“None of this can be read in books.

A student can only learn it through intimate contact with his teacher.”

Theodor Billroth

“Because something is happening here,

and you don’t know what it is,

do you, Mr. Jones?”

Bob Dylan

University of Alberta

Examining The Resident-Medical Student Shadowing Program: A Concurrent Triangulation Mixed Methods Randomized Control Trial

by

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This work is dedicated to Dr. J. Drew Sutherland:

Surgeon,

teacher,

mentor,

friend.

Abstract

The Resident-Medical Student Shadowing Program is a novel program in which first-year medical students shadowed a first-year resident during their clinical duties. It was developed to enhance the preparedness of medical students for clinical training. To examine the program's effectiveness, a randomized control trial was conducted within a concurrent triangulation mixed methods study. Student participants were compared to controls using validated questionnaires. Participants' experiences were further explored using semi-structured interviews. Results indicate that participation gave students an understanding of the clinical environment and their role within it, and taught them the skills and knowledge needed to perform that role. Students' learning was enhanced by the relationship developed with their resident, facilitated by the residents' approachability and relatability and their dedication to teaching. Residents, in turn, gained expertise in teaching and learned about professionalism. Suggestions for implementing this program in the future as well as future directions for research are discussed.

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List of Abbreviations

CaRMS-Canadian Resident Matching Service

CFPC-College of Family Physicians of Canada

CPR-Cardio-Pulmonary Resuscitation

ECG-electrocardiogram

JDM_j-Judge's Discrepancy from the Median

OSCE-Objective Structured Clinical Exam

PGME-Postgraduate Medical Education

RCPSC-Royal College of Physicians and Surgeons of Canada

RMSSP-Resident-Medical Student Shadowing Program

UGME-Undergraduate Medical Education

Glossary of Terms

Charting: maintaining a patient's medical record, or chart, with progress notes and orders

Clerkship: colloquial term for the clinical phase of undergraduate medical education

Clinical phase: the second two years of medical school, occurring in patient-care environments

Code: the resuscitation of a patient after cardiac arrest

Electrocardiogram: a tracing of the heart's electrical activity

Internship: colloquial term for the clinical phase of undergraduate medical education

Gilbert's / Gilbert's scholars: a clinical skills program for preclinical medical students at the University of Alberta

On-call: when a doctor or trainee is on duty overnight or over the weekend, for trainees usually involves physically staying on-site

Orders: instructions written by a doctor in a patient's medical chart

Postgraduate: medical training occurring after graduation from medical school, also known as residency

Preclinical phase: the first two years of medical school, occurring largely outside of patient-care environments

Resident: a graduate of medical school pursuing training in any specialized field of medicine

Rounds: the daily review of a clinical team's hospital in-patients, usually performed first thing in the morning

Staff physician: a physician who has completed all of their training and is actively practicing medicine

Tactile fremitus: a sign found on physical examination of a patient with pneumonia

Undergraduate: medical school, the first phase of medical education

Chapter 1: Introduction

This study examines the effects of a novel program called the Resident-Medical Student Shadowing Program (RMSSP). I initially conceived and developed the program as a way to ameliorate some of the challenges that medical students face during their transition from classroom learning to becoming doctors in training. As a graduate of, and currently a resident at, the University of Alberta Faculty of Medicine, my views on the challenges and opportunities of medical education have been shaped by my personal experiences at that institution. Reflecting upon my own experiences as a medical student, and observing those of the medical students who came after me, made me aware of some of the obstacles that medical students face and provided insight into potential means to address them.

Chapter 1 provides the context for the study. An overview of the medical education programs offered at the University of Alberta is presented first, followed by a description of three challenges faced by students in medical school. These challenges- lack of preparation for clinical training, anxiety towards starting clinical training and a lack of effective methods for teaching a competency-based framework known as CanMEDS (Royal College of Physicians and Surgeons, 2005) represent the primary motivators for my development of the RMSSP. The chapter concludes with an outline of the basic structure of the shadowing program including a rationale for the timing of the program and the need for the present study focused on assessing the impact of the RMSSP.

Medical Education at the University of Alberta

North American medical education has two main phases: medical school (undergraduate medical education, or UGME) and residency (postgraduate medical education, or PGME). Medical school is three to four years of basic training intended to create undifferentiated doctors who are capable of pursuing a specialization in any area of medicine. The ensuing period of specialization is what is known as residency, during which time newly graduated doctors train for two or more years to obtain their license to practice in a specialty of their choosing. During this time residents also begin to take on responsibilities for training medical students and more junior residents.

The location of implementation for the RMSSP was at the medical school of the University of Alberta. This medical school is considered to be a medium-sized four-year medical school, and is located in Edmonton, Alberta, Canada. In the 2009-2010 academic year 189 students were registered in the first-year UGME class. The first two years of medical school is known as the pre-clinical phase, which aims to introduce students to the core medical knowledge that will be needed during their medical career, regardless of their eventual specialty. Topics of instruction are organized by body system into a series of blocks, administered one at a time. In the first year of instruction the topics covered are, in order, Introduction, Infection/Inflammation/Immunology, Endocrinology, Cardiology, Pulmonology and Nephrology. In the second year the topics are, in order, Gastroenterology, Reproductive Medicine, Musculoskeletal Medicine/Dermatology, Neurology/Psychiatry/Ophthalmology and Oncology. These first two years are characterized by class-based teaching environments in lectures, small group sessions and labs, which is in contrast to the latter years (K. Stobart, personal communication, July 21, 2009).

Opportunities for gaining clinical experience, such interacting with patients in a hospital setting, are limited during the pre-clinical phase. The only requirement is that students complete one 12-hour elective in a specialty of their choice in each year. During this elective each student is supervised by a physician from the chosen specialty and at the physician's discretion the student may be given the opportunity to experience various aspects of the supervisor's vocation. A second opportunity is presented through the "clinical skills" program known as Gilbert's Scholars, in which groups of six to eight medical students are paired with a staff physician who instructs them in the basic techniques of taking a medical history and performing physical examinations. These sessions may or may not involve the use of actual patients. When patients are involved it is generally in a pre-arranged setting that allows students to practice their skills in a controlled environment. Finally, students are allowed to shadow physicians if they are able to organize sessions themselves (K. Stobart, personal communication, July 21, 2009).

In contrast to the pre-clinical years, the final two years of medical school, the clinical phase, provides opportunities for students to engage full-time in the care of actual patients. Students complete clinical rotations of between four to eight weeks in several specialties, such as Internal Medicine, Surgery, Pediatrics and Family Medicine. During these rotations students interact with real patients in real clinical situations. One factor that separates the clinical phase from the preclinical phase is that students are sometimes a sick patient's point of first contact within the medical system and are required to provide medical care according to their ability. As such, patient health outcomes depend partially on the ability of students to perform well in the clinical setting. Responsibilities assumed by the student during the clinical phase of UGME include assessing patients in outpatient clinics, the emergency room or on inpatient wards, assisting with the delivery of babies or with surgeries in the operating room and performing minor surgical

procedures themselves. What is also different about this phase is that many rotations require students to be on-call, or physically present and on-duty in the hospital for 26 hours or more consecutively, up to one day out of every four. At all times students are at least nominally under the supervision of a licensed staff physician; however, some degree of autonomy is expected starting on the first day of clinical rotations in third-year. The third year begins with a month-long classroom and lab-based course intended to help students' transition into clinical work. However, this course has, at least anecdotally, been criticized as providing little useful, practical training for students. Other than this course, the clinical phase is almost entirely based in the practical environment (K. Stobart, personal communication, July 21, 2009).

Anxiety and Stressors in Clinical Training

Given the lack of clinical experience in their first two years and what may be an inadequate transitional course at the beginning of third-year, students may feel, and be, quite unprepared for their many new responsibilities in the clinical phase (Prince, Boshuizen, van der Vleuten, Scherpbier, 2005). This potentially presents both an educational issue for students and a healthcare issue for the patients in whose care they participate. Therefore, the transition from pre-clinical to clinical training is a time of potential physical, emotional and psychological difficulty for medical students (Chandavarkar, Azzam & Matthews, 2007). The abrupt nature of the change from classroom to hospital environments is a common source of stress for students, especially if they have not been adequately informed of their clinical duties or prepared to carry them out. Beginning with the first day of clinical training, a student's role changes from listening to lectures in a classroom to being responsible for the care of sick patients while on-call overnight in a hospital setting. Furthermore, anticipating this transition may be an additional source of anxiety in students (Sarikaya, Civaner & Kalaca, 2006). Having gone

through this phase personally, I can recall no period more filled with worry than the time immediately before starting my third-year clinical rotations in 2005. Even though my first rotation was a relatively easy one that did not even require overnight call, I can remember feeling unprepared, unsure of myself, and incredibly nervous.

Many medical students will experience several types of stressors during the transition to clinical training, including financial, relationship, physical and educational (Saipanish, 2003). Financial stressors are related to the multiple costs associated with clinical training, including transportation and parking at various hospitals, costs of equipment such as stethoscopes and pocket guides, as well as meal purchases. During the clinical phase, many students will travel to multiple schools in the country or abroad to gain experience in certain specialties or to audition for a postgraduate position, staying in each location for weeks at a time. In addition, tuition costs continue to accumulate. Although an average debt figure for Canadian medical school graduates is not available, it is likely of a similar magnitude (National Physician Survey, 2007) to the American figure, which is approximately $160,000 (Association of American Medical Colleges, 2009).

Other sources of stress may exist, including relationship stressors, or the impact on students' personal relationships with family, friends and significant others. The amount of time that must be devoted to studying new information, in addition to the time devoted to working, being on-call and then recovering from the associated sleepless night can also have deleterious effects on students' personal lives. Fatigue, stress, and anxiety can also impact students' personal relationships. Furthermore, the time commitment, anxiety, poor diet and disrupted sleep schedule that comes with being on duty for such extended hours might also impact students' physical health.

Perhaps the most obvious source of stress, though, is educational. Students must learn to apply the knowledge they acquired in the pre-clinical phase as well as acquire

new knowledge relevant to their required rotations. These abilities must be learned in order to provide medical care to patients. In addition, their choice of a future specialty may be impacted during this time. The clinical phase is the time in which students begin the process of, in effect, auditioning for postgraduate specialty training programs, which are, in many cases, extremely competitive. Students may feel compelled to learn as much as they possibly can about their desired specialty in order to secure a residency position. If students are not well prepared to handle these additional educational demands, they may experience more anxiety. In addition to producing anxiety, educational demands present challenges of their own, related to vocational knowledge requirements and learning of specific competency frameworks.

