronic real-time student feedback (I-Clicker) Definition: An instructional approach utilizing electronic devices that provide instantaneous feedback to both student and instructor regarding student understanding of the concepts, questions, and cases presented in the classroom. Description: Students will use a clicker to answer questions electronically while in the classroom. An advantage of this approach is immediate feedback to student responses. The feedback can be used in reciprocal teaching whereby the students learn from each other through discussion of their answers in a collaborative group. This interactive system informs the faculty, in real time, of student understanding. This enables the faculty to focus on concepts that are unclear.

The final step of the process was to identify effective methods for course assessment and programmatic evaluation. Based upon the literature review, a variety of assessment/evaluation strategies were selected at both the course and programmatic levels. Detailed explanations of the selected assessment/evaluation strategies are found in Chapter Five.

Clinical Reasoning Design Plan for Pilot Courses

Four pilot courses for clinical reasoning will be implemented in the Summer 2009 trimester. The four courses are described below with the following information:

- Course description.
- Programmatic outcomes relating to the course.
- Course learning outcomes that reflect clinical reasoning.
- Teaching methods related to clinical reasoning.
- Assessment strategies.
- Course schedule.

Spinal Anatomy (Trimester 1)
Course Description:
This course is a study of the gross anatomy of the human spine focusing on the osseous, ligamentous and muscular structures of the cervical, thoracic, lumbar, sacral and coccygeal regions**.** It also introduces the student to the neuroanatomy of the spinal cord, spinal nerves, and the autonomic nervous system. Emphasis is placed on the important anatomical relations in the practice of chiropractic. Correlations will be made to various clinical presentations using a computer case-based program and instructor presentation of cases. The cases will emphasize clinical presentations related to spinal anatomy with contributions from other courses in trimester one when appropriate.

Programmatic Outcomes Related to Clinical Reasoning in the Course:
- Integration and application of basic science knowledge with clinical presentations.

Student Learning Outcomes Related to Clinical Reasoning:
The student will:
- Acquire requisite knowledge of spinal anatomy as a foundation for clinical reasoning.
- Correlate clinical presentation to the anatomical structures of the spine and surrounding tissues.
- Integrate knowledge of spinal anatomy with different clinical presentations.
- Demonstrate the relevance of basic science information to clinical application.

Teaching Methods Related to Clinical Reasoning:
- Design-A-Case: The primary intervention will be instructor-designed, computer-based case presentations related to spinal anatomy. The cases will follow a simple on-line format (Design-A-Case). The students will be given specific learning objectives for each case. The case starts with an initial presentation. Questions are asked relevant to the case presentation relating to epidemiology, etiology, and basic science knowledge. Once the students' responses are submitted, faculty feedback will be presented.
- Case-Based Learning: The instructor will include case presentations and clinical correlations during lecture to demonstrate the relevance between basic and clinical sciences.
- Electronic Real-Time Student Feedback (I Clicker): Students will use an electronic interactive learning system by which they answer questions electronically while in the classroom. An advantage of this approach is immediate feedback to student answers. The feedback can be used in reciprocal teaching whereby the students learn from each other by discussing their correct/incorrect answers in a collaborative group. This interactive system also informs the instructors, in real time, of students' understanding, enabling the instructor to focus on misconceptions and concept areas that are unclear.

Assessment Tools:
Student achievement in this course is assessed through three written examinations, ten quizzes and a final comprehensive examination. The four written examinations include:
- Extended matching questions (EMQ)
- Multiple choice questions (MCQ)
- Matching questions

- Clinical cases
- Diagrams

Quizzes may include MCQ, true/false and matching questions. In-class electronic real-time student feedback may also be used as an assessment tool.

Pilot Course Schedule

Summer 2009

Week	Topics
1	Introduction and overview of the vertebral column Curves, curvatures and pyramids, clinical cases Typical and atypical vertebrae
2	Quiz #1 Cervical vertebrae, occiput Overview of joints and classification Joints and ligaments of the cervical region Clinical cases
3	Quiz #2 Vertebrobasilar system and Circle of Willis, Clinical cases Thoracic vertebrae, typical and atypical
4	Quiz #3 Joints and ligaments of thoracic vertebrae. First written examination
5	Lumbar vertebrae, typical and atypical IVDs and facet joints, clinical cases Sacrum, coccyx and hip bone
6	Quiz #4 Sacroiliac joints and ligaments, clinical cases Muscles of the back
7	Quiz #5 Muscles of the back
8	Second written examination Prevertebral muscles Spinal cord, clinical cases
9	Quiz #6 Spinal cord, meninges and blood supply
10	Quiz #7 Peripheral nervous system, Cervical and brachial plexuses Lumbar and sacral plexuses, clinical cases
11	Quiz #8 Autonomic nervous system (ANS) Third written examination
12	Quiz #9 Autonomic nervous system, clinical cases
13	Quiz #10 Development of the vertebral column Clinical cases
14	Review for the final exam
15	Comprehensive final examination

Clinical Case Applications* (Trimester 6)
Course Description:
Building upon the students' clinical reasoning skills, this course will teach strategies for identification and avoidance of common errors in clinical reasoning, management of clinical uncertainty in the decision-making process and application of pattern recognition in the clinical solving process. While drawing primarily on material from Orthopedics I, Adjusting Procedures IV and Clinical Neurology, complex clinical cases will require assimilation of all accumulated knowledge for appropriate diagnoses and treatment plans. The use of standardized patients in both teaching and assessment enhances the learning process.
*This course will be renamed Clinical Case Applications IV upon full implementation of the plan.

Programmatic Outcomes Related to Clinical Reasoning in this Course:
- Integration and application of basic science knowledge with clinical presentations.
- Introduction and application of clinical reasoning strategies in pre-clinical settings.

Student Learning Outcomes Related to Clinical Reasoning:
The student will:
- Incorporate basic science knowledge to form a diagnosis based on patient information.
- Recognize the relevant aspects of a patient's clinical presentation that influence the differential diagnosis list.
- Perform a patient interview and physical examination that elicits the necessary information to develop a probable list of differential diagnoses.
- Incorporate concepts of clinical reasoning to determine appropriate diagnostic investigations and to formulate a therapeutic management plan.
- Incorporate analytic processes and non-analytic resources when solving clinical problems.
- Apply epidemiologic knowledge, clinical experience, knowledge of test capabilities, and decision aids within the patient's clinical context to select the most appropriate diagnostic investigations.
- Identify common errors in clinical reasoning and provide strategies to avoid them.
- Demonstrate the ability to manage uncertainty in the clinical decision-making process.

Teaching Methods Related to Clinical Reasoning:
- Case-Based Learning: This course will utilize case-based learning with standardized patients (SPs). Three cases will be developed based on clinical presentations related primarily to conditions most likely to present in a chiropractor's office. A clinician will model a history and physical examination on an SP based on the clinical presentation. There will be scripted "time outs" for the clinician to provide his/her rationale for asking specific history questions and/or performing specific diagnostic procedures on the SP. In subsequent weeks the students will have three opportunities to do their own SP encounters. Prior to the encounter, the students will be provided with a list of specific learning objectives. These encounters will have both a formative and a summative assessment. The

cases will require students to incorporate their acquired knowledge of both basic and clinical sciences.

- Electronic Real-Time Student Feedback (I-Clicker)

Assessment Tools:
Examples that may be utilized in the pilot course for evaluation of clinical reasoning:
- SP encounters.
- Extended matching questions.
- Key features questions.
- Electronic real-time student feedback (I-Clicker).

Pilot Course Schedule

Summer 2009

Week	
1	Introduction and Syllabus
2	Clinical Reasoning Concepts
3	Differential Diagnosis
4	Differential Diagnosis
5	Differential Diagnosis
6	Differential Diagnosis
7	Case #1 (Expert model with SP) - Classroom
8	Case #2 (SP Experience) - Assessment Center
9	Case #3 (Expert model with SP) - Classroom
10	Case #4 (SP Experience) - Assessment Center
11	Case #5 (Expert model with SP) – Classroom
12	Case #6 (SP Experience) - Assessment Center
13	Differential Diagnosis Review / Case Wrap-up
14	Lab Final
15	Final Exam

Clinic I (Trimester 7)
Course Description:
The Campus Health Center (CHC) is designed to give students initial experience in the clinical setting. The CHC operates as a fully functional campus clinic providing chiropractic care to students, faculty and staff as well as their families. The CHC provides the students with a forum for practical application of clinical knowledge and reasoning, skills, and attitudes obtained through the first six trimesters.

Programmatic Outcomes Related to Clinical Reasoning in this Course:
- Integration and application of basic science knowledge with clinical presentations.
- Introduction and application of clinical reasoning strategies in pre-clinical settings.
- Application of clinical reasoning skills in patient care settings.

Student Learning Outcomes Related to Clinical Reasoning:
The student will:

- Formulate a diagnosis and management plan appropriate to the history, examination findings and any co-morbidity that the patient may exhibit. .
- Determine the necessity for laboratory studies (urinalysis, complete blood count, and blood chemistry), x-rays and special studies in the clinical decision process.
- Develop a rationale for appropriate referrals and/or collaborative care.
- Construct a systematic approach and delivery of patient care.
- Utilize outcome measures to substantiate care.
- Perform regular self reflection regarding their clinical decision-making skills.
- Demonstrate the ability to manage clinical uncertainty in the decision-making process.
- Identify common errors in clinical reasoning and provide strategies to avoid them.

Teaching Methods Related to Clinical Reasoning:
SNAPPS model of clinical teaching: A learner-centered technique for case presentations.

- S – Summarize the history and physical findings.
- N – Narrow the differential to two or three relevant possibilities.
- A – Analyze the differential by justifying, comparing and contrasting the possibilities.
- P – Probe the student/intern by asking questions about uncertainties, difficulties or alternative approaches.
- P – Plan the management for the patient's health issues.
- S – Select a case-related issue for self-directed learning.

The SNAPPS model will be the primary intervention for this pilot. The interns will be introduced to the SNAPPS model during the first week of the trimester and will be provided with guidelines and expectations for the use of SNAPPS. The instructors will encourage the critical thinking process of the interns. The instructors will assist the intern in the clinical reasoning process by identifying deficiencies, providing constructive, corrective measures and assigning self-learning tasks. Students should correlate past classroom tasks into clinical skills related to patient care. At this entry level to clinical experiences, the student will be accountable to their patients to perform appropriate quality care under the direct guidance of the course instructors. Assessment tools will be utilized to monitor the clinical reasoning process, knowledge and skill.

Assessment Tools:
Examples that may be utilized in the pilot course for evaluation of clinical reasoning:

- Direct observation of SNAPPS model by checklist on personal digital assistant (PDA).
- OSCE format (CSCE I).
- SP encounters.
- Extended matching questions (EMQ).
- Script concordance questions.
- Global rating assessment.
- Case-based discussion (chart stimulated recall).
- Knowledge-based inference tool (KBIT).

Student Responsibilities:
The student will:

- Utilize the SNAPPS model to promote, integrate and enhance the clinical thought process.
- Present cases to clinician in “SNAPPS” format.
- Be observed over a minimum of three cases that will vary in complexity between straightforward, moderate and complex.
- Understand that clinical reasoning is a process and relaying uncertainties to the clinician is an integral part of the process.
- Ask history questions related to differential diagnosis (ddx).
- Perform appropriate exam procedures related to ddx.
- Formulate a problem list.
- Identify co-morbidities.
- Correlate the importance of active learning of cases with clinical reasoning.
- Understand that feedback appropriate for a Doctor of Chiropractic will be given by instructors on a daily basis.

Pilot Course Schedule:

Summer 2009

Week	
1	SNAPPS Model Introduction
2	Direct Observation Case 1,
3	Direct Observation Case 1
4	Direct Observation Case 1, KBIT
5	Direct Observation Case 2
6	Direct Observation Case 2
7	Direct Observation Case 2, KBIT
8	Global Rating Assessment
9	Direct Observation Case 3
10	Direct Observation Case 3
11	Direct Observation Case 3
12	Direct Observation Case 3, KBIT
13	OSCE 1 with Extended Matching questions
14	Faculty Interview
15	OSCE 1 (if necessary)

Orthopedics III (Trimester 8)
Course Description:
The lecture portion of this course strives to enhance the student’s ability to differentially diagnose neuromusculoskeletal conditions. Students are required to assess the literature regarding sensitivity, specificity and reliability of the various orthopedics procedures and/or management of clinical conditions. The lab portion is designed to enhance record keeping, diagnostic and differential diagnosis skills through practice and clinical cases. The course will follow the principles of application-oriented curriculum. In addition, it will utilize standardized patient encounters to assess history, diagnostic, and clinical reasoning skills.

Programmatic Outcomes Related to Clinical Reasoning in this Course:

- Integration and application of basic science knowledge with clinical presentations.
- Introduction and application of clinical reasoning strategies in pre-clinical settings.
- Application of clinical reasoning skills in patient care settings.

Student Learning Outcomes Specific to Clinical Reasoning:

The student will:

- Perform, analyze and use the results of the musculoskeletal assessment to accurately diagnose and differentially diagnose the patient's clinical presentation.
- Demonstrate clinical reasoning in his/her assessment, differential diagnosis and management of the patient's presentation.
- Accurately utilize outcome measures when managing a patient.
- Apply self-reflection in the clinical decision-making process.
- Demonstrate the ability to manage clinical uncertainty in the decision-making process.
- Identify common errors in clinical reasoning and provide strategies to avoid them.

Teaching Methods Related to Clinical Reasoning:

- Application-Oriented Teaching: The principles of application-oriented teaching will be utilized in this course. Prior to each lecture session, the students will be provided with objectives to fulfill as they are reviewing pertinent information from the Orthopedics I and II courses regarding a topic. The students will be presented with multiple cases in lecture, and they will be asked to make a diagnosis based on the information presented. Electronic real-time student feedback (I-Clicker) will be used as a means of performing both formative and summative assessment of their ability to diagnose their patients. After the responses are received, the students will be asked to identify what changes in the historical picture or examination findings would make the other differentials for that diagnosis plausible.
- Lab Instruction: In the lab, the students will review and improve on their neuromusculoskeletal diagnostic skills and record keeping skills. They will have case presentations that they will have to work up on a peer or on standardized patients.
- KBIT: the students will be provided with release time to go to the computer lab and work through computer-generated cases in KBIT.

Assessment Tools:

- Lecture Exams: The course contains a midterm exam and a final. These examinations may contain multiple choice, true/false, extended matching, key features and/or script concordance questions so that both their knowledge and clinical reasoning skills can be assessed.
- Cases: Two clinical cases will occur over the course of the trimester, each student will perform as the doctor twice and the patient twice. The doctor will be assessed on his/her performance of a history and examination, charting, clinical decision making and diagnostic skills as well as professionalism. The doctor will have approximately 25 minutes to perform a history of the chief complaint and all pertinent examinations in an order that makes sense. Both the doctor and the patient will receive a zero on the case if it is determined that procedures are not

being performed to the doctor's best capability, or are omitted, and if the patient is providing unsolicited information.

- Standardized patient encounters: These evaluations may have both a formative and summative component. Possible evaluation points in the SP encounters may include:
    - History-taking skills as evaluated by the SP and post-encounter questions
    - Professionalism as evaluated by the SP
    - Selection of appropriate examinations
    - Accurate performance of examination procedures
    - Interpretation of the examination procedures and formulating a diagnosis

  SP Encounter #1 – will focus on history-taking skills and the ability to determine what exams to perform and possible differential diagnoses from the history.