Clinical Medical Education and CanMEDS

Students must learn vocational knowledge and skills in order to be able to function as a part of the healthcare team during their rotations. The most obvious component of this knowledge is the medical knowledge they must possess to assess and treat patients. This includes a theoretical understanding of diseases and treatments and the ability to perform maneuvers such as physical examinations and technical skills such as suturing wounds, inserting nasogastric or urinary catheters, or performing cardiopulmonary resuscitation (CPR). However, there are many other components of vocational knowledge that are needed to effectively function as a clinical medical student. Skills such as communicating with patients, working with other health professions, managing healthcare resources, advocating for patient health, searching the medical literature and behaving in a professional manner are all required abilities for the vocation of the clinical medical student (Windish, Paulman, Goroll & Bass, 2004, Frank & Langer, 2003). Generally, skills such as these could be classified as medical expertise, communication, collaboration, management, health advocacy, scholarship and

professionalism. At the postgraduate (residency) level, the Royal College of Physicians and Surgeons (RCPSC) has codified these various competencies as the CanMEDS Framework (2005).

The RCPSC mandates that all graduates of its residency programs be proficient in the physician roles identified in the CanMEDS Framework. Initially introduced in the mid-1990s, CanMEDS has become a focus of Canadian residency training. All residents are expected to receive some degree of training in each of the framework's seven roles: Medical Expert, Communicator, Collaborator, Manager, Health Advocate, Scholar and Professional (The Royal College of Physicians and Surgeons of Canada, 2005). The CanMEDS competencies are intended to describe "the principle generic abilities of physicians oriented to optimal health and healthcare outcomes…CanMEDS helps answer the question 'What do physicians need to be able to do for effective practice?' " (p. v). Each role has its own definition and description and is further defined with two to six *key competencies,* that together comprise the role. Each key competency is then further delineated with a set of enabling competencies. However, one of the major criticisms of CanMEDS is the lack of tools available to teach the framework and "training programs have struggled to incorporate these new ideas into existing curricula" (Mickelson & MacNeily, 2008, p. 395).

It is the stated goal of the RCPSC that CanMEDS eventually be introduced at the UGME level (Frank & Langer, 2003). Although the RCPSC does not oversee medical schools, CanMEDS may become an important part of UGME as well. The current model of medical education can be seen as a continuum, beginning in medical school, extending through residency and continuing with professional development. Most topics are taught in this fashion, with the basics being introduced in medical school and expertise being gained in residency. It may make sense, therefore, that CanMEDS also would be introduced first in medical school. Furthermore, CanMEDS is now being employed in the

evaluation of medical students by prospective residency programs (Hamel, 2007). However, currently, there are no formal programs in place at the University of Alberta to teach CanMEDS to medical students (K. Stobart, personal communication, July 21, 2009).

A unique resource for addressing the challenges faced by medical students exists built in to the medical education system: residents. Residents are doctors who, having successfully completed the four years of medical school, are undertaking further training in a specialty of their choice, selected from "over 60 medical and surgical specialties" (The Royal College of Physicians and Surgeons of Canada, 2005, p. iv). A residency can last between two years, for Family Medicine, to seven or more for certain surgical subspecialties. The first year of residency is generally the most varied. Residents spend the most time in their home specialty but also rotate through various other related specialties (M.G. Elleker, personal communication, April 14, 2009). In Canada, although residencies are individually administered at the university department or division level, they are overseen and accredited by the Royal College of Physicians and Surgeons of Canada, with the exception of Family Medicine, which is governed by a separate body, the College of Family Physicians of Canada (CFPC). Having faced the challenges of medical school themselves, residents are potentially extremely valuable as mentors and teachers for students preparing for the transition from the pre-clinical phase to the clinical phase. This potential role of residents was a driving force behind the creation of the Resident-Medical Student Shadowing Program (RMSSP).

The Motivation for the Resident-Medical Student Shadowing Program

The following is a written account of my reflection upon my own experiences in medical education and my desire to improve the system for the students who come after me. Because of the potential challenges that face students, especially in the transition from pre-clinical to clinical training, I decided there was a need for an intervention.

> Reflecting on the challenges that I faced as a medical student at the University of Alberta motivated me to try to improve the situation for future medical students. I was driven by three main considerations. First, I was compelled to alleviate some of the anxiety that I could recall afflicting my colleagues and I as we contemplated beginning our clinical training and facing unknown new sources of educational, financial, relationship and physical stress. I can still recall the feeling of panic as I drove to work for my first day on the wards. I was starting my year in Psychiatry, rumored to be one of the easier rotations, but the unfamiliarity of my surroundings and my uncertainty as to how to fulfill my new role as a clinical student made me literally shake with anxiety. Later, as a resident looking back, it struck me that if I had had a better idea of what lay ahead of me and what the nature of clinical training was, I might not have been as nervous.
>
> Similarly, I was motivated by noting the vocational challenges students face when they first start their clinical phase. I could remember personally struggling with such basic concepts as interacting with patients, finding my way around the hospital and doing basic charting. On my first day in Psychiatry I can remember calling the attending psychiatrist at home to tell him about a patient I had just admitted, shortly before midnight. It wasn't until he picked up the phone that I realized I had no idea what I was supposed to do or say, and it didn't take long until the psychiatrist realized this also. My history taking had been incomplete, he informed me, as was my physical exam. Worst of all I hadn't figured out how I was going to treat the patient, partly because I hadn't realized that that was my job. As a more senior medical student, and then as a resident, I observed other students having similar problems when they were beginning the clinical phase. It seemed to me that if students were gradually introduced to the clinical environment and provided with some basic vocational knowledge during the pre-clinical phase, they would find it much easier to hit the ground running when starting clinical training.
>
> Finally, I felt confused by the general model of CanMEDS instruction I had experienced in my training. During medical school I heard, at most, rumors and speculation about a somewhat mysterious set of competencies called CanMEDS. It was not until starting residency that I was given a full introduction to the framework and informed of its importance. I was told that this list of doctor's roles must be learned and the roles mastered if I was ever going to complete my residency. I couldn't understand why a framework that was given so much emphasis in residency was never formally addressed during medical school and why, even in residency, formal programs on CanMEDS instruction seemed to be lacking.

It seemed logical, based on this reflection, that students would benefit from a program designed to increase their knowledge base, decrease their anxiety by giving them an understanding of the experience of clinical medicine, and introduce them to the CanMEDS framework. Early exposure to clinical training has been found to be beneficial for pre-clinical students in several studies (Alford & Currie, 2004, Jones, Willis, McArdle & O'Neil, 2006) and the RMSSP was intended to provide a similar benefit to students at my own school. Introducing such a program for the large number of medical students would demand certain resources, not least of which would be a dedicated teaching staff. This is especially problematic in the current climate in which schools may have difficulty recruiting or retaining staff physicians as teachers because of economic and time pressures (Association of American Medical Colleges, 2001). Residents may be well suited to be teachers for medical students, since their knowledge is significantly greater than first-year students and their own experiences are relevant to students as they approach clinical training. First-year residents offer several advantages as teachers for medical students. Their close proximity to their own medical school years may engender a more understanding approach to students (Edwards, Friedland & Bing-You, 2002) and their schedule of month-long rotations through many different areas results in exposure to a variety of clinical specialties that could provide pre-clinical students with a uniquely broad experience. Also, by selecting first-year residents, the potential exists for long-term pairings between the student and resident that may continue through subsequent years of training.

With these considerations in mind, the RMSSP was developed, pairing first-year medical students with first-year residents. The program was designed to have the students shadow their resident partners once a month for the duration of the academic year. They would observe the residents in their regularly scheduled duties and possibly be able to participate in aspects of the delivery of clinical patient care. By doing so, the students

would gain an understanding of the nature of clinical training by observing their resident in that environment and by discussing the stresses and challenges of clinical training with them. Students thereby would hopefully have less anxiety towards starting the clinical phase. They would also gain vocational knowledge by interacting with real patients, performing some clinical duties themselves. Thus, it was hoped students would be more prepared when actually entering the clinical phase.

Finally, such a program could be used as a forum for introducing students to the concepts of CanMEDS through didactic discussions and by observing their residents role-modeling the competencies. CanMEDS is a complex framework, and mastery of its seven roles as mandated by the RCPSC requires considerable personal professional development. It is not the intention of this program to have students master these competencies in their first year of medical school. Rather the program aims to introduce students to the framework, thus allowing them to become familiar with the CanMEDS framework's terms and its descriptions of the roles of a doctor so that as they continue through the continuum of medical education they can eventually come to master each role.

The Need for This Study

There are three overriding reasons why this study of the RMSSP is needed. First, the literature reveals three major challenges that medical students face, especially during the transition from pre-clinical to clinical training. The RMSSP was specifically designed to mitigate medical students' lack of preparedness, anxiety and lack of tools to teach the CanMEDS framework. The present study will address the question of how does integrating the findings from questionnaires and interviews provide a more comprehensive understanding of the experiences and impact of participating in the

Resident-Medical Student Shadowing Program? To address this question, four research questions will be asked:

1) What are the experiences of participants in the RMSSP?

2) To what extent does participation in the program increase students' preparedness for clinical training, including their vocational knowledge?

3) To what extent does participation in the program increase students' understanding of the nature of clinical training and thereby reduce their associated anxiety?

4) To what extent does participation in the program improve students' knowledge of, and attitudes towards, CanMEDS?

Second, the RMSSP involves pairing first-year medical students with first-year residents in an eight-month job-shadowing program focused on clinical knowledge and skill development. This program differs from other programs geared towards preparing students for the transition to the clinical phase by its combination of a long duration and practical format. Whereas other programs tended to be of a short duration and/or focused on teaching knowledge and skills that may not be truly relevant to students, the RMSSP is noteworthy because of its extended focus on practical experience. The first implementation of such a novel program needs to be studied to determine how the effectiveness of this program differs from other programs with similar goals.

Third, the study provides an empirical example of a way to measure the impact of a novel program that utilizes a study design lacking in the literature. The use of a mixed methods design provides a more comprehensive understanding of program impact than the previously used methods that were limited by focus on single method studies, small sample sizes, retrospective approaches and non-Canadian contexts. When controls were used they were historical and not randomized. This study will contribute to the available literature through the integration of both quantitative and qualitative findings,

randomized controls, a large sample size and a Canadian setting. Furthermore, the use of qualitative methods in the setting of a randomized control trial is in itself innovative. Therefore, by performing this study we will be able to answer important questions about a novel type of program and to do so in a way that adds to the current literature concerning programs with similar goals.

Chapter 2: Literature Review

Chapter 2 contains a review of the literature that was used as the foundation for developing the RMSSP and planning this study. It begins with a review of studies related to the intended outcomes of the RMSSP, including students' preparedness for clinical duties, their anxieties associated with starting clinical training and their training in the CanMEDS framework. Next, didactic and shadowing-based programs designed to address issues related to the transition to clinical training are reviewed. Reviewing this literature reveals the need for a new approach to studying a shadowing based program for pre-clinical students involving resident teachers that both measures the impact on participants and captures their experiences.

Program Outcomes

As previously explained, the transition from preclinical to clinical education in medicine is difficult for medical students (Radcliffe & Lester, 2003). Generally, the first two years of North American medical training is preclinical, occurring mostly in classrooms, labs or small group sessions, whereas the last two years are clinical, consisting of practical experience in a healthcare setting and little classroom content. As students enter the clinical phase they must adopt new roles that demand acquiring new knowledge and applying new skills. Interacting with patients, other healthcare professionals and the medical system as a whole presents new challenges to students, who may be unprepared. As will be seen in the following literature, three areas that present challenges to medical students, especially in the transition to clinical training are students' preparedness to perform the duties of clinical trainees, their anxiety towards starting clinical training and the need for a method to teach students about CanMEDS.

These three challenges were identified as the main outcomes in the study of the impact of the RMSSP and are outlined in the sections below.

Preparedness for the transition to clinical training.

There is a considerable body of literature that indicates that medical students at the beginning of their clinical training feel unprepared for the transition and lacking mentors. Radcliffe and Lester (2003) interviewed 21 final-year medical students in Britain. The students reported that the change in learning environment, expectations and styles of teaching occurring in the transition to the clinical phase was the most difficult aspect of their training. The students also identified a lack of guidance from mentor figures as contributing to their anxiety. Prince, Boshuizen, van der Vleuten, and Scherpbier (2005) also found, in their survey of 71 fourth-year students at Maastricht, Belgium, that lack of preparation and ongoing guidance were prevalent issues. In this study the students reported difficulty in applying their knowledge to the clinical setting and being "uncertain as to how to behave and act, mainly because they didn't know what was expected of them" (p 704). Remarkably, over 50% of these students did not feel well prepared for clinical training and 40% found the transition to be abrupt. The study also revealed that a solution was within reach as 93% of the students agreed that a good introduction would make the transition easier, although what the authors failed to elucidate is what was meant by a "good introduction." Both of these studies were limited in their reliance on a single retrospective method (i.e., interviews or surveys) and involved students other than Canadian medical students. Yet, both of these studies contributed important student perspectives related to the potential role of mentors during the transition stage.

In addition to the student perspective, studies seeking the perspectives of directors of clinical phases have also noted a lack of preparedness on the part of their

students. For example, in a survey of 192 American clinical phase directors Windish, Paulman, Goroll and Bass (2004) identified areas in which students need competency before the transition, including communication, professionalism, history taking/physical examination and systems of care. What is striking about each of these areas is that between 30% and 50% of directors thought that their students were less prepared than necessary. This study contributes evidence that educators, as well as students, perceive a need for better preparation of students before they begin clinical training, yet is limited in that it does not include both student and educator perspectives.

Anxiety and stressors in medical students.

The high degree of anxiety associated with medical school and, in particular, with the transition to clinical duties, has been reported in several studies as having marked effects on students including depression, and effects on relationships and physical health. For example, Chandavarkar, Azzam and Matthews (2007) found, in a psychiatric assessment of 427 Californian medical students, that the highest levels of "anxiety, attentional and depressive symptoms" occurred in medical students in their first year of clinical training. Mosely, Perrin, Neral, Dubbert, Grothues and Pinto (1994) in their study found clinical depression in 16% of the 69 third-year British medical students studied and high levels of distress in the majority (57%) of this population. To better understand the type of distress experienced, Sarikaya, Civaner and Kalaca (2006) administered an anxiety inventory to 201 Turkish medical students prior to starting clinical training. They found that students were anxious about a wide variety of anticipated clinical situations such as dealing with dying patients, undressing patients of the opposite gender, staying awake all night and not getting lost in the hospital. Saipanish (2003) also used a questionnaire to investigate occurrences of stress among 686 medical students across all years of training in Thailand. The survey results revealed a variety of sources of stress in

medical school in general, the most commonly identified of which were educational, relationship, physical and financial stress. Common across all these studies is the finding that medical students have high degrees of anxiety associated with clinical training, which provides evidence for the need for a solution to this problem.

The studies reviewed identify that a lack of preparation exists that may lead to increased stress or anxiety in students transitioning to clinical duties and that could also potentially result in a poorer quality of care provided by the students. The strength of each of these studies is their diversity of populations. The use of validated psychiatric or psychological assessment tools allows us to have confidence in the findings and their relatively large global representation allows for some generalizability.

CanMEDS in medical school.

As the RCPSC oversees all residency programs in Canada outside of Family Medicine, CanMEDS has become a graduation requirement for all non-Family Medicine residents and an accreditation requirement for their residency programs. Family Medicine residents and residencies are subject to a nearly identical set of guidelines called CanMEDS-Family Medicine (The College of Family Physicians of Canada, 2009). Similar requirements, in many cases developed using CanMEDS as a guide, also exist in Britain (General Medical Council, 2009), the United States (Association of American Medical Colleges, 1998, Accreditation Council for Graduate Medical Education, 2001) and elsewhere (Scheele et al., 2008).

As such, the greatest emphasis on CanMEDS occurs during residency training. However, there is a need for educational programs that can introduce students to the framework before they reach residency. Although the RCPSC does not oversee UGME programs, it is the stated goal of the RCPSC that CanMEDS-like competencies eventually be adopted by medical schools (Frank & Langer, 2003). Consequently, there is

a recent trend towards adoption of the framework at the undergraduate level. The accreditation standards to which Canadian and US medical schools must comply includes a requirement for competency-based objectives and the suggestion that CanMEDS as a framework that can be used to develop these objectives (Liaison Committee on Medical Education, 2010). The University of Alberta, accordingly, is planning to adapt core objectives in line with the CanMEDS framework (F. Brenneis, personal communication, July 15, 2010). Furthermore, some residency programs are already using the CanMEDS framework to evaluate medical students when they apply to the program (Hamel et al., 2007), which would seem to assume, fairly or unfairly, that students have been given some sort of relevant training in their medical school years. Finally, since 65 to 70% of Canadian medical students will eventually enter residencies where CanMEDS is a primary requirement (Canadian Residency Matching Service, 2010), and the remainder will enter Family Medicine, with its similar competency framework, it seems prudent to at least introduce students to the framework while they are still in medical school. Senior medical students, when surveyed about the concepts espoused in CanMEDS, have been supportive of the framework's importance (Rademakers, de Rooy & ten Cate, 2007).

However, a major criticism of the CanMEDS framework is the lack of tools to teach it (Mickelson & MacNeily, 2008). The RCPSC has provided several documents that describe what the CanMEDS competencies are, but has largely left the task of determining how to teach and measure the competencies up to individual educators and program officials (Royal College of Physicians and Surgeons, 2006). Perhaps as a result, especially at the undergraduate level, the implementation of CanMEDS has been inconsistent (K. Stobart, personal communication, July 21, 2009). The undergraduate years of medical school represents four years of time that could potentially be used to begin the process of teaching CanMEDS or similar competencies to medical trainees that is currently under utilized.

The three outcomes of preparedness/vocational knowledge, understanding/anxiety and CanMEDS knowledge/attitudes are important considerations to inform the development of a program to prepare students for clinical training. In particular, a shadowing program for medical students, such as the RMSSP, can teach students knowledge and skills that will be needed as clinical trainees and give them an understanding of the nature of clinical training, thereby reducing their anxiety. Further the shadowing program may provide a useful forum in which students could not only be introduced to the basic concepts of CanMEDS, but also be shown how its physician roles are employed in everyday medical practice.

Preparatory Programs

Several methods for easing the transition to the clinical phase have been proposed. These can be classified broadly into two groups: those that are primarily didactic in nature, and those that are experiential in nature, such as shadowing programs. Such courses can be further described in terms of their duration and in terms of the participants involved as learners and as teachers.

Didactic programs.

The most commonly employed method for easing the transition to clinical training is a short didactic course designed to orient students to their new roles. Such short courses have been found to have some impact on students' preparation. Chumley, Olney, Usatine and Dobbie (2005) used a two-week long course to prepare students for clinical duties. Their program was largely delivered in small-group sessions and covered some basic clinical skills such as interpreting electrocardiograms (ECGs) and radiological tests, professionalism, literature searches and charting. Compared to historical controls,

the 165 who participated in this program felt more prepared to perform these clinical skills after completing the program.

A a major drawback of programs such as those offered by Chumley et al. (2005) is the disconnect between their content and the realities of clinical training. For example, the preparatory course at the University of Alberta consists of a three-week long lecture and lab-based curriculum and anecdotal evidence suggests that the topics covered by this course do not adequately reflect what students will actually need to do in the clinical phase (K. Stobart, personal communication, July 21, 2009). This disconnect may be attributable to the course being designed by staff physicians who are unfamiliar with the roles that today's clinical students actually perform. For example, some of the 11 skills included in the program studied by Chumley et al. (2005) were insertion of intravenous lines, phlebotomy (drawing blood for lab tests) and subcutaneous injection. It could be argued that many clinical medical students no longer perform any of these skills in their regular duties. Residents may be more familiar than staff physicians with the duties of clinical medical students, since they are responsible for a large proportion of their supervision and teaching, and thus may be a better guide for preparatory course content. A course that immerses students in the real clinical environment, supervised by residents who know and understand the job for which students need to be prepared, may be even more successful in easing the transition to clinical training.

A somewhat more practical, but still largely didactic-based introduction to clinical training was provided in a course described by Chittenden, Henry, Saxena, Loeser and O'Sullivan (2009). Their seven day course, which focused on real-world interaction with patients resulted in increased role clarity and confidence and less anxiety compared to a purely lecture based course. However, even in this program the real-world interaction was limited to being assigned two already admitted inpatients on whom students performed history taking and physical examinations, wrote a progress note and

presented at rounds. However this course was not completely devoted to practical experience, as the rest of the course was delivered via lectures and lab sessions. The methodology used in the study is not well described in terms of data collection methods and sample sizes, but their conclusion that clinical experience was related to decreased anxiety is relevant to the present study. Another drawback of this program is its length. At seven days, especially with the inclusion of lectures and lab sessions, the amount of clinical experience that can be gained is necessarily limited. Indeed, in a review of US transition courses, Poncelet and O'Brien (2008) found that 83% were between one day and one week long. The review also criticized many of the courses for lacking clear and measurable objectives and emphasized the utility of actual clinical experience.

Shadowing programs.