  SP Encounter #2 – will focus on appropriate exam selection from the provided history; performance of examination procedures in a logical sequence, accurate performance of the examinations, and the ability to interpret findings and render a diagnosis.

  SP Encounter #3 – will be a combination of performing a history and examination on the patient to formulate a diagnosis.
- Participation and Self Reflection Survey: The course will be interactive and case based, each student is required to participate in the discussions of the cases in lecture as well as performance of lab regional exams and charting. The instructor will be assessing the students on their participation, and at the end of the trimester all students will turn in a self-assessment of how well they participated in the both the lecture and lab portion of the course as well as their perception of their diagnostic skills.

Pilot Course Schedule:

Summer 2009

Week	
1	Outcome measures Lab: Review lab procedures
2	Differential Diagnosis (DDx). Headaches and dizziness Lab: Review lab procedures
3	DDx. Neck and upper extremity disorders Lab: Regional examinations
4	DDx. Neck and upper extremity disorders Lab: Case #1
5	Standardized patient encounter #1
6	DDx. Thorax and chest wall disorders Lab: Regional examinations
7	DDx. Low back disorders Lab: Regional examinations
8	Midterm written examination Lab: Regional examinations
9	Standardized patient encounter #2

10	DDx. Low back disorders Lab: Regional examinations
11	DDx. Lower extremity disorders Lab: Case #2
12	DDx. Lower extremity disorders Lab: Lab review
13	DDx. Arthritides
14	Final Standardized patient practical examination
15	Final written examination

Implementation of QEP Across the Curriculum

The pilot courses will initially be offered during the Summer 2009 trimester. Thorough evaluation of the four pilot courses will be conducted through the use of faculty interviews, student course evaluation, course-based examinations, case-based discussions, CSCE I, DAC, and KBIT. Alterations or improvements to the instructional and assessment strategies will be made as required based on the evaluations. The four pilot courses will be conducted again in the Fall 2009 trimester with the incorporation of any necessary changes. With the four pilot courses now fully implemented and ongoing, the remainder of the QEP courses will be implemented across the curriculum starting in Spring 2010. Full QEP implementation will be completed by Spring 2012. See Chart 4.1 at the end of the chapter for a visual overview of the implementation timeline.

Trimester 1

Gross Anatomy I
Course Description:
Gross anatomy of the human body emphasizing the back, walls of the thorax and abdomen and the upper and lower extremities. The laboratory portion of the course covers cadaver dissection. Correlations will be made to various clinical presentations using a computer case-based program and instructor presentation of cases. The cases will emphasize clinical presentations related to Gross Anatomy I with contributions from other courses in trimester one when appropriate.

Intervention/Teaching Strategies:
- Case presentations during lecture to show the relevance between the basic and clinical sciences.
- Electronic real-time student feedback (I-Clickers).
- Computer-based case presentations (DAC).

Examples of Assessment Tools for Clinical Reasoning:
- Extended matching questions.
- Electronic real-time student feedback (I-Clickers).

Student Learning Outcomes Specific to Clinical Reasoning:
- Integrate knowledge of gross anatomy with different clinical presentations.
- Demonstrate the relevance of anatomy to clinical application.
- Acquire requisite anatomy knowledge as a foundation for clinical reasoning.

Expected Implementation: Spring 2010

Human Biochemistry
Course Description:
This course provides an overview of human biochemistry, including the general fundamentals of metabolism, the role of enzymes and enzyme kinetics and energy use and production. Carbohydrate, lipid, protein, nucleic acid, vitamin and mineral metabolism are examined in detail. An overview of genetic coding is introduced. Correlations will be made to various clinical presentations using a computer case-based program and instructor presentation of cases. The cases will emphasize clinical presentations related to Human Biochemistry with contributions from other courses in trimester one when appropriate.

Intervention/Teaching Strategies:
- Case presentations during lecture to show the relevance between the basic and clinical sciences.
- Electronic real-time student feedback (I-Clickers).
- Computer-based case presentations (DAC).

Examples of Assessment Tools for Clinical Reasoning:
- Extended matching questions.
- Electronic real-time student feedback (I-Clickers).

Student Learning Outcomes Specific to Clinical Reasoning:
- Integrate knowledge of human biochemistry with different clinical presentations.
- Demonstrate the relevance of biochemistry to clinical application.
- Acquire requisite biochemistry knowledge as a foundation for clinical reasoning.

Expected Implementation: Spring 2010

Trimester 2

Gross Anatomy II
Course Description:
This course details the gross anatomy of the human neck and head, thoracic and abdominal viscera, pelvis and external genitalia. The laboratory portion of the course covers cadaver dissection. Correlations will be made to various clinical presentations using a computer case-based program and instructor presentation of cases. The cases will emphasize clinical presentations related to Gross Anatomy II with contributions from other courses in the curriculum when appropriate.

Intervention/Teaching Strategies:
- Case presentations during lecture to show the relevance between the basic and clinical sciences.
- Electronic real-time student feedback (I-Clickers).
- Computer-based case presentations (DAC).

Examples of Assessment Tools for Clinical Reasoning:
- Extended matching questions.

- Electronic real-time student feedback (I-Clickers).

Student Learning Outcomes Specific to Clinical Reasoning:
- Integrate knowledge of gross anatomy with different clinical presentations.
- Demonstrate the relevance of anatomy to clinical application.
- Acquire requisite anatomy knowledge as a foundation for clinical reasoning.

Expected Implementation: Summer 2010

Spinal Biomechanics
Course Description:
This course presents a detailed analysis of the anatomy, normal biomechanics and pathobiomechanics of the spine and pelvis and how they relate to common clinical problems. Correlations will be made to various clinical presentations using a computer case-based program and instructor presentation of cases. The cases will emphasize clinical presentations related to Spinal Biomechanics with contributions from other courses in the curriculum when appropriate.

Intervention/Teaching Strategies:
- Case presentations during lecture to show the relevance between the basic and clinical sciences.
- Electronic real-time student feedback (I-Clickers).
- Computer-based case presentations (DAC)

Examples of Assessment Tools for Clinical Reasoning:
- Extended matching questions.
- Electronic real-time student feedback (I-Clickers).

Student Learning Outcomes Specific to Clinical Reasoning:
- Integrate knowledge of spinal biomechanics with different clinical presentations.
- Demonstrate the relevance of spinal biomechanics to clinical application.
- Acquire requisite spinal biomechanics knowledge as a foundation for clinical reasoning.

Expected Implementation: Summer 2010

Cellular and Cardiovascular Physiology
Course Description:
This course discusses the principles of cellular and cardiovascular physiology. An overview of the structural and functional aspects of membrane transport and muscle physiology is covered. The structure, function and regulation of the heart and circulatory system are described. Correlations will be made to various clinical presentations using a computer case-based program and instructor presentation of cases. The cases will emphasize clinical presentations related to Cellular and Cardiovascular Physiology with contributions from other courses in the curriculum when appropriate.

Intervention/Teaching Strategies:

- Case presentations during lecture to show the relevance between the basic and clinical sciences.
- Electronic real-time student feedback (I-Clickers).
- Computer-based case presentations (DAC).

Examples of Assessment Tools for Clinical Reasoning:

- Extended matching questions.
- Electronic real-time student feedback (I-Clickers).

Student Learning Outcomes Specific to Clinical Reasoning:

- Integrate knowledge of cellular and cardiovascular physiology with different clinical presentations.
- Demonstrate the relevance of physiology to clinical application.
- Acquire requisite physiology knowledge as a foundation for clinical reasoning.

Expected Implementation: Summer 2010

Trimester 3

Clinical Case Applications I (New Course)

Course Description:

This course serves as an introduction to the clinical reasoning process through the utilization of a case-based learning format. The students will apply their accumulated basic science knowledge to clinical cases, with particular emphasis on neuroanatomy and general pathology. They will learn to formulate differential diagnoses. The use of standardized patients in both teaching and assessment enhances the learning process.

Intervention/Teaching Strategies:

- This course will utilize standardized patients (SPs). Six cases will be developed based on clinical presentations generated from either the Neuroanatomy or General Pathology course. A clinician will model a history and physical examination on an SP based on the clinical presentation. There will be scripted “time outs” for the clinician to provide his/her rationale for asking specific history questions and/or performing specific diagnostic procedures on the SP. In subsequent weeks the students will have three opportunities to do their own SP encounters. These encounters will have both a formative and a summative assessment. Prior to the encounter, the students will be provided with a list of specific learning objectives.
- Electronic real-time student feedback (I-Clickers).

Examples of Assessment Tools for Clinical Reasoning:

- SP encounters.
- Extended matching questions.
- Key features questions.
- Electronic real-time student feedback (I-Clickers).

Student Learning Outcomes Specific to Clinical Reasoning:

- Incorporate basic science knowledge to formulate a diagnosis based on acquired patient information.
- Recognize the relevant aspects of a patient's clinical presentation that influence the differential diagnosis list.
- Perform a patient interview that elicits the necessary information to develop a possible list of differential diagnoses.
- Introduce the basic concepts of clinical reasoning to determine appropriate diagnostic investigations.

Expected Implementation: Fall 2010

Basic Communication and History-Taking Skills (New Course)

Course Description:

This course serves as an introduction to the verbal and non-verbal communication skills necessary for effective patient interaction. The students practice the skills needed to obtain a basic history based on the patient's chief complaint. They will also elicit basic information on past medical history, family history, review of systems, and current health status and effectively organize the gathered information to develop an initial problem list. Standardized patients will be used in both teaching and assessment to enhance the learning process.

Intervention/Teaching Strategies:

- Modeling of communication and history-taking skills by course instructor and/or video presentations.
- Practicing communication and history-taking skills.
- SP encounters.
- Electronic real-time student feedback (I-Clickers).

Examples of Assessment Tools for Clinical Reasoning:

- Evaluate videos of communication and history-taking skills.
- SP encounters.
- Self-evaluation of video encounter.

Student Learning Outcomes Specific to Clinical Reasoning:

- Formulate and employ an organized and logical method of inquiry when taking the history.
- Identify and revise the course of the patient interview in response to patient verbal and non-verbal cues.
- Prioritize the information obtained from the patient history based on clinical importance and relevance.

Expected Implementation: Fall 2010

Trimester 4

Clinical Case Applications II (New Course)
Course Description:
This course will build upon the clinical reasoning skills introduced in Clinical Case Applications I. With emphasis on material from Systems Pathology I and Renal, Respiratory and Gastroenteric Physiology, students will assimilate acquired basic and clinical science knowledge in developing differential diagnoses in a case-based learning format. Students will begin to recognize common clinical presentations. The use of standardized patients in both teaching and assessment enhances the learning process.

Intervention/Teaching Strategies:

- Same teaching strategy as described in CCA I; however, the topic of the cases will be derived primarily from the courses Systems Pathology I and Renal/Respiratory/Gastroenteric Physiology.
- Electronic real-time student feedback (I-Clickers).

Examples of Assessment Tools for Clinical Reasoning

- SP encounters.
- Extended matching questions.
- Key features questions.
- Electronic real-time student feedback (I-Clickers).

Student Learning Outcomes Specific to Clinical Reasoning:

- Incorporate basic science knowledge to formulate a diagnosis based on acquired patient information.
- Recognize the relevant aspects of a patient's clinical presentation that influence the differential diagnosis list.
- Perform a patient interview that elicits the necessary information to develop a possible list of differential diagnoses.
- Apply basic concepts of clinical reasoning to determine appropriate diagnostic investigations.
- Demonstrate ability to use clinical reasoning when formulating a diagnosis.

Expected Implementation: Spring 2011

Advanced Communication and History-Taking Skills (New Course)
Course Description:
This course will build upon the skills learned in the Basic Communication & History-Taking Skills course. The students will practice the skills needed to address challenging patient communication issues such as delivering bad news, interacting with diverse patient populations, and handling the agitated patient. History-taking skills will be honed to elicit sufficient secondary and tertiary information to obtain a more detailed history. The students will learn how to modify their patient history based upon the patient's age, gender or cultural differences. Standardized patients will be used in both teaching and assessment to enhance the learning process.

Intervention/Teaching Strategies:

- Modeling of communication and history-taking skills by course instructor and/or video presentation.
- Practicing communication and history-taking skills.
- SP encounters.
- Electronic real-time student feedback (I-Clickers).

Examples of Assessment Tools for Clinical Reasoning:

- Evaluate videos of communication and history-taking skills.
- SP encounters.
- Self-evaluation of video encounter.

Student Learning Outcomes Specific to Clinical Reasoning:

- Identify the logical secondary and tertiary questions that are needed to obtain a detailed history based on the patient's responses.
- Determine the basic diagnostic procedures that should be performed based on the patient's history.
- Identify pathological, behavioral and other indicators from the history that may lead to uncertainty or errors in the decision-making process.
- Understand how the form of the history or line of inquiry may change based upon the patient's unique characteristics or clinical presentation.

Expected Implementation: Spring 2011

Trimester 5

Clinical Case Applications III (New Course)

Course Description:

This course will build upon the skills learned in Clinical Case Applications II. There will be greater complexity in case presentations, utilizing accumulated basic and clinical science knowledge with particular emphasis on material from Physical Examination & Diagnosis, Diagnostic Imaging II and Adjusting Procedures III. In addition to recognizing common presentations, formulating differential diagnoses and a final diagnosis, the students will begin to develop appropriate adjustive and/or other therapeutic intervention strategies. The use of standardized patients in both teaching and assessment enhances the learning process.

Intervention/Teaching Strategies:

- Electronic real-time student feedback (I-Clickers).
- With a similar instructional strategy to CCA I and CCA II, this course will require higher level reasoning skills on the part of the student with integration from additional clinical courses. The content of the cases will be related primarily to conditions taught in Adjusting Procedures III, Physical Examination & Diagnosis and Diagnostic Imaging II.

Examples of Assessment Tools for Clinical Reasoning

- SP encounters.
- Extended matching questions.
- Key features questions.

- Electronic real-time student feedback (I-Clickers).

Student Learning Outcomes Specific to Clinical Reasoning:

- Incorporate basic science knowledge to formulate a diagnosis based on acquired patient information.
- Recognize the relevant aspects of a patient's clinical presentation that influence the differential diagnosis list.
- Perform a patient interview and physical examination that elicits the necessary information to develop a probable list of differential diagnoses.
- Apply basic concepts of clinical reasoning to determine appropriate diagnostic investigations.
- Demonstrate ability to use clinical reasoning when formulating a diagnosis.
- Apply various decision aids and evidence to the clinical process.
- Identify common errors in clinical reasoning and provide strategies to avoid them.

Expected Implementation: Summer 2011

Trimester 6

Clinical Neurology

Course Description:

This course offers a didactic and practical approach to the study of the central and peripheral nervous systems with emphasis on the applied anatomy, physiology and symptomology of the various pathologic states. The students will need to recognize common neurological presentations, formulate differential diagnoses, a final diagnosis, and determine viable methods for management. Cases will be presented in the course as a way to make these correlations. Standardized patients will be used to assess the students' progress.

Intervention/Teaching Strategies:

- A lab component will be added to the Clinical Neurology course. The lab hours will provide practical application of neurological assessment and enhance the concepts presented in the lecture portion of the course.

Examples of Assessment Tools for Clinical Reasoning:

- Extended matching questions.
- Key features questions.
- Electronic real-time student feedback (I-Clickers).
- Script concordance questions.

Student Learning Outcomes Specific to Clinical Reasoning:

- Incorporate relevant basic science knowledge to formulate a diagnosis based on patient information.
- Select and demonstrate appropriate neurological examination procedures based upon the patient's history and presentation.
- Correlate findings from the neurological examination with the patient's history, physical exam, orthopedic exam and diagnostic studies to formulate a diagnosis.
- Integrate information from the patient's history, physical exam, orthopedic exam, neurological exam and diagnostic studies to determine an appropriate treatment plan.

- Demonstrate ability to use clinical reasoning when formulating a diagnosis.

Expected Implementation: Fall 2011

Trimester 7

Case Management I
Course Description:
This course includes the development and the recording of management plans based upon the patient's clinical presentation of common neuromusculoskeletal disorders. The course will also address when referral and/or collaborative care may be warranted and how the management plan may be altered based upon outcome measures.

Intervention/Teaching Strategies:
- Case-based learning approach combined with team-based learning.

Examples of Assessment Tools for Clinical Reasoning:
- Extended matching questions.
- Key features questions.
- Script concordance questions.
- Self-reflection survey.
- Assessment of management plans with scoring rubric.

Student Learning Outcomes Specific to Clinical Reasoning:
- Describe a variety of treatment options used in common musculoskeletal injuries.
- Select the appropriate treatment protocol based on a patient's phase of injury, age and health status.
- Apply self-reflection in the clinical decision-making process.
- Determine when referral or co-management is warranted based on the patient's presentation.
- Identify common errors in clinical reasoning and provide strategies to avoid them.
- Demonstrate the ability to manage uncertainty in the clinical decision-making process.

Expected Implementation: Spring 2012

Trimester 8

Clinic II
Course Description:
Building upon pre-clinical coursework and clinical skills learned in Clinic I (Campus Health Center), interns provide chiropractic care to the public in the Moody Health Center under the mentoring and supervision of faculty attending clinicians. All elements of doctor-patient interaction are reviewed and discussed, including history taking, physical examination, diagnostic studies, development of a diagnosis, and implementation of a therapeutic management plan. Total patient care encompasses patient re-evaluation, outcome assessment, and documentation.

Intervention/Teaching Strategies:
- Self-directed, computer-based case simulations.
- SNAPPS model of clinical teaching.

Examples of Assessment Tools for Clinical Reasoning:
- Script concordance questions.
- Global rating assessment.
- Case-based discussion.

Student Learning Outcomes Specific to Clinical Reasoning:
- Effectively utilize clinical reasoning in diagnosis and treatment.
- Develop a rationale for appropriate referrals and/or collaborative care.
- Utilize outcome measures to substantiate care.
- Integrate the input of colleagues and patients in the clinical decision-making process.
- Identify common errors in clinical reasoning and provide strategies to avoid them.
- Demonstrate the ability to manage uncertainty in the clinical decision-making process.
- Demonstrate the use of regular self-reflection in the clinical setting.

Expected Implementation: Spring 2010

Trimester 9

Clinic III
Course Description:
Building upon clinical skills learned in their initial trimester in Moody Health Center, interns continue to provide chiropractic care to patients under the mentoring and supervision of faculty attending clinicians. Interns are expected to refine their skills to meet the defined clinical competencies.

Intervention/Teaching Strategies:
- Self-directed, computer-based case simulations.
- SNAPPS model of clinical teaching.

Examples of Assessment Tools for Clinical Reasoning:
- Script concordance questions.
- Global rating assessment.
- Case-based discussion.
- OSCE format (CSCE II).

Student Learning Outcomes Specific to Clinical Reasoning:
- Effectively utilize clinical reasoning in diagnosis and treatment.
- Develop a rationale for appropriate referrals and/or collaborative care.
- Utilize outcome measures to substantiate care.
- Integrate the input of colleagues and patients in the clinical decision-making process.
- Identify common errors in clinical reasoning and provide strategies to avoid them.

- Demonstrate the ability to manage uncertainty in the clinical decision-making process.
- Demonstrate the use of regular self-reflection in the clinical setting.

Expected Implementation: Summer 2010

Trimester 10

Clinic IV
Course Description:
This course comprises the final trimester in the clinical experience. Upon gaining a high level of clinical proficiency, the intern is afforded increased independence in treatment and case management while still working under the supervision of the faculty attending clinician. Upon completion of all qualitative and quantitative requirements for graduation, interns have the opportunity to participate in the hospital rotations program and/or in community preceptorships throughout the United States.

Intervention/Teaching Strategies:
- Self-directed, computer-based case simulations.
- SNAPPS model of clinical teaching.

Examples of Assessment Tools for Clinical Reasoning:
- Script concordance questions.
- Global rating assessment.
- SP encounters.
- Case-based discussion.

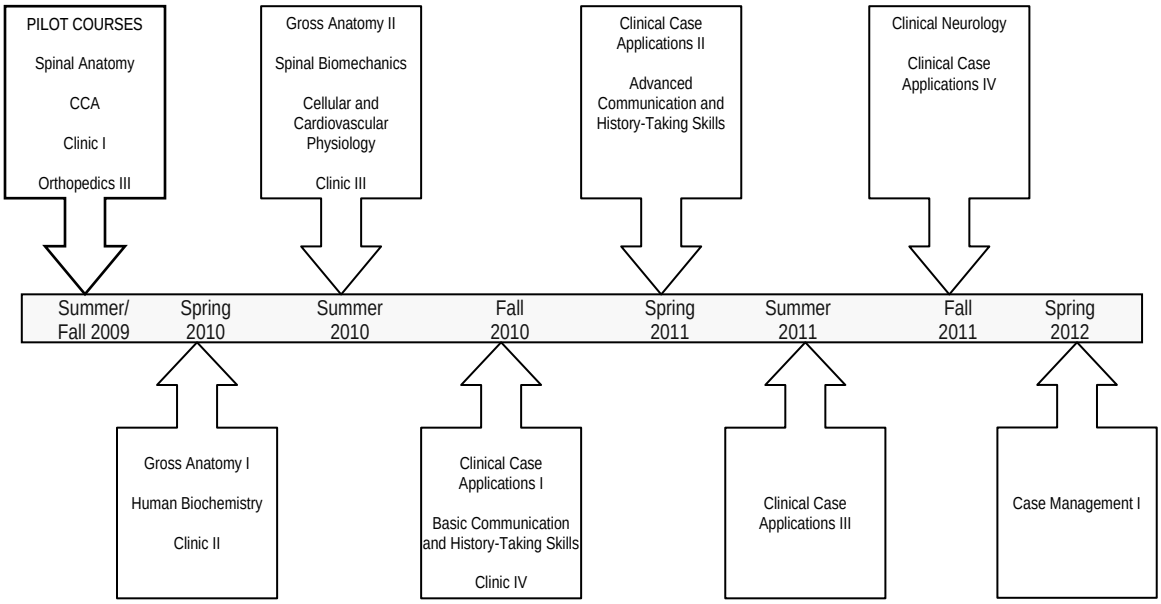
Student Learning Outcomes Specific to Clinical Reasoning:
- Effectively utilize clinical reasoning in diagnosis and treatment.
- Develop a rationale for appropriate referrals and/or collaborative care.
- Utilize outcome measures to substantiate care.
- Integrate the input of colleagues and patients in the clinical decision-making process.
- Identify common errors in clinical reasoning and provide strategies to avoid them.
- Demonstrate the ability to manage uncertainty in the clinical decision-making process.
- Demonstrate the use of regular self-reflection in the clinical setting.

Expected Implementation: Fall 2010

Implementation Timeline

Chart 4.1 provides a visual timeline of the implementation of the QEP throughout the curriculum. There is a dual track for implementation in the didactic classes and in the clinical experience. The QEP will be fully integrated into the clinics by Fall 2010 and total QEP implementation will be realized by Spring 2012.

Chart 4.1: Initial Implementation



CHAPTER 5: ASSESSMENT METHODS

Introduction

A subcommittee was formed and charged with formulating both course and programmatic assessments. See Appendix II for subcommittee members.

When selecting an appropriate method to assess clinical reasoning, several factors should be considered. These include reliability, validity, generalizability, educational impact, practicality, and cost. Reliability is the extent to which a test is repeatable and yields consistent scores. Validity is the extent to which a test measures what it is designed to measure. In order to be valid, a test must be reliable; but reliability does not guarantee validity. Generalizability refers to the results of a specific assessment being reproducible with other groups or assessments covering similar but not identical content. Assessment directly affects educational impact since assessment drives learning. Practicality (the ability to administer a particular assessment) and cost, both in time and dollars, are also key considerations when selecting a method.

Health professions education has yielded many new and innovative methods to assess various aspects of knowledge and competency. The assessments generally fall into two categories, formative and summative. Formative assessment is used primarily to provide feedback to students about their educational progress while summative assessment measures the achievement of learning outcomes in a course or program. Methods related specifically to the assessment of clinical reasoning are discussed below.

Course Assessments

Written Examinations

Written examinations take on many forms and are used in varying frequency in health professions education. These examinations can be classified into two categories: open response (e.g. fill-in-the-blank or essay) and selected response (e.g. multiple choice). Open response examinations require the learner to recall knowledge rather than to recognize it. These examinations are reliable if constructed and scored well. However, significant time is required to score short answer and essay questions, and it is difficult to create a comprehensive answer key. These factors often limit the use of open response examinations in health professions education.

Selected response written examinations consist of a question, clinical vignette or other stem followed by a list of answers from which the learner can select. In general, these written examinations require the learner to recognize the answer rather than to recall it. Multiple choice examinations generally evaluate a learner's knowledge related to a subject; but advanced forms of selected response examinations, such as extended matching, key features, and script concordance examinations, can be used to assess higher levels of thinking, reasoning and clinical decision making.

Extended Matching Questions (EMQ) (Beullens et al., 2005)– Extended matching questions are a variant of multiple choice questions. A question formatted as an EMQ has an introductory statement or stem similar to a multiple choice question (MCQ): the stem may be in the form of a question, statement or clinical vignette. Learners are then given a list of multiple items from which to choose an answer. This list is generally 10 to

20 items long and, often, items in the list may be selected more than once. Multiple stems can be used for a single list of answer items as well. Unlike MCQ format examinations which are useful for measuring medical knowledge, EMQ examinations are very useful to assess clinical reasoning and decision making, which is considered a higher order of learning.

Sample EMQ

For each case described below, select the **single** most likely diagnosis. Answers may be used once, more than once or not at all.	
A 41 y/o male presents complaining of intense lower back pain of two days duration. He describes a sudden onset of the pain while lifting a 75 lb. box. The patient is experiencing no pain or numbness in the buttock or leg. The pain is midline at the L4 level and the regional muscles are tender and taut to palpation.	
A. Disc prolapse B. Lumbar muscle strain C. Facet inflammation D. Joint infection E. Disc degeneration	F. Primary bone tumor G. Space occupying lesion H. Fracture I. Metastasis J. Degenerative joint disease

Key Features Examinations (Page, Bordage, & Allen, 1995) – A key feature examination is a type of written assessment used to measure clinical decision-making skills. A key feature is defined as a critical step in the resolution of the problem. A key feature assessment considers two areas of clinical decision making: (1) it focuses on a step in which examinees are most likely to make an error, and (2) it is a difficult aspect of the identification and management of a problem in practice. A typical key feature problem begins with a clinical vignette of sufficient length to establish the problem and its parameters. The vignette is followed by a series of questions aimed at identifying areas of common mistakes or difficult diagnostic pathways. These questions can be presented in various formats, including fill-in-the-blank, short answer, multiple choice or extended matching. While key feature problems have been shown to perform well when assessing clinical decision-making skills, extensive planning and development of items and scoring criteria are required.

Sample Key Features Question

Paul, a 56 y/o man consults you in the outpatient clinic because of pain in his left leg which began two days ago and has been getting progressively worse. He states his leg is tender below the knee and swollen around the ankle. He has never had similar problems. His other leg is fine.	
Question 1 What diagnosis would you consider at this time? List up to three. 1. _____ 2. _____ 3._____	
Question 2 With respect to your diagnosis, what elements of his history would you particularly want to elicit? Select up to seven.	
A. Activity at onset of symptoms B. Alcohol intake C. Allergies D. Angina pectoris E. Anti-inflammatory therapy F. Cigarette smoking G. Cough	H. Headache I. Low back pain J. Paresthesia K. Polydipsia L. Previous knee problems M. Recent dental procedure N. Wounds on foot

Script Concordance Test (Charlin, Roy et al., 2000; Charlin, Tardif et al., 2000) – The script concordance test is another method to assess clinical decision-making skills and clinical reasoning. The questions are preceded by a clinical vignette that is described in a few sentences. The actual questions in a script concordance test follow a specific format consisting of three parts. The first part includes a diagnostic hypothesis, an investigative action or a treatment option that is relevant to the situation. The second part presents new information that may have an effect on the diagnostic hypothesis, an investigative action or a treatment option. The third part is a five-point Likert type scale. Script concordance questions require development and scoring by a panel of two to ten experts.

Script Concordance Sample

A 22 y/o female presents with acute ankle pain of two days duration. The pain is a result of a running injury.

If you were considering the utility of the following treatment…	**…and the following new information were to become available…**	**…you would then consider this treatment…**				
Ultrasound	Stress fracture of talus bone	-2	-1	0	+1	+2
Elevation	Ankle edema	-2	-1	0	+1	+2
Wobble board exercises	Ligament instability	-2	-1	0	+1	+2
Bracing	Ligament laxity	-2	-1	0	+1	+2

-2 Useless -1 less useful 0 neither more or less useful +1 useful +2 very useful

Electronic Real-time Student Feedback

Electronic real-time student feedback is a method by which students can simultaneously submit responses to questions posed by faculty in class. This is accomplished via an electronic response device called the I-Clicker. Quizzing students in this manner can provide insight into a student's ability to reason through a unique patient presentation. An immediate record of student responses can be captured and saved for grading purposes. This method of inquiry allows a faculty member to provide immediate feedback and clarification based on student group responses. No significant data related to reliability or validity of this assessment method is available, so this method should be utilized primarily as a formative tool.

Standardized Patient Encounters (Dent & Harden, 2005)

Standardized patients (SP) are individuals that have been trained to portray various clinical conditions and scenarios or may be patients with actual diagnoses that have been trained to standardize their responses about their condition for assessment purposes. While SPs are not necessarily solely an assessment tool, they are a vehicle to allow an assessment of a learner's performance in many aspects of clinical competency. Often, standardized checklists, global rating scales or narrative responses are used with SPs. Most often, SPs are used in OSCEs, but can also be effectively used as a stand-alone assessment tool.

Case-Based Discussion (CbD) (Goulet et al., 2007)

Case-based Discussion (CbD), also known as Chart Stimulated Recall, is a form of work-based assessment in which a person is evaluated based on performance in real-life situations. In CbD, the student presents two patient files into which he/she has made entries and then the evaluator selects one of the two files for review. A discussion between the student and evaluator about the aspects of the case related to clinical decision making and reasoning ensues. After this discussion, the evaluator judges the

quality of the performance using a score sheet and provides feedback to the student. This process is repeated a minimum of five times in a year and should include multiple evaluators and a representative sampling of case types.

The CbD approach is both a reliable and valid approach to workplace assessment in respect to clinical reasoning. Factors necessary to insure reliability include an appropriate number of cases (5 to 8), multiple raters, multiple case types, a defined scoring rubric, and an effective method of constructive feedback.