Job shadowing programs are based on the theory of situational learning, or learning in context (Mann, 2011). Such theories emphasize the benefits of practical, hands-on experience as a powerful learning tool. Students may be more likely to learn given sets of knowledge and skills if they are exposed to these in a real world setting and are given a chance not only to see the application of knowledge and skills, but also to employ them in a way that reinforces learning, resulting is students who become "more than an observer or imitator, as an active participant" (Mann, 2011, p. 64).

In a move to optimize the relevance of the learning that takes place in preparatory programs and to take advantage of the benefits of experiential learning, several programs have instead used on the job shadowing as a tool to expose students to the clinical environment. In one such program, graduating medical students shadowed the pre-registration house officer, formerly a position in the British medical education system analogous to a first-year resident in Canada (Jones, Willis, McArdle & O'Neill, 2006). A random sample 23 of these students was interviewed regarding their experience. By

shadowing the person whose job they were about to inherit, the interviewed students reported that they gained experience that was directly relevant to their needs, became familiar with their work environment, were oriented to their future role and learned specific and relevant medical knowledge. As one student noted "The house officer can teach you what the house officer's job is, because that's what they know" (p. 292). Another student described the benefit of an opportunity to apply knowledge in a real world setting under direct supervision before having to function in a new role autonomously. The impact of this program was to facilitate the students' eventual adoption of the more senior role by immersing them in the role in a safe and supervised environment. Although the study addressed a different role transition, it illustrates the value of experiencing a new training environment before being expected to function within it.

One study that did address the student's transition from pre-clinical to clinical training involved a program that had first-year students in Texas shadow third-year students to prepare for clinical duties (Alford & Currie, 2004). Based on the results of a survey of first-year students after they had completed the program, Alford and Currie concluded, "students learned about the practice of medicine, the process of becoming a doctor, providers of healthcare, the nature of real patients and the procedures of medicine" (p. 260). They emphasized that much of the learning available in such a program would be impossible to teach in a classroom setting. One of the major limitations of this study was that the sample size was not stated. Nonetheless, the insight into the experiences of students in a shadowing program does provide evidence that a similar program could be used to give students an understanding of the nature of clinical training. Alford and Currie also pointed to work done by Schon (1986) who described expert practice in many fields, including medicine. As Schon stated: "When someone learns a practice, he is initiated into the traditions of a community of practitioners and the

world they inhabit. He learns their conventions, constraints, languages…systematic knowledge and patterns of knowing-in-action" (p. 36-37). This type of content, as noted by Alford and Currie (2004), is difficult to teach in a lecture.

Thus it can be seen that shadowing programs have the potential to orient students to their upcoming roles and to prepare them by teaching skills and knowledge relevant to those roles. Many of the necessary topics may not be easily taught in the absence of practical exposure in the real clinical setting. By immersing students in the job of a clinical trainee, shadowing programs provide information that is necessarily relevant and that appears to be beneficial in terms of producing better-prepared students. The two studies described differ from the RMSSP in terms of the populations involved, although the general concepts were similar. Jones, Willis, McArdle and O'Neill (2006) used graduating students as the trainees and residents as trainers, while Alford and Currie (2004) used third-year students as the trainers of first-year students. The RMSSP will use a mixture of these approaches: first-year students as trainees and first-year residents as trainers. By providing the program to preclinical students the RMSSP has the opportunity to prepare students for the earliest phases of clinical training and not just residency. By utilizing residents as trainers the program takes advantage of the greater knowledge base and experience of the residents and is supported by the extensive literature on residents as teachers.

Residents as teachers.

The use of residents as teachers of medical students well supported in the literature, although not in the exact context provided by the RMSSP wherein residents are paired with a first-year student for an eight month shadowing program. In clinical training, many rotations require students to participate in healthcare teams that include residents. Although there tends not to be a formal declaration of the residents' teaching

roles, in these settings, residents may provide a significant, if informal, source of teaching for students. In one Canadian study, 17 Queen's University medical students were surveyed during their clinical training regarding residents as teachers (Minor & Poenaru, 2002). Students perceived that residents actually contributed more to their teaching than the staff physicians to whom they were assigned. Similar findings were revealed by Pelletier and Belliveau (1999), who found that for 14 of 15 teaching behaviours studied in their survey of 97 students in clinical training, students felt residents to be more active teachers than staff physicians. Residents were also found to be significantly more important than staff physicians as teachers of 6 of 13 clinical skills studied. In a seven-year review of clinical medical students' evaluations of their surgical rotation at the University of Illinois, residents were consistently rated as more valuable teachers than staff physicians (Whittaker, Estes, Ash & Meyer, 2006). The majority of the 59 staff physicians surveyed in a study by De, Henke, Ailawadi, Dimick and Coletti (2004) believed that residents were important and effective teachers of medical students. Cognitive congruence theory suggests that when teachers are close to their students in training they tend to deliver teaching using a cognitive framework that is closer to that of the learner, facilitating information processing (Lockspeiser, O'Sullivan, Teherami, Muller, 2008). Furthermore, the interpersonal approach involving role modeling and friendship that is more likely to develop when students and teachers share similar roles can lead to more interested teachers and more receptive students (ten Cate & Durning, 2007).

One important difference exists between the teaching performed by the residents in these studies and the teaching by residents that is expected to occur in the RMSSP. The students being taught in these studies were clinical level students. Teaching clinical level students was associated with a conflict between residents' needs as a learner and their role as a teacher and difficulty teaching material in which they were not yet experts

(Weissman, Bensinger & Koestler, 2006). Clinical level students have already been taught a great deal of medical knowledge prior to starting their rotations. As such, these students likely require a more in-depth level of teaching from their residents. The knowledge of first-year students is relatively poor in comparison and, as such, the conflict of not feeling expert enough at the level required by their students, may not be as great a problem when teaching first-year students. Similarly, because the students in the RMSSP will not have any defined responsibilities to the healthcare team it will presumably be easier to supervise them. Residents will not have to spend time making sure the students get their work done, because they have no work to do, per se. Lastly, this may also alleviate a third conflict noted by Yedidia, Schwartz, Hishkorn and Lipkin (1995), that of balancing patient care with teaching. Since the design of the interaction the RMSSP is largely observational, a great deal of learning may be done by students without requiring a great deal of effort by the residents, who can then devote their time as needed to patients.

There are also benefits to the residents when they act as teachers. Weiss and Needlman (1998) randomly assigned 43 residents to either teach or receive a lecture. On a test of knowledge of the lecture topic administered six to eight weeks after the lecture, residents in the teaching group performed significantly better than residents in the learner group. This finding supports experiments by Annis (1983) and Benware and Deci (1996) in which students who studied material with the intention of teaching it were able to recall more than students who studied the same material for their own use only. Cognitive theories of the benefits of teaching for the teacher have highlighted the effects of internal verbalization and contextualization on reinforcing memory and other theories have suggested that by accepting the role of a teacher self-confidence is increased, as does intrinsic motivation each of which may improve learning (ten Cate & Durning, 2007).

Research Hypotheses

Based on the literature and reflecting on the goals of the RMSSP, the following research hypotheses were postulated:

1) The RMSSP experience will be viewed positively by first-year students and first-year residents.
2) Participation in the RMSSP will prepare students for clinical training by increasing their basic vocational knowledge.
3) Participation in the RMSSP will decrease students' anxiety about their future clinical training by increasing their understanding of the experience of clinical training, including the associated educational, relationship, physical and financial stressors.
4) Participation in the RMSSP will increase students' knowledge of the CanMEDS framework and improve their attitudes towards CanMEDS.

Chapter 3: Development and Validation of Instruments

Chapter 3 contains a description of the development and validation of the questionnaires and interviews used in the present study. The rationale for, and construction of, the questionnaires and interviews are provided. The judges' panel method used to assess the validity of the questionnaire is included together with the results of the analysis of the judges' responses, as are the procedures for ensuring confidence in the qualitative analyses of the interviews.

Questionnaires

Four questionnaires were created for use in the present study. Students were administered a pre-encounter questionnaire and a post-encounter questionnaire. Residents also received a both a pre-encounter and a post-encounter questionnaire.

Rationale.

Questionnaires were selected for this study because of their ability to efficiently collect a large volume of data from a large sample with relatively low cost and with little expenditure of time and effort by participants. Both selection and open-response items were used to allow for different comparisons to be made: for example, selection items are more appropriate for gathering information on pre-determined variables such as attitudes, whereas open-response items are more appropriate for generating understanding of less well-defined constructs, such as experiences, or for providing further information about the responses to selection items. Selection items using Likert scaling allow respondents to easily and quickly indicate their responses to many items. Open-response items, while more labour intensive for the respondent, permit the respondent to provide richer, more detailed answers, including unexpected responses (De Vaus, 1996).

In this study, both selection and open-response items were employed in both versions of the questionnaire (i.e., pre- and post-encounter questionnaires) for students in two randomly formed groups. One group participated in the RMSSP and one did not, and thus the second group served as a control. The pre-encounter questionnaire served the purpose of determining a baseline level of knowledge and attitudes for both groups and to establish whether the two groups were equivalent. The post-encounter questionnaire, containing many of the same items as the pre-encounter questionnaire, was used to assess change in the students in both groups and to look for differences between the amount of change in the intervention and control groups after participation in the program. Students in the intervention group also received additional items on the post-encounter questionnaire that specifically addressed their experiences in the program. Residents completed similar pre- and post-encounter questionnaires in order to provide information on their experiences in the program and their evaluation of their student's experiences.

Student pre-encounter questionnaire.

The student pre-encounter questionnaire (Appendix I) was designed to investigate students' attitudes and knowledge regarding the study's three research outcomes: preparedness for clinical duties/vocational knowledge; understanding of, and anxiety towards, clinical training; and knowledge of, and attitudes towards, CanMEDS. The development of the items in each subscale is described below. In addition to these three main subscales, the questionnaire included a study information and consent form, along with background and demographic items. In the background items, students were asked whether they had any previous experience working or volunteering in healthcare, and if so, to describe it in terms of type and duration. Demographic items, placed last in the questionnaire as part of a personal code, included age and gender.

Student post-encounter questionnaire.

The student post-encounter questionnaire (Appendix II) had two forms. Both forms included subscales related to preparedness for clinical training/vocational knowledge, understanding of, and anxiety towards, clinical training, and knowledge of, and attitudes towards, CanMEDS as the pre-encounter questionnaire. In addition, questions about clinical exposure in general in the first year of medical school were included in both forms. The form administered to students in the RMSSP (the intervention group) also included items specifically about their experiences with the RMSSP.

Resident pre-encounter and post-encounter questionnaires.

The resident pre-encounter questionnaire (Appendix III) used the same items regarding CanMEDS, background and demographics as the student pre-encounter questionnaire. In addition to these items, the resident post-encounter questionnaire (Appendix IV) also included items pertaining to the residents' experiences in the program and their evaluation of their student's learning in the program.