Sample CbD Score Sheet

Clinical Setting	CHC	MHC	EXTERNAL
Case Complexity	LOW	MED	HIGH

Grade the following areas using scale heading as appropriate	Below Expectations	Borderline	Meets Expectations	Above Expectations	Completely Exceeds Expectations
Record Keeping					
Clinical Assessment					
Treatment					
Investigations					
Follow-up					
Clinical Reasoning					
Overall Clinical Care					

Key Learning Points	Discussion with Faculty

Agreed Action

Student Self-Evaluation (Holmboe & Hawkins, 2008)

When developing clinical reasoning abilities, it is necessary for the learner to incorporate self-reflection into their practice. This requires the student to conduct an accurate self-evaluation of his/her abilities. It has been demonstrated that practitioners have a poor ability to perform an accurate self-assessment that truly reflects performance. In fact, inaccuracy in self-assessment appears to be worse in the least competent physicians. They tend to overestimate their ability and competence.

The focus of self-evaluation should be less on accuracy and more on recognizing internal and external cues in order to arrive at a point of self-realization. It is important for the self-evaluation process to lead the student to reflect both “in-action” (knowing when to seek help during the act of doing) and “on-action” (looking critically at actions post-experience). Guided self-assessment is a process that uses a systematic approach combining structured scoring rubrics with accurate mentor feedback. This process combines a level of standardization, reflection with a mentor, and clear evaluation criteria. While incorporating this approach reduces extraneous factors that negatively influence outcomes, it should be realized that the ultimate goal of self-evaluation is not to

accurately self-judge clinical performance but rather to hone one's ability to reflect on that performance.

There are several accepted methods for conducting self-evaluation. These include open-ended questionnaires, checklists and survey instruments. Typical topics addressed in self-assessment include learning needs, confidence in performing procedures, general clinical skills, critical appraisal knowledge and professionalism.

Sample Open-ended Questionnaire Items

1. What strengths in your clinical practice did this demonstrate?
2. What learning did this reveal?
3. Which one learning need do you address as a priority?
4. Decide exactly what you would like to achieve.
5. Why do you consider this action worthy of reflection?

Global Rating Assessment (Gray, 1996)

Global rating assessments are similar to checklist evaluations except that the rater makes judgments on general categories of an ability rather than specific components. Global ratings can be of two types: 1) ratings on a specific ability observed over a period of time (e.g. end of a clinical rotation); or 2) ratings of an ability considering all aspects of the necessary attitudes, knowledge and skills required (e.g. rating performance of chiropractic technique, considering all the components necessary, into a single score). Global ratings are generally considered to be summary evaluations.

Certain weaknesses are inherent in these evaluations. Most notable is consistency between raters and rater bias. These weaknesses can be attenuated by recognizing potential pitfalls and conducting appropriate rater training. Global rating assessments become much more reliable when completed in a series and by multiple raters. Due to the need for direct observation of a learner's performance, global ratings also provide an opportunity for formative feedback between the learner and rater.

Sample Global Rating Form

Rating Scale
(4) Exceptional – exceeds expectations
(3) Satisfactory – meets and occasionally exceeds expectations
(2) Marginal – Meets some expectations, falls short in some areas
(1) Unsatisfactory – performance falls short of reasonable expectations

☐ Mid Trimester
☐ End of

Intern	Trimester 7 8 9 10	Evaluator	Date

	1	2	3	4
Diagnosis				
1. Understands importance of collecting sufficient clinical information to avoid making a premature diagnosis.				
2. Generates a diagnosis consistent with history and examination findings.				
3. Exhibits clinical reasoning and correlation skills to support a diagnosis.				
4. Identifies the pathophysiologic process responsible for the patient's clinical presentation.				
5. Generates a list of differential diagnoses appropriate to findings.				

Objective Structured Clinical Examination (OSCE) (Dent & Harden, 2005)

An OSCE is designed to obtain a cross-sectional sampling of a learner's competence through a series of themed encounters. Each learner rotates through stations that have various clinical scenarios represented. Typically, stations contain a standardized patient (SP), an individual who has been trained to portray a specific clinical presentation, set of symptoms or other situation that may be encountered in practice. Other station options may include visual information, oral examination or a written task. Learners are usually asked to perform a specific skill or other focused aspect of clinical care.

An OSCE typically consists of 8 to 20 stations at which a learner may spend anywhere from 3 to 30 minutes. Often, this encounter is followed by a post-encounter station where written or oral feedback to or from the learner is required. This feedback can be formative, summative, or both. OSCE's are usually scored with a standardized checklist or global rating scales. These exams are both reliable and valid for assessing many clinical skills, communication skills, clinical reasoning and fund of knowledge.

Sample OSCE Rotation

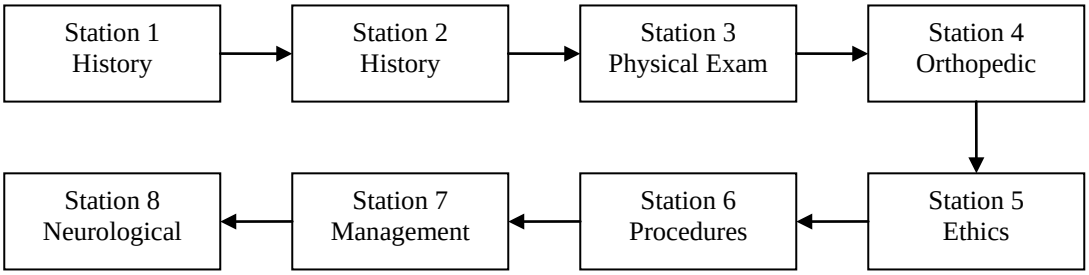


Table 5.1 lists the course assessment strategies and shows whether they are formative and/or summative methods.

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Table 5.1: Assessment Strategies

Assessment Methods	Formative	Summative
Extended matching questions		x
Key features questions		x
Script concordance questions		x
Electronic real-time student feedback	x	x
Standardized patient encounters	x	x
Case-based discussion (Chart Stimulated Recall)	x	x
Student self-evaluation	x	
Intern global rating	x	x
Objective Structured Clinical Evaluation (OSCE)	x	x

Programmatic Evaluation

Evidence from programmatic evaluation is essential to enhance the quality of the educational process. Implementation of the QEP, first in the pilot courses and then throughout the curriculum, requires utilization of methods to evaluate its effectiveness. Several instruments and data sets will be used as indicators of successful implementation of the QEP.

Student Course Evaluations

Each course related to the QEP will be evaluated by students on a periodic basis. These evaluations will monitor course effectiveness and relevancy from the student's perspective. Particular attention will be given to targeted elements of the course that relate to the QEP (e.g., the type and use of instructional strategies, assessment methods, learning outcomes, and content). The benchmark goal for TCC's QEP courses is that they are at or above the mean evaluation scores of all courses offered in the curriculum.

Diagnostic Thinking Inventory (DTI) (Bordage et al., 1990)

The Diagnostic Thinking Inventory (DTI) is a 41-question self-assessment tool that is designed to give insight into an individual's clinical reasoning process. Each item on the questionnaire consists of two opposing statements separated by a six-point scale that connects the two statements. Students are required to select a point on the scale that represents their diagnostic thinking related to the statement.

The DTI has a sufficiently high level of both reliability and validity to successfully measure clinical reasoning ability. Some questions of construct validity related to reasoning styles of novices versus experts may somewhat diminish the DTI as a complete measure of an individual's clinical reasoning ability. However, as long as the tool is used as designed, it provides a reliable measure of a student's strengths and weaknesses, as well as the effects of educational interventions.

This questionnaire is a validated tool to measure reasoning ability in the health professions educational setting. Since this instrument is not grounded in content knowledge, it can be used at all levels of the curriculum. Specifically, results from administration of the DTI will be evaluated in cohorts or larger samples related to the QEP curriculum. This approach will provide a tool to monitor the performance of educational interventions and curricular sequencing and is measured by reviewing the performance trend over a five year period.

Sample DTI Item

When I know very little about a particular condition,

I can still come up with a diagnosis							I have great difficulty in reaching a diagnosis

Clinical Skills Competency Examination I and II

The Clinical Skills Competency Examinations (CSCE) I and II are OSCE-type examinations administered on a programmatic level. These exams are clinical performance exams administered at two specified points in the curriculum (end of Clinic I, and end of Clinic III) and are designed to evaluate various clinical competencies and learning outcomes. Certain elements of these exams are related to clinical reasoning, such as employment of reasoning skills in history-taking, selecting appropriate diagnostic procedures, formulating a differential diagnosis, and making patient management decisions. Analysis of scores from these examinations over a continuum provides an opportunity to evaluate curricular effectiveness using standardized data that is generalizable. The benchmark goal is that the combined scores for those elements of the exam related to clinical reasoning be above the mean scores for the entire exam.

Health Sciences Reasoning Test (HSRT)

The HSRT is designed for learning outcomes assessment of undergraduate and graduate professional school students in the health sciences. The HSRT is a valid and reliable 33-item multiple choice format test. Items present necessary informational content in text-based and diagrammatic formats. Questions are designed to draw inferences, to make interpretations, to analyze information, to identify claims and reasons, and to evaluate the quality of arguments. Test items are set in clinical and professional practice contexts and supply the necessary content for applying one's thinking skills. Students are neither advantaged nor disadvantaged based on specific subject-matter factual content knowledge or specialized experience. Success on this testing tool depends on the correct application of their thinking skills, not on memorized information. The HSRT demonstrates both construct and content validity for assessment of clinical reasoning skills. Baseline scores must be established over a period of time prior to determining benchmark goals for the HSRT. Insight Assessment, the designer of the HSRT, provides various reports to assist the institution in measuring program performance. Due to copyright laws, a copy of the HSRT cannot be included in the QEP submission. However, the HSRT can be viewed by the onsite team.

National Board Examinations, Parts I, II, III and IV

The National Board of Chiropractic Examiners (NBCE) administers a series of nationally based standardized examinations that are used for attaining licensure in most states. The examinations are given in multiple parts at prescribed intervals in the curriculum. Part I evaluates basic science knowledge. At the conclusion of the first year of QEP implementation, the goal is meeting or exceeding the national mean for National Board scores that pertain to the courses in the QEP. Parts II, III and IV all have elements related to clinical practice. While there are no specific sections of these board examinations labeled as clinical reasoning, certain information can be extrapolated from subsets of scores in areas that require some element of clinical reasoning. It is understood that this is not a direct programmatic measure but it does provide an independent and standardized set of data for comparison. By the conclusion of full implementation of the QEP, the goal is that scores in those subsets related to clinical reasoning be at or above the national mean scores.

Faculty Interviews

Faculty interviews will be conducted following initiation of the pilot courses and as each course related to the QEP is implemented. The interviews will focus on the positive and negative aspects of the course. Results from the interviews will be used for quality improvement purposes.

Sample Open-ended Faculty Interview Questions

1. How do you feel, in retrospect, about this way of structuring the course?
2. Did integrating clinical reasoning into the course pose any special planning challenges?
3. How did students respond to active learning teaching strategies used in the course?
4. What areas of the course should be targeted for improvement or modification?

Core Concepts in Basic Sciences, Core Concepts in Clinical Sciences, Core Concepts in Clinical Applications (Capstone Examinations)

The College administers a series of capstone examinations independent of any course at defined intervals in the curriculum. These exams contain multiple choice type questions and are divided into six basic science and seven clinical science categories. Historically, these examinations have been used to monitor student preparedness for National Board examinations. Additionally, some inferences of programmatic effectiveness have been drawn from these exams. To further enhance the usefulness of this existing assessment tool, question types designed to measure clinical relevance of acquired knowledge will be added. Specific performance on the new question types can be monitored as an indicator of programmatic effectiveness. Implementation of this process will first require development of valid and reliable questions. Once implemented, several administrations of these examinations will be required to establish a baseline for comparison.

Knowledge-Based Inference Tool (KBIT)

The Knowledge-based Inference Tool is a web-based program used to develop pattern recognition skills. KBIT provides a platform for students to experience multiple cases with similar presenting symptoms and coaches them to recognize subtle differences that distinguish one diagnosis from another. One aspect of the program tracks student performance related to accuracy of selecting an appropriate diagnosis. While this tracking mechanism is not a formal assessment of clinical reasoning or decision making, data from these exercises can be used to monitor possible trends that may occur and provide insight to curricular strengths and weaknesses related to the QEP topic.

Case-Based Discussion (CbD)

Case-based discussion may be utilized as both a course assessment and programmatic evaluation tool. A thorough description of CbD has been provided in the course assessment section.

Table 5.2 lists the programmatic evaluation strategies and shows whether they are formative and/or summative methods.

Table 5.2: Programmatic Evaluations

Evaluation Methods	Formative	Summative
Student course evaluations	x	
Diagnostic Thinking Inventory (DTI)	x	
Clinical Skills Competency Examinations I & II (CSCE I and CSCE II)	x	x
Health Sciences Reasoning Inventory (HSRI)	x	
National Board Parts I, II, III and IV	x	x
Faculty Interviews	x	
Core Concepts in Basic Sciences, Core Concepts in Clinical Sciences, Core Concepts in Clinical Applications		x
Knowledge-based Inference Tool (KBIT)	x	
Case-based Discussion (Chart Stimulated Recall)	x	

Assessments and Criteria for Determination of Programmatic Success

The assessments and evaluations selected for the QEP were chosen to link clinical reasoning learning outcomes to programmatic outcomes, demonstrating infusion of clinical reasoning across the curriculum. It is considered essential to tie student learning outcomes in the QEP courses to each programmatic outcome through the evaluation process. Specific criteria are identified for each assessment and will be used to determine mastery of the learning outcomes related to clinical reasoning. Tables 5.3, 5.4 and 5.5 detail these important links.