Item development.

The items in each subscale were constructed by the author in an attempt to create three distinct subscales that each fully represented one of three domains.

Items in the preparedness/vocational knowledge subscale asked students to assess and relate their confidence in their ability to function as a clinical level medical student. They were asked to rate their confidence in a variety of clinical skills from simple tasks such as writing medical orders to more complex duties such as interacting with patients or their families. They were also asked to rate their knowledge of certain profession-specific topics (e.g., the role of doctors in healthcare organizations and profession-led

regulation), their level of preparedness to begin clinical duties in third-year and their preparedness to select a residency specialty. The aim of this subscale was to attempt to cover the breadth of the skills needed by medical students to become successful clinical students. In the resident post-encounter questionnaire, residents were asked to rate whether the RMSSP improved their student's performance of a list of the same vocational skills and knowledge.

In the subscale regarding understanding and anxiety, items were focused on students' understanding of the stresses to expect in clinical training, their anxiety towards clinical training and whether they knew where to find resources to deal with stress. Students were asked to rate the extent to which they were looking forward to, and to describe how they felt about starting, clinical duties in their third year. Items were based on the four most common stressors found in a study by Saipanish (2003): financial, relationship, physical/health and educational.

The items included in the CanMEDS subscale were designed to investigate both knowledge of, and attitudes toward, CanMEDS. Students and residents were asked if they had ever heard of CanMEDS outside of the context of the current study. If yes, students were asked to indicate where, or from whom, they had heard of CanMEDS. Next, students and residents were asked to list by name or to describe as many of the seven CanMEDS roles as possible.

Following these questions were three main types of items that were used for each of the seven CanMEDS roles individually. First, respondents were asked to describe the meanings they ascribed to a given role in an open response item. Second, respondents rated the importance of that role. Third, the respondents rated the importance of each of the key competencies associated with each role. The responses to the first two of these three items could not be changed as a result of reading the prompts to the third item.

The CanMEDS framework published by the RCPSC (2005) was used to develop these items. Each role's definition is associated with a set of "key competencies" that together comprise a role in its entirety. For example, the Collaborator role is made up of the following two key competencies:

1. Participate effectively and appropriately in an inter-professional healthcare team.
2. Effectively work with other health professionals to prevent, negotiate, and resolve inter-professional conflict (The Royal College of Physicians and Surgeons of Canada, 2005, pp. 15).

Some adaptations of this format were necessary. In cases such as Collaborator key competency #2, above, to avoid the use of multiple-barreled items, the author simplified the competency statement where possible to make it single-barreled while still retaining the intent of the overall competency and avoiding the need for multiple items. For example, the stem for key competency #2, above, became "Effective resolution of conflicts with other healthcare professionals". This was done to maintain the intended ratio of one item per key competency. Roles with more key-competencies were assessed with a higher number of items in order to preserve the intended complexity of each role and the representativeness for each role. In the resident post-encounter questionnaire, residents were asked to rate whether the RMSSP improved their student's understanding, and performance, of each of the CanMEDS roles. Both the intervention group and the residents were asked to identify the type of teaching style used most often by the resident when teaching CanMEDS.

The student post-encounter questionnaire included items pertaining to clinical exposure in general, both in and outside of the RMSSP. This was done to allow a comparison between the amounts of clinical experience in which each group, intervention and control, participated. The student post-encounter questionnaire respondents in the

intervention group included a subscale regarding their experiences in the program. This subscale was comprised of items requiring students to rate and describe their experience in the RMSSP, especially relating to the present study's three main outcomes (preparedness, understanding/anxiety, CanMEDS). These items were developed partly by using findings from interviews with students and residents about their experiences in the program.

The resident post-encounter questionnaire also included items that asked residents to rate and describe their own experiences in the RMSSP. There were also several items that addressed the benefits and detriments perceived by the residents regarding their participation in the program. As was the case with the student items in this subscale, these items on the resident post-encounter questionnaire were developed partly by using findings from interviews with students and residents about their experiences in the program.

A five-point Likert scale was used. (1 = *Strongly Disagree*, 5 = *Strongly Agree*). Options 2, 3 and 4 were left unlabeled to facilitate the construction of an equal interval scale (De Vaus, 1996). Where possible, items dealing with preparedness/vocational knowledge and understanding/anxiety of clinical training were constructed to minimize response set bias by randomly reversing the polarities of the items in each subscale using a coin toss. For example, two items related to stress were:

a. I know what relationship stresses to expect in the upcoming years of med school.

b. I do not know what physical/health stresses to expect in the upcoming years of med school.

Care was taken to ensure that each polarity appeared at least once in the first three items of each subscale. Polarity reversal was not employed in the CanMEDS

subscale because of difficulty constructing these items in a meaningful way with reversible polarities.

Review panel.

The two subscales on preparedness/vocational knowledge and understanding/anxiety were validated using a panel of expert judges[1] (Slocumb & Cole, 1991, Rogers, 2009b). The judges were selected as persons familiar with the University of Alberta UGME or PGME curriculum and familiar with the experiences of students and residents in those programs. They came from a range of medical and surgical specialties. The instrument provided to the judges is given in Appendix V. Judges were asked to review each item and rate its relevance to the subscale's stated content area and asked to comment to explain their responses. They were also asked to judge the whether the items provided adequately represented the stated domain for each subscale, and to suggest items, if any, that may be omitted or items that should have been included, but were not.

The items included in the subscale regarding attitudes towards CanMEDS were not reviewed by the expert panel. The wording and content of each item was taken as exactly as possible from the official RCPSC framework. Consequently, the relevance of the items was assumed to be adequate. Also, because one item was assigned to each role and key competency, the representation of the items was assumed to reflect the domain as designed by the RCPSC. Likewise, items pertaining to the program itself and participants' descriptions of experiences therein included in the student and resident post-encounter surveys were not subjected to a formal validity testing process. These items

[1] In contrast to the usual procedure for validating an instrument such as this questionnaire, in this study the validity test involving judges was performed after administration of the instrument. Given the need to administer the pre-encounter questionnaire before initiating the program in October, there was unfortunately not enough time to perform the judges' panel validation in advance.

were selected for the specific use of investigating the RMSSP and were not thought to be amenable to the expert judges' approach.

Judges.

Seventeen of the 21 judges contacted returned responses. A description of the respondents, including their academic positions, clinical specialties and years of clinical teaching experience are provided in Table 1. All were members of the Faculty of Medicine at the University of Alberta from a variety of clinical specialties including family medicine, surgery, internal medicine and pediatrics. Further, all were in, or had previously been in, an administrative position. Their teaching experience ranged from 3 to 34 years.

The first step of analyzing the judges' validation of the student questionnaire was to calculate the agreement among judges in each domain, which was calculated using the judge's discrepancy from the median (JDM_j) and is shown in Tables 2 and 3:

$$JDM_j = \sum | X_{kj} - Md_k |$$

where X_k is the rating given to item k by judge j, and

Md_k is the median rating of item k.

Table 1.

Characteristics of Validation Panel Judges

Judge	Academic Position	Clinical Specialty	Teaching Experience (years)
1	Coordinator for clinical skills in UGME	internal medicine	20
2	Coordinator for psychiatry in UGME	psychiatry	3
3	Coordinator for internal medicine in UGME	cardiology	22
4	Coordinator for family medicine in UGME	family medicine	5
5	Program director for pediatrics in UGME	pediatrics	10
6	Former Assoc. Dean of UGME	pathology	25
7	Coordinator of UGME rural integrated clerkship	family medicine	11
8	Coordinator for surgery in UGME	general surgery	15
9	Vice Dean of Education, Faculty of Medicine	family medicine	25
10	Asst. Dean of Clerkship / Electives in UGME	emergency	12
11	Coordinator of emergency medicine in UGME	emergency	15
12	Assoc. Dean of PGME	anaesthesia	22
13	Asst. Dean of Clinical Education in UGME	gynecology	22
14	Former Asst. Dean of Student Affairs, UGME	pediatrics	25
15	Former Assoc. Dean of PGME	neurology	34
16	Assoc. Dean of UGME	pediatrics	15
17	Director for family medicine in UGME	family medicine	6

Table 2.

Judge's Discrepancy From the Median (JDM_j) Calculations for the Preparedness/Vocational Knowledge Subscale

Judge	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
JDM_j	11	8	0	14	41	39	21	12	13	35	22	19	16	24	18	28	15

Table 3.

Judge's Discrepancy From the Median (JDM_j) Calculations for the Understanding/Anxiety Subscale

Judge	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
JDM_j	11	4	6	7	7	7	15	13	9	25	13	12	7	6	13	11	11

The JDM_j was used to help ensure that all judges understood the task. To this end, the comments made by the judges in each subscale were examined, starting by evaluating the comments of judges with high JDM_j values, but all judges' comments were eventually evaluated. Judges 4-7, 10, 13, 14 and 16 were identified as likely not understanding the validation task based on their comments. These judges expressed that they were evaluating the structure of the items in addition to or instead of the content of the items. For example several of the judges objected to the use of alternating polarity. Since an assessment of the structure of the items was not what was needed in this validation study, these judges were removed from the analysis. Nine judges remained after this step.

Next, remaining judges were evaluated based only on their JDM_j value. Judges with aberrant JDM_j values were removed until there were no outliers. No judges were removed due to aberrant JDM_j in the preparedness/vocational knowledge domain as there

were two judges that both had high, but similar values (see Table 4). Two iterations were needed for the understanding/anxiety subscale. Each iteration is shown in Table 5.

Table 4.

Judge's Discrepancy From the Median (JDM_j) in the Preparedness/Vocational Knowledge Subscale

Judge	JDM_j (1)
1	21
2	13
3	8
8	0
9	5
11	10
12	7
15	6
17	24

Table 5.

Iterations of Judge's Discrepancy From the Median (JDM_j) Calculation in the Understanding/Anxiety Subscale

Judge	JDM_j (1)	JDM_j (2)	JDM_j (3)
1	23	-	-
2	16	15	-
3	7	7	7
8	1	0	0
9	6	4	4
11	0	0	0
12	1	1	1
15	0	0	0
17	8	8	8

Following the removal of aberrant judges, item fit item and ambiguity (R_k) were calculated. Item fit was assessed using the median of the judges' rating for a given item.

The closer a median is to five, the greater the fit. Item ambiguity, a measure of the disagreement among the judges for the item was calculated as follows:

$$R_k = (Max_{kj} - Min_{kj}) + 1$$

where Max_{kj} is the highest rating given to item k, and

Min_{kj} is the lowest rating given to item k.