Table 5.3: Programmatic Outcome #1

Programmatic Outcome #1 Integration and application of basic science knowledge with the clinical presentation **Related Courses** Spinal Anatomy, Gross Anatomy I, Human Biochemistry, Gross Anatomy II, Spinal Biomechanics, Cellular and Cardiovascular Physiology		
Student Learning Outcomes	**Evaluation Method**	**Criteria**
1A) Acquire requisite basic science knowledge as a foundation for clinical reasoning. 1B) Demonstrate the relevance of basic science information to clinical application. 1C) Understand the basic science mechanisms that relate to clinical presentation and findings.	NBCE Part I scores	1st Year: Fail rate ≤ 15% on all parts 2nd Year: Fail rate ≤ 13% on all parts 3rd Year: Fail rate ≤ 10% on all parts
	Core Concepts In Basic Sciences Capstone Exam	70% pass rate or higher
	Course-based exams related to SLOs	Students achieve or exceed course exam pass rate of 70%
	Core Concepts In Basic Sciences Capstone Exam	70% pass rate or higher on relevant questions
	Design-A-Case	Indirect measure for trend analysis
	Faculty Interviews	Indirect measure for trend analysis
	Student Course Evaluations	Indirect measure for trend analysis

Table 5.4: Programmatic Outcome #2

Programmatic Outcome #2 Introduction and application of clinical reasoning strategies in the pre-clinical setting **Related Courses** Clinical Case Applications I, II, III and IV, Basic Communication and History-Taking Skills, Advanced Communication and History-Taking Skills, Clinical Neurology		
Student Learning Outcomes	**Evaluation Method**	**Criteria**
2A) Demonstrate history taking, examination and diagnostic skills as a foundation for clinical reasoning. 2B) Incorporate basic science knowledge to formulate a diagnosis based on acquired patient information. 2C) Demonstrate the use of analytic processes (hypothetico-deductive reasoning) and non-analytic resources (pattern recognition) when solving clinical problems. 2D) Apply various decisions aids and evidence to the clinical decision process.	NBCE Part II scores	1st Year: Fail rate ≤ 15% on all parts 2nd Year: Fail rate ≤ 13% on all parts 3rd Year: Fail rate ≤ 10% on all parts
	Core Concepts In Clinical Sciences Capstone Exam	70% pass rate or higher
	Course-based exams related to SLOs	Students achieve or exceed course exam pass rate of 70%
	Standardized Patient Encounters	Students will satisfactorily perform clinical skills based upon critical criteria
	Faculty Interviews	Indirect measure for trend analysis
	Student Course Evaluations	Indirect measure for trend analysis
	Health Sciences Reasoning Test	Initial: Compare to established normative data until institutional norms are established During QEP implementation: All group subscores at “average strength” After full QEP implementation: All group subscores at “strong”

Table 5.5: Programmatic Outcome #3

Programmatic Outcome #3 Application of clinical reasoning skills in the patient care setting **Related Courses** Clinical Case Applications IV, Clinic I, II, III and IV, Case Management I and Orthopedics III		
Student Learning Outcomes	**Evaluation Method**	**Criteria**
3A) Demonstrate the ability to manage clinical uncertainty in the decision-making process. 3B) Identify common errors in clinical reasoning and provide strategies to avoid them. 3C) Demonstrate the use of regular self-reflection in the clinical learning setting. 3D) Effectively utilize clinical reasoning in patient diagnosis and treatment.	NBCE, Parts III & IV	1st Year: Fail rate ≤ 15% on all parts 2nd Year: Fail rate ≤ 13% on all parts 3rd Year: Fail rate ≤ 10% on all parts
	Core Concepts In Clinical Applications Capstone Exam	70% pass rate or higher
	Intern Global Assessments	Group ratings of satisfactory on clinical reasoning elements
	Knowledge Based Inference Tool (KBIT)	Indirect measure for trend analysis
	Diagnostic Thinking Inventory	Initial administration (trimester 6) mean of 153. Second administration (trimester 10) mean of 168.
	Case-based Discussion	Group ratings of satisfactory on clinical reasoning elements
	Course-based exams related to SLOs.	Students achieve or exceed course exam pass rate of 70%
	CSCE I and II	Students achieve or exceed 70% on clinical reasoning related elements
	Standardized Patient Encounters	Students satisfactorily perform clinical skills based upon critical criteria
	Faculty Interviews	Indirect measure for trend analysis
	Student Course Evaluations	Indirect measure for trend analysis
	Health Sciences Reasoning Test	Initial: Compare to established normative data until institutional norms are established During QEP implementation: All group subscores at “average strength” After full QEP implementation: All group subscores at “strong”

Programmatic Evaluation Schedule

Table 5.6 illustrates the evaluation methods to be used during each trimester for determination of the efficacy of the QEP program.

Table 5.6: Programmatic Evaluation Schedule

Evaluation Tool	Location	Trimester
Faculty Interview / Course Evaluations Health Sciences Reasoning Test	Gross Anatomy I, Spinal Anatomy, Human Biochemistry Spinal Anatomy	1
Faculty Interview / Course Evaluations	Gross Anatomy II, Spinal Biomechanics, Cellular & Cardiovascular Physiology	2
Faculty Interview / Course Evaluations	Clinical Case Applications I, Basic Communication and History-Taking Skills	3
Faculty Interview / Course Evaluations	Clinical Case Applications II, Advanced Communication and History-Taking Skills	4
Faculty Interview / Course Evaluations Health Sciences Reasoning Test Core Concepts in Basic Sciences NBCE Part I	Clinical Case Applications III Clinical Case Applications III Capstone Examination Independent Examination	5
Faculty Interview / Course Evaluations Diagnostic Thinking Inventory	Clinical Case Applications IV Clinical Neurology Clinical Case Applications IV	6
CSCE I Core Concepts in Clinical Sciences NBCE Part II Faculty Interview / Course Evaluations KBIT	Clinic I Capstone Examination Independent Examination Case Management I, Clinic I Clinic I	7
Core Concepts in Clinical Applications NBCE Part III Faculty Interview / Course Evaluations KBIT	Capstone Examination Independent Examination Orthopedics III, Clinic II Orthopedics III, Clinic II	8
CSCE II Faculty Interview / Course Evaluations KBIT	Clinic III Clinic III Clinic III	9
NBCE Part IV Faculty Interview / Course Evaluations Diagnostic Thinking Inventory KBIT Health Sciences Reasoning Test	Independent Examination Clinic IV Clinic IV Clinic IV Clinic IV	10

CHAPTER 6: FACULTY DEVELOPMENT

Introduction

Faculty development is integral to successful teaching and assessment strategies. The QEP Steering Committee appointed a subcommittee to investigate and determine the most effective development programs to train the TCC faculty. Appendix II lists the subcommittee members.

Faculty development has been defined as that broad range of activities that institutions use to renew or assist faculty in their roles (Centra, 1978). Faculty development programs demonstrate that institutions value their workforce. Signs of successful faculty development are improved teaching performance and better learning outcomes for students. The focus of faculty development is to improve teaching practices and manage change in instructional and assessment methods through enhancement of individual strengths and abilities as well as institutional capacities and culture (Bligh, 2005).

The organizational outline of TCC's faculty development program consists of three phases: planning, implementation, and evaluation/feedback. The "planning" phase identifies the activities and initiatives needed to improve the performance of faculty in instruction and assessment related to clinical reasoning. The "implementation" phase trains faculty in interactive learner-centered activities and educational strategies to support the educational outcomes. In the "evaluation/feedback" phase, information is obtained to identify the effectiveness of faculty development as illustrated in Table 6.1.

Table 6.1: Faculty Development Outcomes

Reaction	Participants' satisfaction with the training as ascertained by a survey.
Learning - Changes in attitudes	Changes in the attitudes or perceptions among participant groups towards teaching and learning as assessed by a faculty questionnaire.
Learning - Modification of knowledge or skills	For knowledge, this relates to the acquisition of concepts, procedures and principles; for skills, this relates to the acquisition of thinking/problem-solving, psychomotor and social skills. This is assessed by a clinical skills exam at the completion of the training session.
Behavior	Documents the transfer of learning to the workplace or willingness of learners to apply new knowledge & skills. This is assessed by direct observation and questionnaire.
Results – Change in the practice	Refers to wider changes in the organization, attributable to the educational program as determined by a faculty climate survey.
Results – Change among the participants	Refers to improvement in student learning/performance as a direct result of the educational intervention as evidenced by the programmatic evaluation.

Table adapted from Kirkpatrick's model for evaluating educational outcomes (Kirkpatrick, 1994) as modified by Freeth et al (Freeth & Network, 2002).

Faculty Development

TCC faculty development related to clinical reasoning began in 2006. Table 6.2 is an outline of the workshops and presentations that have occurred during the past three years relating to teaching strategies, clinical reasoning, and assessment methods. Additional faculty development efforts will continue in Spring 2009 and will primarily target those instructors in the pilot phase of the QEP. Training will consist of workshops, journal reviews, and online tutorials. During the implementation of the pilot courses, on-going evaluations and feedback will be utilized to assess the effectiveness of faculty development in relation to achieving the course and programmatic outcomes. Based on faculty feedback, development strategies will be adapted and incorporated into subsequent training sessions involving the full complement of QEP-related faculty. All faculty development workshops will be video-recorded and a faculty development resource library will be assembled and maintained to provide support and follow-up training.

Table 6.2: Previous QEP Related Faculty Development Activities

January 2006, Dr. Alan Adams and Dr. Jason Flanagan presented "The Learning-Centered Course Syllabus". This workshop emphasized differentiating and communicating learning objectives and outcomes in the course syllabus.
May 2006, Dr. John Littlefield of UTSA presented a workshop on writing good multiple choice questions.
August 2006, TCC's Symposium on Contemporary Concepts in Clinical Assessment consisted of four presentations and five workshops related to clinical assessment. Speakers included: Drs. John Littlefield of UTSA, Karen Szauter of UTMB, Steven Downing of UIC, Delia Anderson of Tulane, et al.
January 2007, Drs. Charlene Dewey and Teri Turner of BCM presented a workshop on clinical teaching.
May 2007, Drs. Ruth Levine of UTMB and Paul Haidet of BCM presented a workshop on Team-Based Learning.
December 2007, Drs. Alan Adams, Jesse Coats, Jason Flanagan, Martha Friesen, John Mrozek and Dorrie Talmage attended the SACS Annual Conference in New Orleans, Louisiana.
January 2008, Dr. Frank Papa from TCOM presented information on Application-Oriented Curriculum.
July 2008, Drs. John Mrozek and Dorrie Talmage attended the SACS Summer Institute in Orlando, Florida.
September 2008, Dr. Robert Bulik of UTMB presented DAC, an online application for creating and using case studies to enhance learning and clinical reasoning.
September 2008, Dr. Dorrie Talmage attended a workshop on Application-Oriented Curriculum at TCOM presented by Dr. Frank Papa and colleagues.
November 2008, Drs. Terry and Daniel Wolpaw presented a workshop on the SNAPPS model of clinical teaching at the AAMC annual meeting in San Antonio. Drs. Amy Wright and Victor Benavides attended.
November 2008, Drs. Victor Benavides, Isis Zaki & Amy Wright attended a presentation on KBIT at AAMC.
November 2008, Dr. Steve Foster attended "Fundamentals of Assessment in

Medical Education" workshop at AAMC.
November 2008, Drs. Isis Zaki and Ezzat Mikhail attended a AAMC workshop, "Transforming Your Course from Content-Centered to Learning-Centered".
December 2008, Drs. Alan Adams, Stephen Foster, John Mrozek, and Dorrie Talmage attended the annual SACS Annual Conference in San Antonio.

Previous training in some teaching strategies may preclude the need for further faculty development. The following teaching strategies may be new or unfamiliar to the current faculty and training opportunities will be provided. Table 6.3 reflects the focus of future faculty development specifically related to teaching strategies.

Table 6.3: Faculty Development of Teaching Strategies

Topic: Case-Based Learning (CBL) • Design-A-Case (DAC) • Paper Cases
Focus: DAC training will focus on tailoring existing cases in the program to the College's basic science courses. Dr. Robert Bulik is a source for altering the cases; TCC faculty member, Dr. Jeffrey Weiss, is a source for developing the cases. Paper Cases: Dr. Jeffrey Weiss will hold workshops on case development and modeling of appropriate methods to facilitate case discussions.
Schedule: Spring 2009 and follow-up as needed.
Target Audience: DAC = Basic Science Faculty Paper Cases = All faculty who may utilize this strategy

Topic: Electronic Real Time Student Feedback (I-Clickers)
Focus: Training on the successful implementation of the I-Clicker in courses for both formative and summative use. I-Clicker offers daily on-line/teleconference training sessions and a downloadable resource guide on its use.
Schedule: Spring 2009 and follow-up as needed.
Target Audience: All faculty who wish to utilize the clickers

Topic: Team-Based Learning (TBL)
Focus: Training on the appropriate utilization of TBL will continue. External resources are Drs. Ruth Levine and Paul Haidet. Dr. Dorrie Talmage is the onsite resource for additional training.
Schedule: Training has been implemented and will continue through the Spring of 2009
Target Audience: Case Management I Instructor

Topic: Application-Oriented Teaching (AOT)
Focus: Training for AOT has already occurred. Dr. Frank Papa is a resource if further help is required.
Schedule: Training has already occurred.
Target Audience: Orthopedics III Instructor

Topic: Knowledge Based Inference Tool (KBIT)
Focus: Training on the utilization of KBIT. Dr. Frank Papa is an external resource and Drs. Victor Benavides & Amy Wright are onsite resources if further training is required.
Schedule: Training has already occurred.
Target Audience: CCA, Clinic I, and Orthopedics III faculty members

Topic: Standardized Patients
Focus: TCC has utilized SP's for approximately 7 years. Most faculty will not require training.
Schedule: Training has already occurred.
Target Audience: Pre-clinical faculty

Topic: SNAPPS
Focus: TCC clinicians, Drs. Victor Benavides and Amy Riman-Wright, will provide training on the implementation and benefits of the SNAPPS model.
Schedule: Spring and Summer of 2009
Target Audience: Clinic Faculty

Topic: Faculty Modeling
Focus: Dr. Jeffrey Weiss will present workshops that will train faculty on how to convey their decision-making processes as they are examining, diagnosing and managing a patient.
Schedule: Spring 2009
Target Audience: Clinical Science faculty, especially those involved in the CCA courses.

Topic: Reflective Practice
Focus: Dr. Dennis Baker from FSU will be invited to present a faculty workshop on facilitation of student self-reflection.
Schedule: Spring 2009
Target Audience: Clinical Science and Clinic Faculty

TCC currently utilizes several of the identified assessment methods, including standardized patient encounters, OSCE format assessments and global rating scales. Many faculty members have working knowledge of these methods. However, additional training in these methods may become necessary as new faculty members are incorporated into the QEP process. Certain methods are new or unfamiliar to the current faculty so development opportunities will be held to ensure adequate training in the use of all assessment methods related to the QEP. The additional training topics are listed in Table 6.4.

Table 6.4: Faculty Development of Assessment Strategies

Topic: Writing Script Concordance Questions
Focus: TCC faculty member, Dr. Stephen A. Foster, will train the participants to develop, implement and score script concordance type questions. Emphasis is placed on when these questions should be used and the process for developing questions by group consensus. Time is also spent on interpreting scoring methods and the relevance of those scores to clinical reasoning.
Schedule: Initial training in Spring 2009 with annual follow-up training as needed.
Target Audience: Faculty teaching clinically based courses

Topic: Writing Extended Matching Questions
Focus: This training, presented by TCC faculty member Dr. Stephen A. Foster, focuses on the development and educational usefulness of extended matching questions. Topics include psychometric properties, construction methods and techniques to write questions aimed at evaluation of clinical reasoning.
Schedule: Initial training in Spring 2009 with annual follow-up training as needed.
Target Audience: Faculty that utilize written format questions

Topic: Writing Key Features Questions
Focus: TCC faculty member, Dr. Stephen A. Foster, will teach the design and use of key features type questions. Topics include the necessary elements of a key feature question, identifying key elements in a case and interpreting clinical reasoning for the answers.
Schedule: Initial training in Spring 2009 with annual follow-up training as needed.
Target Audience: Faculty that utilize written format questions

Topic: Case-based Discussion
Focus: This training will present the elements of a case based discussion including use of a scoring rubric and how to give effective feedback.
Schedule: Initial training in Spring 2009 with annual follow-up training as needed.
Target Audience: Clinic faculty

CHAPTER 7: INSTITUTIONAL CAPABILITY FOR INITIATION AND CONTINUATION OF THE QEP

Introduction

An emphasis on the complex process that defines clinical reasoning is expected to become a key component of the Doctor of Chiropractic program at TCC. The College looks forward to the effect that this journey will have across the institution. A subcommittee (Appendix II) was formed to develop the management structure, budgetary requirements and project timeline to ensure the plan's success.

Management Structure

Figure 7.1 outlines the management structure that best suits the development and support of the plan. The overall responsibility for the academic program, including the QEP, rests with the Vice President (VP) of Academics and Program Development who will carry out this responsibility with input from the President's Cabinet. Members of the President's Cabinet are listed in Appendix III.

The Dean of Academic Affairs directly supports the VP of Academics and Program Development. The Dean of Academic Affairs will receive continuous input from both the QEP Administrative Committee and the Curriculum Committee. The QEP Administrative Committee and the Curriculum Committee must work in close concert in order to effectively implement the QEP across the curriculum.

The QEP Administrative Committee is composed of a cross section of TCC teaching and administrative faculty, and one to two students. The advice and counsel of this committee ensures a broad representation of voices across the institution. The charge of the QEP Administrative Committee is to monitor the implementation and evaluation of the QEP. Each trimester, the committee reports the progress of the QEP to the Dean of Academic Affairs and proposes possible improvements, including adjustments to the timeline and budget. Minutes of all open meetings of the QEP Administrative Committee will be made available to all faculty members via the College's resource drive and/or Blackboard for their information and input. Committee members are Dr. Dorrie Talmage (chair), Dr. Victor Benavides, Dr. Karlene Denby, Dr. Amanda Tang, and Dr. Jeffrey Weiss (case coordinator). Ex officio members are Dr. Alan Adams, Dr. Stephen Foster, Dr. John Mrozek, and Dr. Kuan Yang. Additionally, one to two student representatives will be added to the committee.

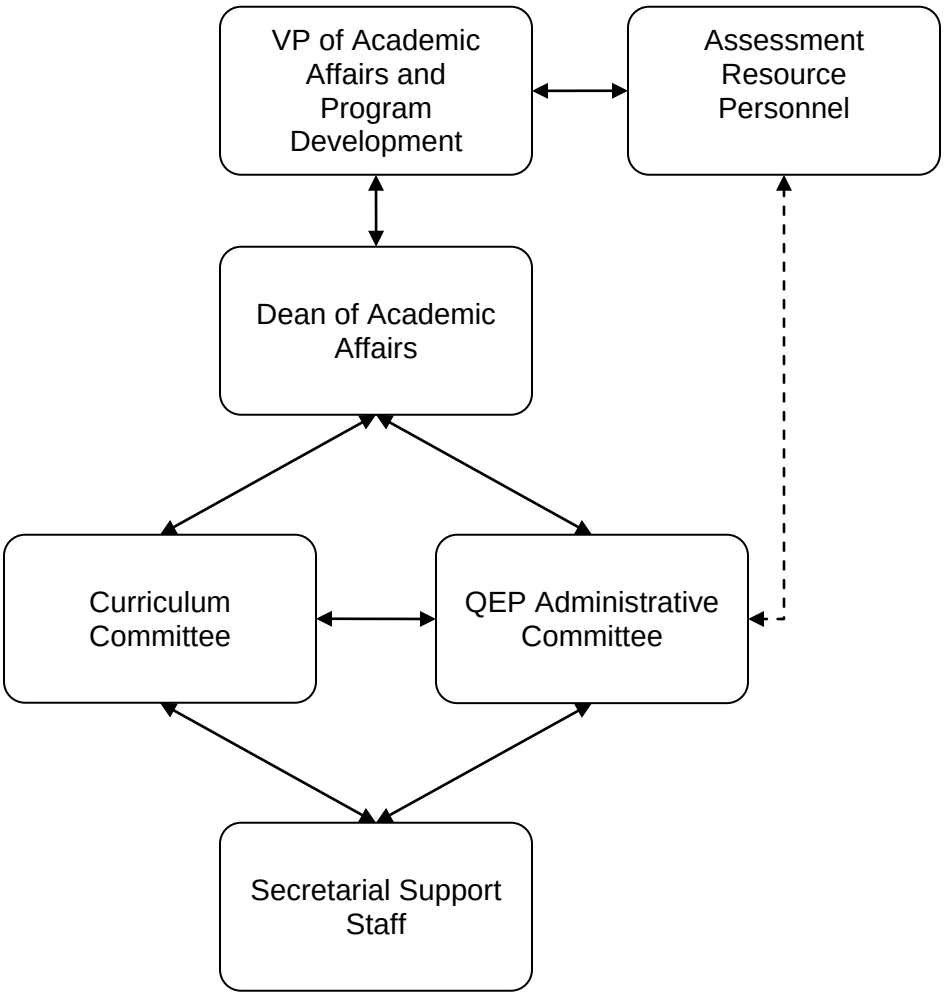
The charge of the Curriculum Committee is to review and make recommendations to the VP of Academics and Program Development concerning proposed changes to the doctorate and baccalaureate curricula of Texas Chiropractic College. It is the responsibility of the Curriculum Committee to ensure that curricular initiatives associated with the QEP are placed on the committee's agenda in a timely manner for deliberation, consideration, approval and submission to the Dean of Academic Affairs for implementation. Committee members are Dr. Jesse Coats (chair), Dr. Karlene Denby, Dr. Stephen Foster, Dr. Timothy Lee, Dr. Ezzat Mikhail, Dr. Dorrie Talmage, Dr. Jeffrey Weiss, and Dr. Larry Wyatt. Ex officio member is Dr. Sandra Hughes.

Assessment resource personnel are essential components in evaluating the implementation of the QEP. The Director of Assessment, along with the Director of

Institutional Research, report directly to the VP of Academics and Program Development. These two directors will also work closely with the QEP Administrative Committee by providing all assessment data relevant to the QEP. The Director of Assessment is a member of Curriculum Committee and an ex officio member of the QEP Administration Committee.

Secretarial support staff are responsible for transcribing committee minutes, assembling documentation and compiling the ongoing output related to the QEP, and will assist both the QEP Administrative Committee and Curriculum Committee as needed. The secretarial support staff will be provided from the office of the VP of Academics and Program Development and the office of the Dean of Academic Affairs and will share the QEP related workload as appropriate.

Figure 7.1: QEP Management Structure



While not shown in the QEP Management Structure (Figure 7.1), an external consultant will review the implementation, changes and evaluation process of the QEP on an annual basis.

QEP Communications and Marketing

The QEP Communications and Marketing Subcommittee, formed in November 2008, is charged with initiating an internal campaign to introduce the details of the QEP to the student body, faculty, staff, and the Board of Regents during January and February 2009. With a budget of $2,000.00, the subcommittee formulated an advertising campaign that involves promoting the most relevant details in the QEP document. The subcommittee members can be found in Appendix II.

The most pertinent information necessary to effectively communicate the internal campaign were determined to be the logo, the definition of clinical reasoning, programmatic outcomes, and changes to the curriculum. This information will be communicated through a set of posters, tri-fold pocket cards and campus computer backgrounds. More detailed information on each of these topics will be provided through various communication mediums such as email blasts, the campus newsletter (The Backpage), the TCC Magazine, the College website and the Blackboard campus information system. One page handouts will also be distributed during orientation, convocation, grand rounds and in various classes.

Copies of the full QEP document will be given to all faculty, staff, board members and student leaders. Student leaders will be an essential component for relaying information to the student body. Therefore, several meetings will be scheduled with student leaders and student associations during January and February. A *QEP Week* during February 16-20 will feature a presentation to the student body to ensure that all students have a thorough understanding of the changes. Additionally, presentations during faculty in-services and faculty/staff convocation in early January will ensure that faculty and staff are fully informed about the QEP. A presentation to the Board of Regents will help solidify the QEP concepts to them as well.

Examples of the promotional materials are provided in Appendix IV; the communications timeline is provided in Appendix V. The subcommittee believes that the outlined promotional strategies will sufficiently disseminate QEP information to all faculty, staff, students, and board members.

Project Timeline

A timeline has been developed which details the implementation of the QEP over a five year span. Ongoing faculty development, programmatic assessment and possible improvements/modifications to the QEP are performed each trimester. The five-year timeline can be found in Appendix VI.

QEP Budget

The College is dedicating adequate funding to successfully initiate and implement the QEP for the next five years. The College's budget year is September 1 – August 31. Table 7.1 provides the projected costs for the plan's implementation. The projected costs were estimated by the QEP Steering Committee and include 1.50 FTE in new funding. Uncovering existing resources and applying them to the QEP is an ongoing goal and challenge. The VP of Academics and Program Development, as a member of the Texas Chiropractic College President's Cabinet, is well placed to ensure that the QEP receives the necessary financial and human resources needed for successful outcomes.

Current qualified TCC employees will be integral players in the QEP implementation process, as delineated below. Additional personnel will be hired as required.

The QEP Administrative Committee Chair (.25 FTE): New funding will be allocated to provide a workload offset through the hiring of an adjunct faculty member and/or compensation for the Chair. The Chair reports to the Dean of Academic Affairs and indirectly to the VP of Academics and Program Development, as required. This position is responsible for keeping within budget, for monitoring progress, and for recommending QEP modifications to the Dean of Academic Affairs and the VP of Academics and Program Development.

Director of Assessment (.25 FTE): New funding will be allocated to this position to provide a workload offset through the hiring of an adjunct faculty member and/or compensation for the Director. The Director reports to the VP of Academics and Program Development or indirectly to the Dean of Academic Affairs through the Administrative Chair of the QEP, as needed.

Registrar (.25 FTE): New funding will be allocated to this position to provide a workload offset through the hiring of additional part-time staff support and/or compensation for the Registrar. The Registrar is a member of the Curriculum Committee and the QEP Administrative Committee, providing essential input and information to both committees regarding the administrative status of the degree program and implications to the QEP, as needed.

Director of Campus Health Center (.25 FTE): New funding will be allocated to this position to provide a workload offset through the hiring of an adjunct faculty member and/or compensation for the Director. The Director is responsible for implementation of clinical reasoning throughout the clinical setting and providing input to the QEP Administrative Committee.

Case Coordinator: The case coordinator will be provided with a workload offset through utilization of existing faculty members. The case coordinator is responsible for integration of clinical cases within both the basic sciences and clinical sciences curriculum.

New hire/s (.50 FTE): New funding will be allocated to the hiring of one-half of a full-time-equivalent faculty, whose primary duty will be the instruction of the three new Clinical Case Application courses.

Additional funding, as set out in the table below, is dedicated to the purchase of the necessary teaching and assessment tools, faculty travel and development, and related administrative costs. Funding for the first year was approved by the President's Cabinet and the Board of Regents**.** The budgetary requirements to fund the entire QEP have been forwarded to the Board of Regents and approval is anticipated at their next meeting in January 2009. Funding for the second through fifth years of the QEP will be part of the College's normal operating budget.

Table 7.1: Projected Cost for QEP Implementation

Expense	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Personnel						
Faculty*	0	90,000.00	94,500.00	99,225.00	104,185.00	109,395.00
Standardized Pts.	7,000.00	18,000.00	18,000.00	18,600.00	19,200.00	19,800.00
Equipment/Software						
Design A Case	500.00	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00
KBIT	5,250.00	11,250.00	11,250.00	11,250.00	11,250.00	11,250.00
I-Clickers	1,625.00	8,100.00	8,100.00	8,100.00	8,100.00	8,100.00
Assessment Tools						
HSRT	1,500.00	2,500.00	2,500.00	2,500.00	2,500.00	2,500.00
Scantron Forms	50.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00
Faculty Development	8,000.00	8,000.00	8,000.00	8,000.00	8,000.00	8,000.00
Communication/ Public Relations	2,000.00	500.00	500.00	500.00	500.00	500.00
Copier Costs	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00	5,000.00
Printing Costs	5,000.00	1,000.00	1,000.00	1,000.00	1,000.00	1,000.00
Travel	2,500.00	2,500.00	2,500.00	1,500.00	1,500.00	1,500.00
Miscellaneous	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00	1,500.00
Total	39,925.00	150,850.00	155,350.00	159,675.00	165,235.00	171,045.00

* 1.50 full time faculty equivalent including salary and benefits.

CONCLUSIONS

The QEP topic, Clinical Reasoning, links to TCC's mission statement to provide students with a patient-centered approach to health care. It also relates to TCC's vision to be recognized for excellence in patient-centered care. TCC's strategic plan strives for continuous quality improvement in the College's academic programs. The QEP, along with the TCC Graduate document, provide an important blueprint for achieving quality improvement.

The topic selection process was multifaceted. Programmatic assessment, along with the recommendations from the TCC Graduate document, identified three potential topics. A broad range of stakeholders were included in the topic selection process and a consensus was reached. A steering committee was formed to formulate the plan and potential benefits to the College were identified.

A review of the literature was performed searching multiple databases and using appropriate key terms. The focus was theory and practice of clinical reasoning, teaching strategies, course and curricular models, and assessment methods.

A conceptual model of clinical reasoning was developed and, using that model as a source, a clinical reasoning stream was integrated across the curriculum. Based upon the clinical reasoning model, three programmatic outcomes were identified:

1. Integration and application of basic science knowledge with clinical presentations.
2. Introduction and application of clinical reasoning strategies in pre-clinical settings.
3. Application of clinical reasoning skills in patient care settings.

Four courses were selected as a means of piloting the identified teaching and assessment strategies. Modifications to the curriculum were made and new courses added. A two-track implementation system was developed in both the didactic and clinical settings. Full implementation will be concluded by Spring 2012.

Several assessment methods were selected for both student learning and programmatic outcomes. Thorough analysis of the assessment results will drive modifications to both teaching and assessment, and will determine the future direction of the QEP.

Effective faculty development is essential to successful implementation of clinical reasoning across the curriculum. Faculty development has been ongoing and will continue to focus on enhancing teaching proficiency and assessment strategies, meeting the desired learning outcomes, and managing change. The effectiveness will be determined through the triangulation of evidence of faculty learning, change in behavior, and results, including improvement in student learning and performance.

TCC is dedicated to the success of the QEP through the establishment of an appropriate management structure, workload reduction and/or increased compensation for key personnel, and adequate budgetary support. Key players in the management of the QEP are dedicated and determined in order to ensure the successful implementation of clinical reasoning across the curriculum.

REFERENCES

Ainsworth, M. A., Rogers, L. P., Markus, J. F., Dorsey, N. K., Blackwell, T. A., & Petrusa, E. R. (1991). Standardized patient encounters: A method for teaching and evaluation. *Journal of the American Medical Association, 266*(10), 1390-1396.
Ark, T. K., Brooks, L. R., & Eva, K. W. (2006). Giving learners the best of both worlds: Do clinical teachers need to guard against teaching pattern recognition to novices? *Academic Medicine, 81*(4), 405-409.
Beullens, J., Struyf, E., & Van Damme, B. (2005). Do extended matching multiple-choice questions measure clinical reasoning? *Medical Education, 39*(4), 410-417.
Beullens, J., Struyf, E., & Van Damme, B. (2006). Diagnostic ability in relation to clinical seminars and extended-matching questions examinations. *Medical Education, 40*(12), 1173-1179.
Bligh, J. (2005). Faculty development. *Medical Education, 39*(2), 120-121.
Bordage, G. (2007). Prototypes and semantic qualifiers: from past to present. *Medical Education, 41*(12), 1117-1121.
Bordage, G., Grant, J., & Marsden, P. (1990). Quantitative assessment of diagnostic ability. *Medical Education, 24*(5), 413-425.
Bowen, J. L. (2006). Educational strategies to promote clinical diagnostic reasoning. *New England Journal of Medicine, 355*(21), 2217-2225.
Brownell Anderson, M., Stillman, P. L., & Wang, Y. (1994). Growing use of standardized patients in teaching and evaluation in medical education. *Teaching and Learning in Medicine, 6*(1).
Carriere, B., Gagnon, R., Charlin, B., Downing, S., & Bordage, G. (2008). Assessing clinical reasoning in pediatric emergency medicine: Validity evidence for a Script Concordance Test. *Annals of Emergency Medicine*.
Case, S. M., & Swanson, D. B. (1993). Extended-matching items: A practical alternative to free-response questions. *Teaching and Learning in Medicine, 5*(2), 107-115.
Centra, J. A. (1978). *Types of faculty development programs*: Journal of Higher Education.
Charlin, B., Boshuizen, H. P., Custers, E. J., & Feltovich, P. J. (2007). Scripts and clinical reasoning. *Medical Education, 41*(12), 1178-1184.
Charlin, B., Roy, L., Brailovsky, C., Goulet, F., & Van Der Vleuten, C. (2000). The Script Concordance test: A tool to assess the reflective clinician. *Teaching and Learning in Medicine, 12*(4), 189-195.
Charlin, B., Tardif, J., & Boshuizen, H. P. (2000). Scripts and medical diagnostic knowledge: Theory and applications for clinical reasoning instruction and research. *Academic Medicine, 75*(2), 182-190.
Coderre, S., Mandin, H., Harasym, P. H., & Fick, G. H. (2003). Diagnostic reasoning strategies and diagnostic success. *Medical Education, 37*(8), 695-703.
Dent, J. A., & Harden, R. M. (2005). *A practical guide for medical teachers* (2nd ed.). Edinburgh ; New York: Elsevier Churchill Livingstone.
Durak, H. I., Caliskan, S. A., Bor, S., & Van Der Vleuten, C. (2007). Use of case-based exams as an instructional teaching tool to teach clinical reasoning. *Medical Teacher*, 1-5.
Epstein, R. M., & Hundert, E. M. (2002). Defining and assessing professional competence. *Journal of the American Medical Association, 287*(2), 226-235.