A value of 1 indicates there was no item ambiguity. A value of 5 indicates maximum ambiguity. The results of these analyses are presented in two tables, one for each of the two sets of items the judges read (see Tables 6 and 7). The items are ordered in each table according to their median value and item ambiguity. For example, as shown in Table 6, item 27 had a fit index of 5 and an item ambiguity index of 2, indicating total agreement with minor variability among the judges. Item 28c also had a fit index of 5 but had an item index of 3, an indication of moderate ambiguity. All items had a median item fit rating of 4 or greater. Next, item ambiguity was assessed. Values of R_k up to 3 were considered acceptable. Four items from the preparedness/vocational knowledge domain and two items from the understanding/anxiety domain had values of R_k greater than 3. Because of the high degree of ambiguity in these items, they were removed from analysis.

Table 6.

Judges' Ratings: Preparedness/Vocational Knowledge

Item	Md_k	R	Decision
27	5	2	Accept
28a	5	2	Accept
28b	5	2	Accept
28f	5	2	Accept
28h	5	2	Accept
28i	5	2	Accept
28k	5	2	Accept
28l	5	2	Accept
28p	5	2	Accept
28q	5	2	Accept
28r	5	2	Accept
28c	5	3	Accept
28d	5	3	Accept
28e	5	3	Accept
28j	5	3	Accept
28s	5	3	Accept
28t	5	3	Accept
28u	5	4	Reject
28m	4	2	Accept
28n	4	4	Reject
28o	4	4	Reject
28g	4	5	Reject

Table 7.

Judges' Ratings: Understanding / Anxiety

Item	Md_k	R	Decision
29	5	1	Accept
30	5	1	Accept
31a	5	2	Accept
31b	5	2	Accept
31c	5	2	Accept
31d	5	2	Accept
31e	5	2	Accept
31f	5	2	Accept
31g	5	2	Accept
31h	5	2	Accept
31i	5	2	Accept
31j	5	3	Accept
31k	5	3	Accept
31l	5	3	Accept
32	4	4	Reject
33	4	4	Reject

All judges agreed that the items provided adequately represented the preparedness/vocational knowledge domain. One judge did not agree that the items provided were adequately representative of the understanding/anxiety domain, while the other six did. The dissenting judge provided the following suggestion for items that should have been included: "Conflict with peers, staff relations, harassment/intimidation, level of responsibility." Of these topics, all are addressed to a degree in items in the preparedness/vocational subscale.

Interviews

Interviews were conducted with students and residents who had participated in the RMSSP. Students in the control group were not interviewed.

Rationale.

The purpose of interviewing students and residents was to more fully explore the participants' experiences in the program than was possible using only questionnaires. As noted by Patton, "we interview people to find out from them those things we cannot directly observe" (2002, p. 340). Interviewing allows insight into participants' perspectives and experiences that would be difficult or impossible to gather otherwise (2002). Small group interviews allow more freedom of responses than questionnaires while still allowing the views of multiple participants to be gathered simultaneously (Seidman, 1991). Interview questions were geared towards each of the four main research questions (experiences, preparedness/vocational knowledge, understanding/anxiety of clinical training, and CanMEDS) for the students and residents. The resident interviews also looked for any burden or benefit to residents. Findings from the interviews were also used to inform the development of the student and resident post-encounter questionnaires. Themes that emerged in the interviews that were thought to warrant further exploration were developed into both selection and open response questionnaire items.

Development.

In order to gain an understanding students' experiences of participating in the RMSSP, a series of semi-structured small group interviews were designed. Each interview was planned to last up to one hour. Questions were worded in such as way as to be "open-ended, neutral, singular and clear" (Patton, 2002, p 353) in order to ensure the

quality of responses. An interview guide (2002), containing major questions to be asked was developed and included questions on four main topics: experiences, preparedness/vocational knowledge, understanding/anxiety of clinical training and CanMEDS. In this way, parallel questions were created in the questionnaire and interviews that addressed the same concept using different methods (Creswell & Plano Clark, 2011) and each research question was specifically addressed in the creation of the interview guides. The following paragraphs detail the construction of the section of the interview corresponding to each of the study's four research questions.

Interview questions pertaining to experiences were developed to generate an understanding of what students and residents did, thought and felt during their time in the RMSSP. Respondents were asked to describe their typical shadowing sessions. They were also asked to discuss the best and worst parts of the program and what should be changed. They were asked if they would participate again in the program and whether it should be continued again the next year in either a mandatory or voluntary form. Residents were asked in particular about the workload of the program and how it compared to their other teaching duties.

Questions in the preparedness section focused on practical knowledge and skills learning related to clinical work. Students were asked about the types of activities they observed and/or participated in during their experience in the program. They were also asked to compare their experience in the RMSSP to the Gilbert's scholars program, in terms of content and efficacy. Finally, students were asked to comment on whether they felt the program would make them better prepared for clinical duties. Residents were also asked in what type of activities they engaged the student and about any specific skills they attempted to teach.

Several interview questions addressed the understanding/anxiety domain and attempted to investigate if, and how, students learned about the nature of clinical training

and whether this contributed to less anxiety. Students were asked how the program changed their impression of what it means to be a doctor, including whether their resident matched their expectations of what a resident would be like. They were also asked to describe how the RMSSP had affected their anxiety towards starting clinical training. Students and residents were asked the extent to which topics such as what it is like to be a clinical trainee, the stresses associated with clinical training and any other topics outside of medical knowledge were discussed.

Both students and residents were asked about the instruction of CanMEDS. The students were also asked what they thought they learned about the framework, along with several questions regarding the methods of CanMEDS instruction. Discussion was encouraged about whether CanMEDS was taught more frequently and more effectively through didactic discussion or by observation. They were also asked to describe situations in which their resident performed a role well, or poorly, and a time when they felt that they used CanMEDS in practice themselves. Residents were asked if they thought the program was an effective way to teach the students about the framework and about the methods they used to teach this topic. They were also asked if they thought they learned about CanMEDS themselves by teaching the students. The student interview guide (Appendix VI) and the resident interview guide (Appendix VII) are included. Details of interview data collection are provided in Chapter 4.

Procedures for enhancing confidence in interviews.

Efforts were made to reduce potential bias in the collection of interview data. Questions were structured to be open-ended, neutral and non-leading, to allow open and unprompted responses. Each question was singular in nature, referring to only one concept at a time and clarity of language was emphasized when developing the questions to ensure a consistent understanding of both participants and researchers. This clarity was

aided by the interviewer's own experience as a medical student at the University of Alberta, as was the rapport with interview participants. Both positive and negative feedback were received with verbal and non-verbal reactions that were as neutral as possible and care was taken to encourage differing view points and open discussion. Finally, although the wording of individual probing questions changed for each student interview in reaction to responses from previous interviews, a consistent guide was used for each interview, consisting of the same major questions each time, to minimize variation between interviews, with only minor variation in the structure of probing questions based on experiences with previous interviews (Patton, 2002).

After each interview was transcribed and analyzed, a summary of the author's impressions from the interview was sent to the interviewees for their feedback. They were asked to comment on the summary and to correct any misinterpretations. None of the interview member checks generated any corrections or additions from the interviewees. One student and one resident responded via email to confirm the accuracy of the summary. The student stated:

> Thank you for sending a copy of the interview summary. I had a read through it, and I think it is a great overview of what we talked about during the session. It captures the variety of our experiences, voices what little concerns we actually had about the program, and emphasizes the positive impact that the program had on us all.

Generally, there was homogeneity in the responses between each of the interview groups and, to an extent, within individual interviews, although varying viewpoints on most themes did emerge. The participant in the individual interview identified themes in a manner consistent with the results from the five group interviews.

Chapter 4: Research Methods

Chapter 4 provides a description of the procedures for answering the study's four research questions. First, an overview of the mixed methods design is provided, including a justification for the use of a concurrent triangulation mixed methods design and each of the strands used therein (quantitative and qualitative), as well as the use of an embedded randomized control trial. This overview is followed by a detailed account of the intervention under study, the RMSSP. Third, a description of the subjects follows, including recruitment methods and information related to the ethics approval obtained. Fourth, the data collection techniques and analysis procedures used are described for each strand. Data collection is presented as organized by instrument, while analysis procedures are organized by strand. Lastly, an overview of how the findings were combined in the mixed methods phase is given.

Overview of Mixed Methods Design

To assess the effectiveness of the RMSSP a concurrent triangulation mixed methods design was used. What is unique in this study is the incorporation of a randomized control trial as part of the design. A graphical representation of the methods used with the study's different groups is provided in Figure 1.

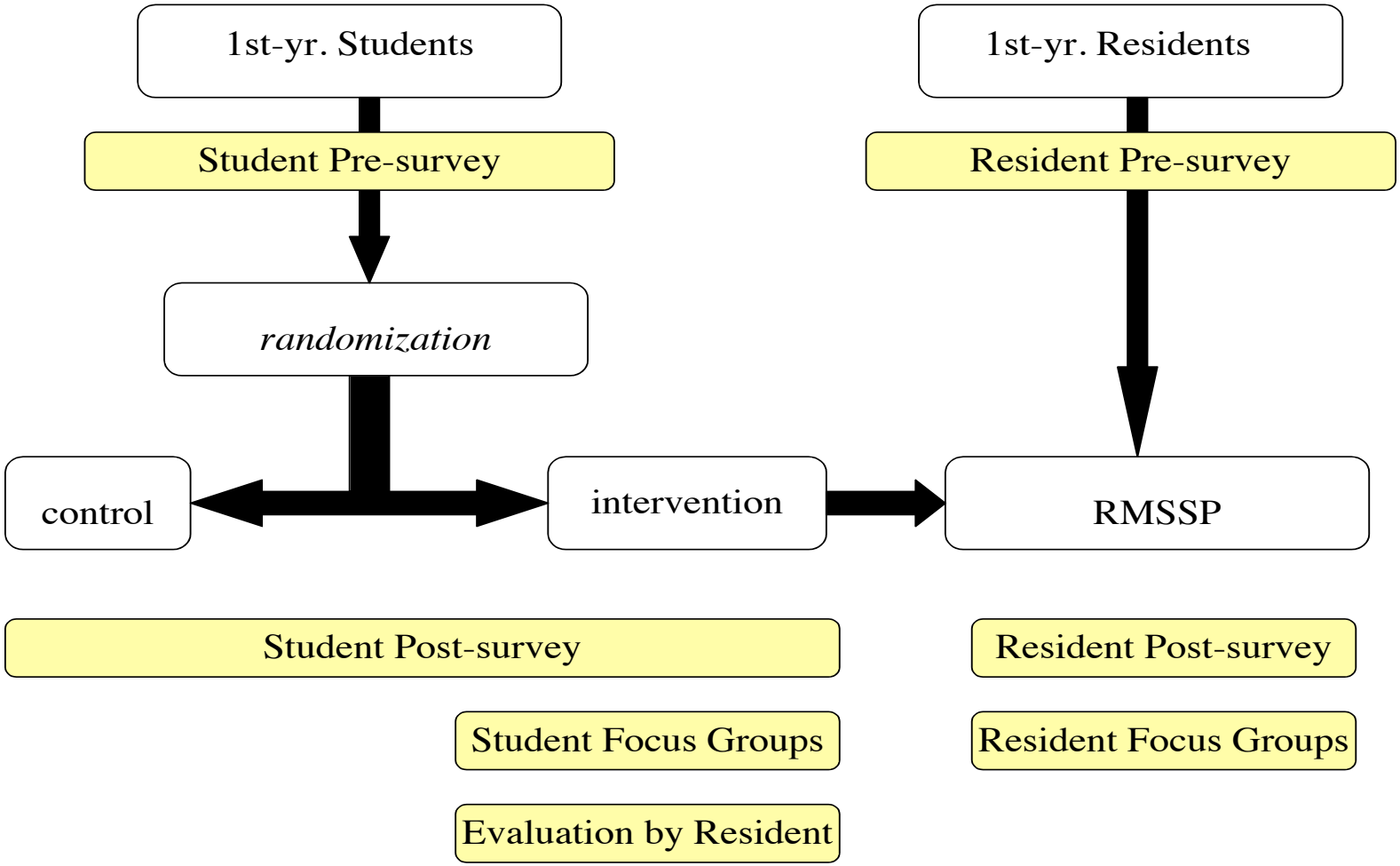

Figure 1. Graphical Representation of the Study Plan.