Ericsson, K. A. (2004). Deliberate practice and the acquisition and maintenance of expert performance in medicine and related domains. *Academic Medicine, 79*(10 Suppl), S70-81.
Ericsson, K. A. (2007). An expert-performance perspective of research on medical expertise: The study of clinical performance. *Medical Education, 41*(12), 1124-1130.
Eva, K. W. (2005). What every teacher needs to know about clinical reasoning. *Medical Education, 39*(1), 98-106.
Eva, K. W., Neville, A. J., & Norman, G. R. (1998). Exploring the etiology of content specificity: Factors influencing analogic transfer and problem solving. *Academic Medicine, 73*(10 Suppl), S1-5.
Eva, K. W., & Norman, G. R. (2005). Heuristics and biases--a biased perspective on clinical reasoning. *Medical Education, 39*(9), 870-872.
Facione, N. C., & Facione, P. A. (2006). *The health sciences reasoning test manual*. Millbrae: California Academic Press.
Freeth, D., & Network, L. a. T. S. (2002). *A critical review of evaluations of interprofessional education*, from http://www.health.ltsn.ac.uk/publications/occasionalpaper/occasionalpaper02.pdf
Goulet, F., Jacques, A., Gagnon, R., Racette, P., & Sieber, W. (2007). Assessment of family physicians' performance using patient charts: Interrater reliability and concordance with chart-stimulated recall interview. *Evaluation & the Health Professions, 30*(4), 376-392.
Gray, J. D. (1996). Global rating scales in residency education. *Academic Medicine, 71*(1 Suppl), S55-63.
Harden, R. M., & Gleason, F. A. (1979). Assessment of clinical competence using an Objective Structured Clinical Evaluation. *Medical Education, 13*(1), 41-54.
Holmboe, E. S., & Hawkins, R. E. (2008). *Practical guide to the evaluation of clinical competence*. Philadelphia, PA: Mosby/Elsevier.
Irby, D. M. (1994). What clinical teachers in medicine need to know. *Academic Medicine, 69*(5), 333-342.
Jones, U. F. (1997). The reliability and validity of the Bordage, Grant & Marsden diagnostic thinking inventory for use with physiotherapists. *Medical Teacher, 19*(2), 133.
Kirkpatrick, D. L. (1994). *Evaluating training programs: The four levels* (1st ed.). San Francisco
Emeryville, CA: Berrett-Koehler ;
Publishers Group West [distributor].
Loyens, S. M., Rikers, R. M., & Schmidt, H. G. (2006). Students' conceptions of constructivist learning: A comparison between a traditional and a problem-based learning curriculum. *Advances in Health Sciences Education: Theory and Practice, 11*(4), 365-379.
Mamede, S., & Schmidt, H. G. (2004). The structure of reflective practice in medicine. *Medical Education, 38*(12), 1302-1308.
Mamede, S., Schmidt, H. G., & Penaforte, J. C. (2008). Effects of reflective practice on the accuracy of medical diagnoses. *Medical Education, 42*(5), 468-475.
Mandin, H., Harasym, P., Eagle, C., & Watanabe, M. (1995). Developing a "clinical presentation" curriculum at the University of Calgary. *Academic Medicine, 70*(3), 186-193.

Mandin, H., Jones, A., Woloschuk, W., & Harasym, P. (1997). Helping students learn to think like experts when solving clinical problems. *Academic Medicine, 72*(3), 173-179.
Mattingly, C. (1991). What is clinical reasoning? *American Journal of Occupational Therapy, 45*(11), 979-986.
Meeuwsen, H. J. (2002). Effective use of learning teams in the classroom. *Journal of Sport and Exercise Psychology, 24 (Suppl.),* S4.
Michaelsen, L. K., Knight, A. B., & Fink, L. D. (2004). *Team-based learning: A transformative use of small groups in college teaching* (1st pbk. ed.). Sterling, VA: Stylus Pub.
Moulton, C. A., Regehr, G., Mylopoulos, M., & MacRae, H. M. (2007). Slowing down when you should: A new model of expert judgment. *Academci Medicine, 82*(10 Suppl), S109-116.
Newble, D. I., & Jaeger, K. (1983). The effect of assessments and examinations on the learning of medical students. *Medical Education, 17*(3), 165-171.
Norcini, J. J., & McKinley, D. W. (2007). Assessment methods in medical education. *Teaching and Teacher Education, 23*(3), 239-250.
Norman, G. (2005). Research in clinical reasoning: past history and current trends. *Medical Education, 39*(4), 418-427.
Oglesby, M. W., Dubin, B. D., Gwirtz, P. A., Martin, M. W., Putthoff, S. L., & Papa, F. J. (2008). *An application-oriented curriculum: Impact on medical student performance on national licensing boards*.Unpublished manuscript.
Page, G., & Bordage, G. (1995). The Medical Council of Canada's key features project: A more valid written examination of clinical decision-making skills. *Academic Medicine, 70*(2), 104-110.
Page, G., Bordage, G., & Allen, T. (1995). Developing key-feature problems and examinations to assess clinical decision-making skills. *Academic Medicine, 70*(3), 194-201.
Papa, F. J. (2008). *An application-oriented curriculum: Rationale and cognitive framework*.Unpublished manuscript.
Papa, F. J., & Harasym, P. H. (1999). Medical curriculum reform in North America, 1765 to the present: A cognitive science perspective. *Academic Medicine, 74*(2), 154-164.
Papa, F. J., Oglesby, M. W., Aldrich, D. G., Schaller, F., & Cipher, D. J. (2007). Improving diagnostic capabilities of medical students via application of cognitive sciences-derived learning principles. *Medical Education, 41*(4), 419-425.
Papa, F. J., Shores, J. H., & Meyer, S. (1990). Effects of pattern matching, pattern discrimination, and experience in the development of diagnostic expertise. *Academic Medicine, 65*(9 Suppl), S21-22.
Papa, F. J., Stone, R. C., & Aldrich, D. G. (1996). Further evidence of the relationship between case typicality and diagnostic performance: Implications for medical education. *Academic Medicine, 71*(1 Suppl), S10-12.
Patel, V. L., Groen, G. J., & Arocha, J. F. (1990). Medical expertise as a function of task difficulty. *Memory & Cognition, 18*(4), 394-406.
Patel, V. L., Groen, G. J., & Norman, G. R. (1991). Effects of conventional and problem-based medical curricula on problem solving. *Academic Medicine, 66*(7), 380-389.

Rahayu, G. R., & McAleer, S. (2008). Clinical reasoning of Indonesian medial students as measured by diagnostic thinking inventory. *South East Asian Journal of Medical Education, 2*(1), 42-47.
Round, A. P. (1999). Teaching clinical reasoning--a preliminary controlled study. *Medical Education, 33*(7), 480-483.
Schmidt, H. G., Dauphinee, W. D., & Patel, V. L. (1987). Comparing the effects of problem-based and conventional curricula in an international sample. *Journal of Medical Education, 62*(4), 305-315.
Schmidt, H. G., & Rikers, R. M. J. P. (2007). How expertise develops in medicine: Knowledge encapsulation and illness script formation. *Medical Education, 41*(12), 1133-1139.
Schmidt, H. G., Vermeulen, L., & Van Der Molen, H. T. (2006). Longterm effects of problem-based learning: A comparison of competencies acquired by graduates of a problem-based and a conventional medical school. *Medical Education, 40*(6), 562-567.
Schön, D. A. (1983). *The reflective practitioner: How professionals think in action*. New York: Basic Books.
Schön, D. A. (1987). *Educating the reflective practitioner: Toward a new design for teaching and learning in the professions* (1st ed.). San Francisco: Jossey-Bass.
Slavin, S. J., Wilkes, M. S., & Usatine, R. (1995). Doctoring III: Innovations in education in the clinical years. *Academic Medicine, 70*(12), 1091-1095.
Srinivasan, M., Wilkes, M., Stevenson, F., Nguyen, T., & Slavin, S. (2007). Comparing problem-based learning with case-based learning: Effects of a major curricular shift at two institutions. *Academic Medicine, 82*(1), 74-82.
Sweet, M., & K., M. L. (2007). How group dynamics research can inform the theory and practice of postsecondary small group learning. *Educational Psychology Review, 19*(1), 31-47.
Thomas, M. D., O'Connor, F. W., Albert, M. L., Boutain, D., & Brandt, P. A. (2001). Case-based teaching and learning experiences. *Issues Ment Health Nurs, 22*(5), 517-531.
University of Calgary Faculty of Medicine: Operating philosophy. (2008). Retrieved 03/23/2008, from http://medicine.ucalgary.ca/undergrad/ume/philosophy
Windish, D. M., Price, E. G., Clever, S. L., Magaziner, J. L., & Thomas, P. A. (2005). Teaching medical students the important connection between communication and clinical reasoning. *Journal of General Internal Medicine, 20*(12), 1108-1113.
Woloschuk, W., Harasym, P., Mandin, H., & Jones, A. (2000). Use of scheme-based problem solving: An evaluation of the implementation and utilization of schemes in a clinical presentation curriculum. *Medical Education, 34*(6), 437-442.
Wolpaw, T. M., Wolpaw, D. R., & Papp, K. K. (2003). SNAPPS: A learner-centered model for outpatient education. *Academic Medicine, 78*(9), 893-898.
Woods, N. N. (2007). Science is fundamental: The role of biomedical knowledge in clinical reasoning. *Medical Education, 41*(12), 1173-1177.
Woods, N. N., Brooks, L. R., & Norman, G. R. (2007). The role of biomedical knowledge in diagnosis of difficult clinical cases. *Advances in Health Sciences Education : Theory and Practice, 12*(4), 417-426.

APPENDIX I: QEP STEERING COMMITTEE

QEP Steering Committee	
Dorrie Talmage, M.Ed., D.C. Chairperson	Professor, Department of Principles, Technique and Biokinetics
Alan Adams, D.C.	Professor, Vice president of Academics and Program Development
Victor Benavides, D.C.	Assistant Professor, Director of Campus Health Center
Karen Bulow, M.L.S.	Assistant Professor, Research and Public Services Librarian
Jesse Coats, D.C.	Associate Professor, Chairman, Department of Clinical Sciences
Karlene Denby, D.C.	Professor, Registrar
Stephen Dyess, D.C.	Assistant Professor, Attending Clinician
Jason Flanagan, D.C.	Associate Professor, Dean of Post Graduate and Continuing Education
Stephen Foster, D.C.	Professor, Director of Assessment and Development
John Mrozek, M.Ed., D.C.	Professor, Dean of Academic Affairs
Bill Quinn, B.B.A., C.P.A.	Budget and Accounting Officer
Isis Zaki, M.D., M.S., Ph.D.	Professor, Department of Anatomy

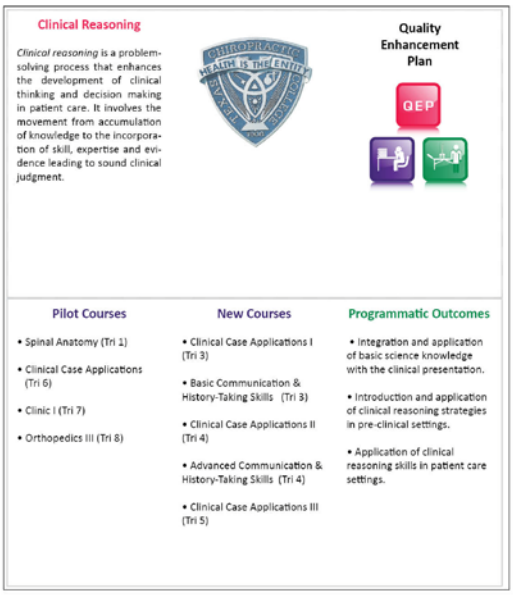
APPENDIX II: QEP SUBCOMMITTEES

History of TCC	Topic Focus	Literature Review	Plan Design	Assessment	Faculty Development	Institutional Capability	Marketing & Communications
Victor Benavides, D.C.	Jesse Coats, D.C.	Alan Adams, D.C.	Alan Adams, D.C.	Alan Adams, D.C.	Alan Adams, D.C.	Alan Adams, D.C.	Patty Barnes, M.Ed.
Stephen Dyess, D.C.	Jason Flanagan, D.C.	Stephen Foster, D.C.	Victor Benavides, D.C.	Karlene Denby, D.C.	Victor Benavides, D.C.	Victor Benavides, D.C.	Lynn Benton
		John Mrozek, M.Ed., D.C.	Karlene Denby, D.C.	Stephen Foster, D.C.	Karlene Denby, D.C.	Karlene Denby, D.C.	Karen Bulow, M.L.S.
		Dorrie Talmage, M.Ed., D.C.	Stephen Foster, D.C.	John Mrozek, M.Ed., D.C.	Stephen Foster, D.C.	Stephen Foster, D.C.	Bill Clements, M.S.W.
		Carol Webb, M.A., M.L.I.S.	John Mrozek, M.Ed., D.C.	Dorrie Talmage, M.Ed., D.C.	John Mrozek, M.Ed., D.C.	John Mrozek, M.Ed., D.C.	Stephen Dyess, D.C.
		Isis Zaki, M.D., M.S., Ph.D.	Dorrie Talmage, M.Ed., D.C.		Dorrie Talmage, M.Ed., D.C.	Bill Quinn, B.B.A., C.P.A.	Jason Flanagan, D.C.
			Isis Zaki, M.D., M.S., Ph.D.			Dorrie Talmage, M.Ed., D.C.	Steve Haslund, Ph.D.
							Joanna Little

APPENDIX III: PRESIDENT'S CABINET

Dr. Richard G. Brassard	President, TCC
Dr. Alan Adams	Vice President, Academics and Program Development
Ms. Sandy Mooney	Vice President, Financial Affairs
Dr. Steve Haslund	Vice President, Student Affairs
Mr. Bill Clements	Associate Vice President, Institutional Advancement
Dr. John Mrozek	Dean, Academic Affairs
Dr. Steve Elliott	Dean, Clinics
Dr. Jason Flanagan	Dean, Post Graduate and Continuing Education

APPENDIX IV: PROMOTIONAL AND EDUCATIONAL MATERIALS



Clinical Reasoning

Clinical reasoning is a problem-solving process that enhances the development of clinical thinking and decision making in patient care. It involves the movement from accumulation of knowledge to the incorporation of skill, expertise and evidence leading to sound clinical judgment.