A concurrent triangulation mixed methods research design was selected to allow the most comprehensive analysis of the effectiveness of the RMSSP. This approach combines the advantages of both quantitative and qualitative research methods (Mertens, 2003). The use of both qualitative and quantitative methods within a mixed methods design is appropriate because of the study's research questions. Qualitative methods are suited to developing a description of the experience of participation in the program, generated from the participants' own words. They also allow the identification of potentially unforeseen outcomes from the program, both positive and negative, being more exploratory in nature. Conversely, quantitative methods permit the study of many discrete end-points with minimal cost, and allow for determinations of statistical significance. Quantitative methods can thus be seen as more confirmatory than qualitative methods (Lieber, E. 2009). The reason for collecting both types of data is to generate a better understanding of each research question than would be possible by using either quantitative or qualitative methods alone (Creswell & Plano Clark, 2011). Mixed methods design allows researchers to "better understand a research problem by converging numeric trends from quantitative data and specific details from qualitative data" (Hanson, D.T, Creswell, J.W., Plano Clark, V.L., Petska, K.S., & Creswell, J.D., 2005, p. 226). By performing both qualitative and quantitative measures in a concurrent fashion with triangulation, the findings of one measure can be used to inform the understanding of the findings of another, in order to answer complex research questions (Creswell & Plano Clark, 2011). Data from different sources is used to triangulate towards a conclusion. In this way, findings regarding each of a study's research questions can be understood more fully, and more accurate conclusions can be generated. This may

also add to validity, as different data sources can be used to corroborate each other (Creswell, 2009).

The benefits of quantitative methods are maximized when employed in a randomized control trial. In addition to being a gold standard in most medical research, the advantage offered by a randomized control trial is the ability to draw conclusions about causality (Jadad, 1998). In this study, several factors might account for a student's change within any of the areas of focus over the course of a year. The impact of time, exposure to medical school curriculum and other confounding variables can be controlled-for using a randomized control trial, since participants in the intervention and control groups can be expected to be exposed similarly to each factor.

In this study, the initial data source reviewed was the quantitative aspect of the questionnaire. Quantitative data was collected from the control and intervention groups. This data was then used to test the statistical hypothesis that there were no differences for each the three study outcomes and to describe the program numerically. Qualitative data was collected to explore students' and residents' experiences in the program, especially as they relate to these same four hypotheses. These data were then combined to gain a more thorough understanding of the trends revealed by the quantitative analysis and to either support or refute quantitative conclusions.

The RMSSP Intervention

The Resident-Medical Student Shadowing Program was developed starting in 2008 in response to challenges facing medical students as they enter the clinical phase of their training in the medical faculty at the University of Alberta. With the cooperation of both the UGME and PGME offices of the University of Alberta, a pre-existing resident-medical student mentorship program was modified to become a shadowing program. The

goal of the RMSSP was to help to better prepare students for the transition to clinical duties. To serve this goal, three main areas of focus were identified as shown in Table 8.

Program participants and activities.

To achieve the program's objectives, first-year medical students were paired with first-year residents. Because the students in their second year had been involved with the predecessor mentorship program, this population was not suitable for study because of potential confounding effects. In addition, first-year students were well suited for study because of the potential for the greatest impact on their training as well as the potential to optimize the amount of time for students to form a long-term relationship with their resident throughout their training. First-year residents were chosen because of their wide variety of clinical rotations and because they are the closest to students in terms of age and training. It was hoped this proximity would foster a better understanding of students' needs and again help to develop a closer relationship between student and resident.

Table 8.

RMSSP Learning Objectives

Program goal	Program focus	Learning objectives
Help to better prepare students for the transition to clinical training	Increasing students' preparation for clinical training, including by increasing their vocational knowledge and skills.	1) Describe the job of the student within the healthcare team. 2) Perform some basic tasks required by a clinical student intern. 3) Describe the job of the resident within the healthcare team. 4) Describe the process of applying for a residency position.
	Increasing students' understanding of the stresses of clinical training, thereby reducing their anxiety towards it.	1) Describe personal benefits associated with student internship. 2) Describe personal hardships associated with student internship. 3) Describe personal benefits associated with residency. 4) Describe personal hardships associated with residency. 5) Describe the stresses associated with internship and residency. 6) Describe methods of handling professional stress.
	Improving students' knowledge of, and attitudes towards, CanMEDS.	1) Define "CanMEDS" and list the seven roles. 2) Accurately describe each of the seven CanMEDS roles.

Resident-student pairs were instructed to meet once per month over an eight-month period, for four to six hours at a time. Sessions were to take place during the resident's regularly scheduled work duties and during a time when their student was free of other academic obligations. Suggested settings included inpatient wards, outpatient clinics, the emergency room and the operating room. In these settings, the students were to observe the resident at work and participate in any tasks the resident deemed appropriate. A visual representation of the resources and activities of the program linked to the intended outcomes is provided in the program logic model, shown in Figure 2. In this figure the inputs, or resources of the program, are listed. Next, the activities in which participants were to engage are listed and linked to the outputs, outcomes and impact (short, medium and long-term results, respectively) expected from the program. Aspects of the figure related to residents are in fine hash-marked boxes, students in coarse hash-marked boxes and aspects related to both are in a combination. By following the arrows in the figure from left to right the logical flow of the program from each activity to its intended effects can be seen. To ensure a safe atmosphere, both for participants and for patients, and to improve the fidelity of the intervention, a set of rules and guidelines were distributed to all students and residents (a copy is provided in Appendix VIII). Residents were directed to discuss with their student relevant medical knowledge and skills and the nature of clinical training. In addition, each session was assigned a topic related to CanMEDS as outlined in Table 9. In order to allow time for recruitment, the program began in October 2010. Resident participants were given a copy of the RCPSC CanMEDS 2005 Physician Competency Framework that describes the CanMEDS framework and each of the seven roles in detail (The Royal College of Physicians and Surgeons of Canada, 2005). Students were not given a copy of the framework so that any effect seen with respect to students' knowledge of the framework could be attributed to participation in shadowing sessions and not to having read the framework themselves.

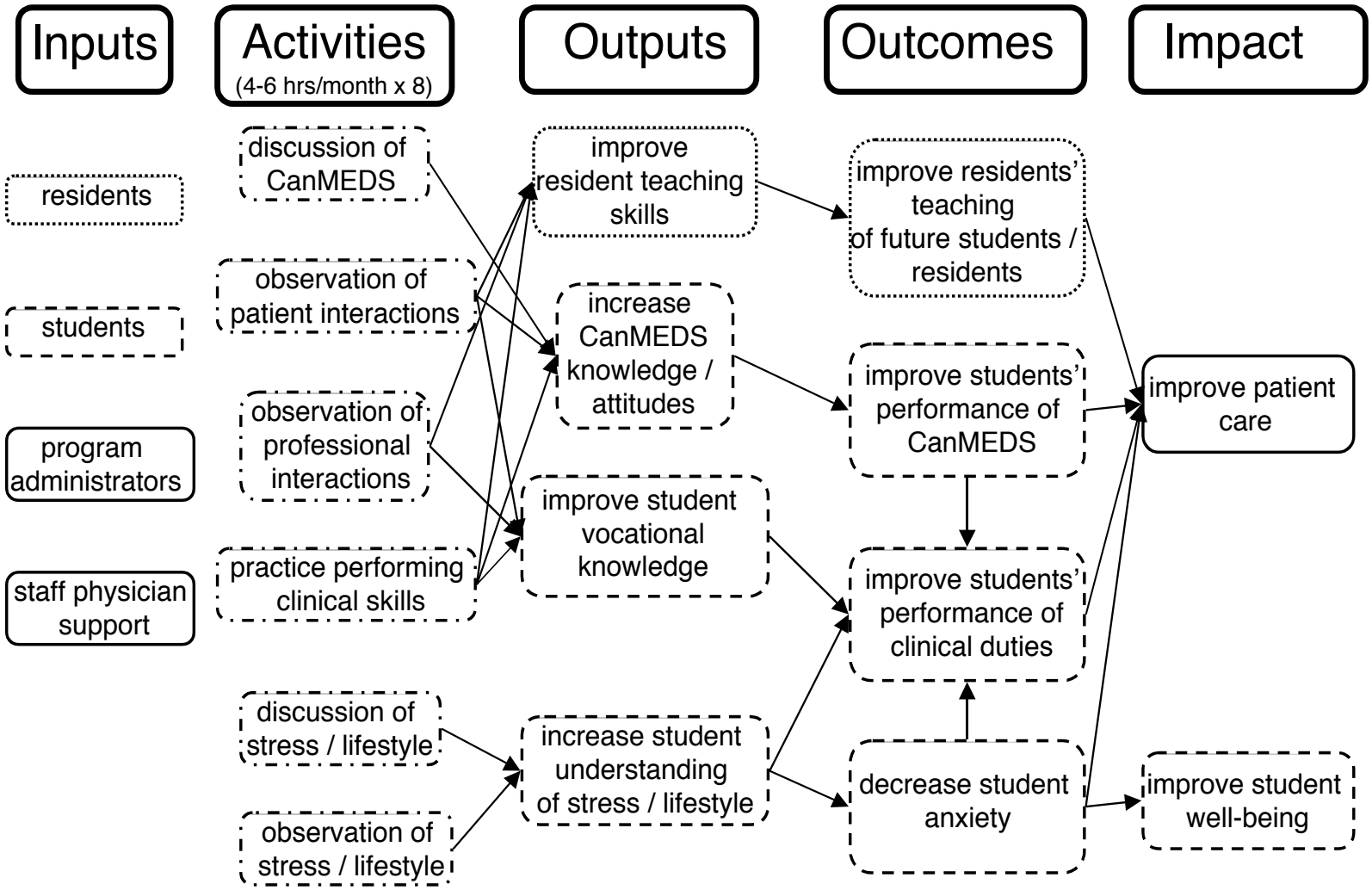

Figure 2. Logic Model of the RMSSP.