Quality Enhancement Plan

QEP

Pilot Courses

- Spinal Anatomy (Tri 1)
- Clinical Case Applications (Tri 6)
- Clinic I (Tri 7)
- Orthopedics III (Tri 8)

New Courses

- Clinical Case Applications I (Tri 3)
- Basic Communication & History-Taking Skills (Tri 3)
- Clinical Case Applications II (Tri 4)
- Advanced Communication & History-Taking Skills (Tri 4)
- Clinical Case Applications III (Tri 5)

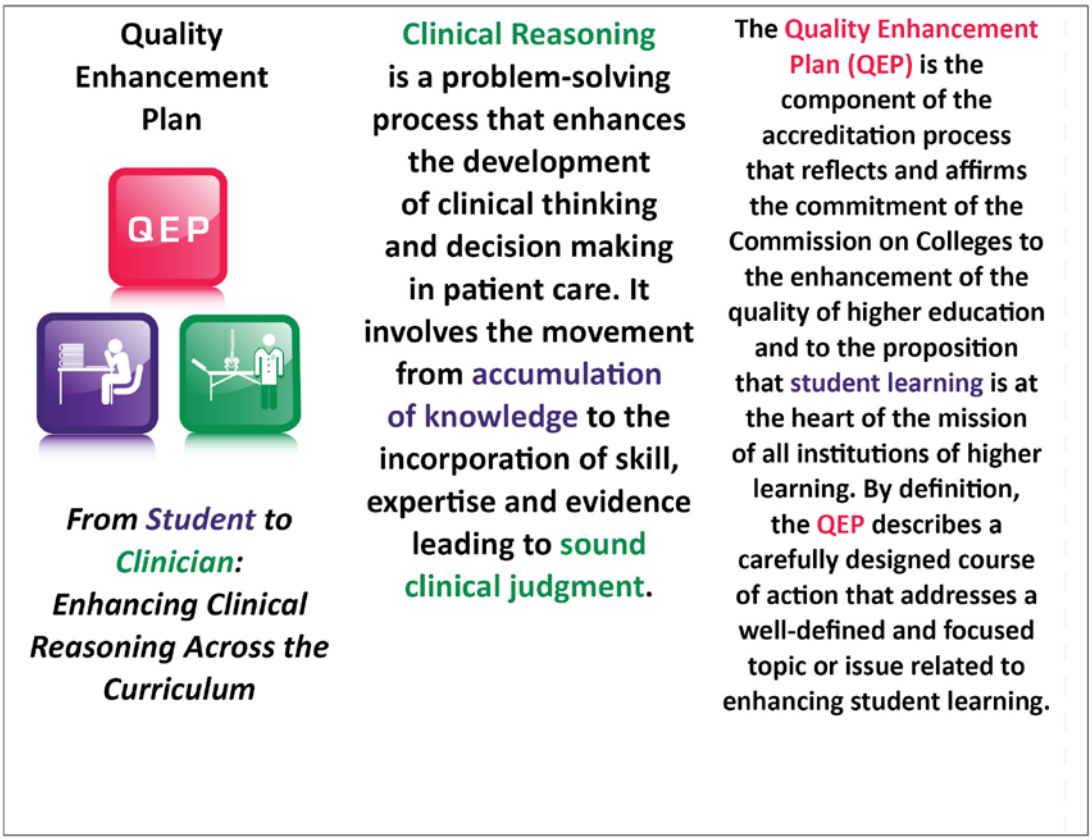
Programmatic Outcomes

- Integration and application of basic science knowledge with the clinical presentation.
- Introduction and application of clinical reasoning strategies in pre-clinical settings.
- Application of clinical reasoning skills in patient care settings.

Illustrated on this page are two examples of items being used to promote and educate the TCC campus community about the QEP topic.

(left) *A two-sided piece, that folds to a size slightly smaller than a standard business card, providing an overview of the QEP topic.*

(below) *A tri-fold "table tent" that stands 8.5 inches in height with each panel measuring 3.5 inches in width.*



Quality Enhancement Plan

QEP

From Student to Clinician: Enhancing Clinical Reasoning Across the Curriculum

Clinical Reasoning is a problem-solving process that enhances the development of clinical thinking and decision making in patient care. It involves the movement from accumulation of knowledge to the incorporation of skill, expertise and evidence leading to sound clinical judgment.

The Quality Enhancement Plan (QEP) is the component of the accreditation process that reflects and affirms the commitment of the Commission on Colleges to the enhancement of the quality of higher education and to the proposition that student learning is at the heart of the mission of all institutions of higher learning. By definition, the QEP describes a carefully designed course of action that addresses a well-defined and focused topic or issue related to enhancing student learning.

APPENDIX V: COMMUNICATIONS TIMELINE

Week	Task
January 5-9	Post small poster #1 - logo and definition Post desktop backgrounds Implement QEP website Implement QEP Communications Organization on Blackboard Distribute one page QEP summary Email blast #1 – Introduction to the QEP and accreditation Presentation at convocation, in-service, and orientation
January 12-16	Presentation to the Student Body Association Email blast #2 - Programmatic Outcomes
January 19-23	Post small poster #2 – course development Email blast #3 – pilot courses Speech at Grand Rounds
January 26-30	Presentation to the Board of Regents Email blast #4 – new courses
February 2-6	Small Poster #3 – programmatic outcomes Distribute buttons – “Ask Me About the QEP” Distribute fold out cards Email blast #5 – changed courses
February 9-13	Distribute table tents Email blast #6 – QEP Week
February 16-20	“QEP Week” Post large poster - summary of posters 1-3 Presentation at Grand Rounds Presentation to the student body Distribute buttons – “Tell Me About the QEP” Email blast #7 – a note from faculty member
Ongoing distributions	QEP Document QEP pens – “Enhancing Clinical Reasoning Across the Curriculum”

APPENDIX VI: PROJECT TIMELINE

Spring 2008-Fall 2008 • Select topic. • Design QEP plan and pilot project. • Conduct faculty in-service sessions that focus on instructional strategies related to the QEP topic. • Conduct full campus community convocations that include a presentation on the QEP. • Prepare five year plan.
Spring 2009 • Conduct full campus community convocation that includes an update on the QEP. • Launch continuing faculty development seminars/workshops on instructional and assessment methods that support the QEP courses. • Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure. • Preview student learning outcomes as outlined in Chapter 4 prior to pilot course implementation in Summer 2009. • Preview faculty learning outcomes as outlined in Table 6.1 in Chapter 6.
Summer 2009 • Conduct full campus community convocation that includes an update on the QEP. • Initiate the four pilot courses. • Administer Diagnostic Thinking Inventory to students enrolled in pilot course, Clinical Case Applications. • Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure. • Administer Health Science Reasoning Test (HSRT) to the students in the four pilot courses.
Fall 2009 • Conduct full campus community convocation that includes an update on the QEP. • Assess the four pilot courses and make any alterations or improvements to the teaching methods and assessment strategies. • Conduct the four pilot courses, incorporating changes as deemed necessary. • Administer Diagnostic Thinking Inventory to students enrolled in pilot course, Clinical Case Applications. • Conduct faculty development seminars/workshops on instructional and assessment methods for those faculty involved in the three QEP courses scheduled to start in Spring 2010. • Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure. • Preview student learning outcomes as outlined in Chapter 4 for the three QEP courses scheduled to start in Spring 2010. • Administer Health Science Reasoning Test (HSRT) to the students in the four

pilot courses.

Spring 2010
• Conduct full campus community convocation that includes an update on the QEP.
• Initiate the three QEP designated courses.
• Conduct faculty development seminars/workshops on instructional and assessment methods for those faculty involved in the four QEP courses scheduled to start in Summer 2010.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Preview student learning outcomes as outlined in Chapter 4 for the four QEP courses scheduled to start in Summer 2010.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students.
• Administer Diagnostic Thinking Inventory to students enrolled in trimester six course, Clinical Case Applications.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.

Summer 2010
• Conduct full campus community convocation that includes an update on the QEP.
• Initiate the four QEP designated courses.
• Conduct faculty development seminars/workshops on instructional and assessment methods for those faculty involved in the three QEP courses scheduled to start in Fall 2010.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Preview student learning outcomes as outlined in Chapter 4 for the three QEP courses scheduled to start in Fall 2010.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students.
• Administer Diagnostic Thinking Inventory to students enrolled in trimester six course, Clinical Case Applications.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.

Fall 2010 • Conduct full campus community convocation that includes an update on the QEP. • Initiate the three QEP designated courses. • Conduct faculty development seminars/workshops on instructional and assessment methods for those faculty involved in the two QEP courses scheduled to start in Spring 2011. • Schedule regular meetings of the QEP Administrative Committee to monitor the

phases of the plan and communicate the progress to all members of the QEP management structure.
• Preview student learning outcomes as outlined in Chapter 4 for the two courses scheduled to start in Spring 2011.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students.
• Administer Diagnostic Thinking Inventory to students enrolled in trimester six course, Clinical Case Applications.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.
  • May 2010 NBCE Part IV scores.

Spring 2011
• Conduct full campus community convocation that includes an update on the QEP.
• Initiate the two QEP designated courses
• Conduct faculty development seminars/workshops on instructional and assessment methods for those faculty involved in the one QEP course scheduled to start in Summer 2011.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Preview student learning outcomes as outlined in Chapter 4 for the one course scheduled to start in Summer 2011.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students.
• Administer Diagnostic Thinking Inventory (DTI) to students enrolled in trimester six course, Clinical Case Applications and follow-up DTI to trimester ten students.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.
  • November 2010 NBCE Part IV scores.

Summer 2011 • Conduct full campus community convocation that includes an update on the QEP. • Initiate the one QEP designated course. • Conduct faculty development seminars/workshops on instructional and assessment methods for those faculty involved in the two QEP courses scheduled to start in Fall 2011. • Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure. • Preview student learning outcomes as outlined in Chapter 4 for the two courses scheduled to start in Fall 2011. • Administer Health Science Reasoning Test (HSRT) to incoming trimester one students. • Administer Diagnostic Thinking Inventory (DTI) to students enrolled in trimester

six course, Clinical Case Applications and follow-up DTI to trimester ten students.

- Modify the QEP implementation based upon:
  - Faculty feedback by interview.
  - Student course evaluations.
  - Student learning outcomes based on course assessments.

Fall 2011

- Conduct full campus community convocation that includes an update on the QEP.
- Initiate the two QEP designated courses.
- Conduct faculty development seminars/workshops on instructional and assessment methods for those faculty involved in the one QEP course scheduled to start in Spring 2012.
- Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
- Preview student learning outcomes as outlined in Chapter 4 for the one course scheduled to start in Spring 2012.
- Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five students.
- Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
- Modify the QEP implementation based upon:
  - Faculty feedback by interview.
  - Student course evaluations.
  - Student learning outcomes based on course assessments.
  - Results of Health Sciences Reasoning Test.
  - Results of Diagnostic Thinking Inventory.
  - September 2011 NBCE Part I scores.
  - May 2011 NBCE Part IV scores.

Spring 2012

- Conduct full campus community convocation that includes an update on the QEP.
- Initiate the one QEP designated course.
- Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
- Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five students.
- Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
- Modify the QEP implementation based upon:
  - Faculty feedback by interview.
  - Student course evaluations.
  - Student learning outcomes based on course assessments.
  - Results of Health Sciences Reasoning Test.
  - Results of Diagnostic Thinking Inventory.
  - Fall 2011 CSCE I results.
  - November 2011 NBCE Part IV scores.

Summer 2012

• Conduct full campus community convocation that includes an update on the QEP.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five students.
• Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.
  • Results of Health Sciences Reasoning Test.
  • Results of Diagnostic Thinking Inventory.
  • March 2012 NBCE Parts I, II and III scores.
  • Spring 2012 CSCE I results.

Fall 2012
• Conduct full campus community convocation that includes an update on the QEP.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five students.
• Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.
  • Results of Health Sciences Reasoning Test.
  • Results of Diagnostic Thinking Inventory.
  • May 2012 NBCE Part IV scores.
  • September 2012 NBCE Parts I, II and III scores.
  • Summer 2012 CSCE I results.
  • Summer 2012 CSCE II results.

Spring 2013 • Conduct full campus community convocation that includes an update on the QEP. • Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure. • Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five and trimester ten students. • Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students. • Modify the QEP implementation based upon: • Faculty feedback by interview.

• Student course evaluations. • Student learning outcomes based on course assessments. • Results of Health Sciences Reasoning Test. • Results of Diagnostic Thinking Inventory. • November 2012 NBCE Part IV scores. • Fall 2012 CSCE I results. • Fall 2012 CSCE II results.

Summer 2013
• Conduct full campus community convocation that includes an update on the QEP.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five and trimester ten students.
• Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.
  • Results of Health Sciences Reasoning Test.
  • Results of Diagnostic Thinking Inventory.
  • March 2013 NBCE Parts I, II and III scores.
  • Spring 2013 CSCE I results.
  • Spring 2013 CSCE II results.

Fall 2013
• Conduct full campus community convocation that includes an update on the QEP.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five and trimester ten students.
• Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.
  • Results of Health Sciences Reasoning Test.
  • Results of Diagnostic Thinking Inventory.
  • May 2013 NBCE Part IV scores.
  • September 2013 NBCE Parts I, II and III scores.
  • Summer 2013 CSCE I results.
  • Summer 2013 CSCE II results.

Spring 2014 • Conduct full campus community convocation that includes an update on the

QEP.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five and trimester ten students.
• Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.
  • Results of Health Sciences Reasoning Test.
  • Results of Diagnostic Thinking Inventory.
  • November 2013 NBCE Part IV scores.
  • Fall 2013 CSCE I results.
  • Fall 2013 CSCE II results.

Summer 2014
• Conduct full campus community convocation that includes an update on the QEP.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five and trimester ten students.
• Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.
  • Student learning outcomes based on course assessments.
  • Results of Health Sciences Reasoning Test.
  • Results of Diagnostic Thinking Inventory.
  • March 2014 NBCE Parts I, II and III scores.
  • Spring 2014 CSCE I results.
  • Spring 2014 CSCE II results.

Fall 2014
• Conduct full campus community convocation that includes an update on the QEP.
• Schedule regular meetings of the QEP Administrative Committee to monitor the phases of the plan and communicate the progress to all members of the QEP management structure.
• Administer Health Science Reasoning Test (HSRT) to incoming trimester one students and follow-up HSRT to trimester five and trimester ten students.
• Administer Diagnostic Thinking Inventory (DTI) to trimester six students and follow-up DTI to trimester ten students.
• Modify the QEP implementation based upon:
  • Faculty feedback by interview.
  • Student course evaluations.

- Student learning outcomes based on course assessments.
- Results of Health Sciences Reasoning Test.
- Results of Diagnostic Thinking Inventory.
- May 2014 NBCE Part IV scores.
- September 2014 NBCE Parts I, II and III scores.
- Summer 2014 CSCE I results.
- Summer 2014 CSCE II results.