Table 9.

Monthly Session Schedule

Session	Month	Topic
1	October	Introductions/What Is CanMEDS?
2	November	Communicator
3	December	Collaborator
4	January	Manager
5	February	Health Advocate
6	March	Scholar
7	April	Professional
8	May	Medical Expert

Subjects

The subjects in this study were in three groups. Two of the groups were students, an intervention group that participated in the RMSSP, and a control group that did not. The third group of subjects in this study was the residents who were used as teachers in the intervention. For both students and residents, program and study recruitment occurred concurrently because enrollment in the shadowing program was made contingent upon participation in the associated research study.

Students.

Program enrollment for students began on September 3, 2009 with a presentation to all University of Alberta first-year medical students during their orientation to medical school, followed by a series of emails regarding the program. A follow-up question and

answer session was held before a class lecture on September 8, 2009. The email addresses and names of interested students were compiled to form the list of recipients of the student pre-encounter questionnaire. Of 183 first-year medical students, 180 gave their permission to be contacted by email in order to participate.

Enrollment in the RMSSP and participation in the research study was initiated by completing a pre-encounter questionnaire. Once participants had completed the pre-encounter questionnaire they were enrolled in the study. Students were then randomized to either the intervention or control groups by coin toss. Students in the intervention group were partnered at random with a resident participant and enrolled in the shadowing program. Students in the control group were not enrolled in the shadowing program and received only the normal first-year medical school curriculum mandated by the University of Alberta. Students in the intervention group also received the normally mandated curriculum, in addition to participation in the shadowing program.

Residents.

First-year residents from every residency program at the University of Alberta were approached to enroll in the RMSSP and participate in the study. Recruitment of residents began with description of the program given to all first-year residents on June 30, 2009. The email addresses and names of interested residents were compiled to form the list of recipients of the resident pre-encounter questionnaire. Of 167 first-year residents, 90 gave their permission to be contacted by email in order to participate. As with the students, residents' participation in the program was made contingent upon participation in the associated research study via completion of the pre-encounter questionnaire. Once a resident completed the pre-encounter questionnaire they were matched randomly to a student and the initial email was sent to the pair. This email introduced the two participants to each other and encouraged them to begin scheduling

shadowing sessions immediately. A total of 83 residents were enrolled in the study and were matched to students.

Ethics

Ethical approval for this study was granted by the Health Research Ethics Board of the University of Alberta Faculty of Medicine on October 5, 2009. This approval was forwarded to the Faculty of Education Research Ethics Board and reviewed by the Chair on October 8, 2009. Faculty approval was granted by Dr. Kent Stobart, Associate Dean of UGME and Dr. George Elleker, Associate Dean of PGME.

Data Collection

There are two main sources of data in this study and two populations (the students, in the intervention and control groups, and the residents). All groups participated in both pre-encounter and post-encounter questionnaires. Students in the intervention group and residents were also interviewed.

Administration of questionnaires.

All questionnaires were administered electronically using the SurveyMonkey web-based survey program. The link to the questionnaire was included in e-mail invitations to students and residents who provided their contact information through recruitment activities. Individualized links were used so that each participant could respond only once, and so that no individuals who were not specifically recruited could participate. The pre-encounter questionnaires were distributed in October 2009. The post-encounter questionnaires were distributed in June 2010 in a similar fashion. To increase the response rate, each questionnaire was available for six weeks and participants were

given four weekly reminders. Data was stored on a password protected secure site to which only the author had access.

Administration of interviews.

Interviews were held during or after the final months of the RMSSP. Students were invited to participate in small group interviews in March and April of 2010. Six student interviews were conducted with a total of 27 volunteer students from March 22 to April 13, 2010. One interview was an individual interview, with a student who was unable to attend any of the other scheduled interview times, and the rest were in small groups of two to eight students. Residents were also invited to participate in small group interviews in June 2010. One resident interview was conducted with three volunteer residents on June 8, 2010. The author conducted all interviews and informed consent was obtained prior to the interview. The length of the student interviews ranged from 30 minutes (the individual interview) to 52 minutes. The resident interview was 31 minutes in length. The interviews were recorded on a digital voice recorder and then transcribed by the author with the assistance of a written notation of the conversation performed by a volunteer third party.

Data Analysis

Analysis of the study was completed in three stages. First, the quantitative data was analyzed, followed by the qualitative data separately. Once these analyses were completed, the qualitative data was used to better understand the quantitative data and to produce joint findings for each of the four research questions. The analyses of the quantitative and qualitative strands, as well as the mixed methods analyses are represented in Figure 3.

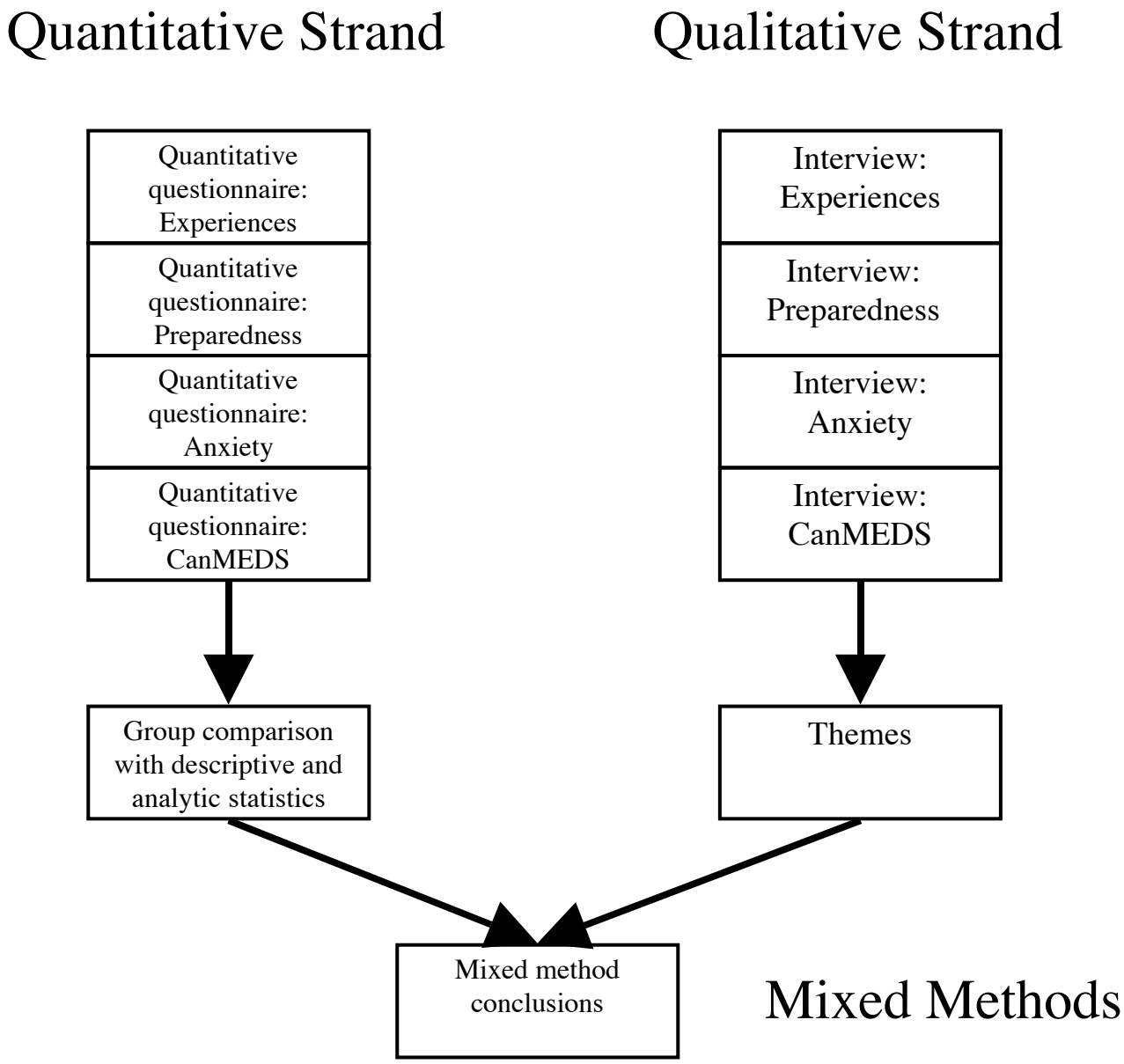

Figure 3. Graphical Representation of The Analyses Performed.

Quantitative analyses.

To compare the scores of the intervention and control groups on the three subscales administered, the following statistical hypothesis was tested:

H_0: $D_i = D_c$

H_1: $D_i \neq D_c$

where D_I is the mean change in the intervention group students' scores on a given subscale from the pre-encounter questionnaire to the post-encounter questionnaire, and D_c is the mean change in the control group students' scores on a given subscale from the pre-encounter questionnaire to the post-encounter questionnaire. When comparing proportions between the control and intervention groups, the test for two independent proportions was used (Glass & Hopkins, 1996).

The alpha level for rejection of the null hypothesis was set at the standard level of 0.05 (Gravetter & Wallnau, 2009) as this was thought to provide an acceptable type I error rate. Although three comparisons were made, one for each subscale administered in the questionnaires, the alpha rate was not reduced to 0.04 or 0.03 to accommodate for the family-wise error rate, given the exploratory nature of the study.

The procedure selected for testing this hypothesis was the t-test for independent samples. There were unequal sample sizes and where the assumption of homogeneity of variance was violated the Welch modification of the t-test was employed (Gravetter & Wallnau, 2009). For all items with negative polarity, the polarity of responses was reversed prior to analysis. Statistical tests were performed using Microsoft Excel X and Predictive Analytics SoftWare SPSS 17.

Qualitative analyses.

Analysis of the interviews was completed using thematic analysis in a multi-step process using two raters. The first step of the analysis, performed by rater 1, was to examine the data using a deductive approach, looking for how data addressed the research questions and whether there was any unexpected data that did not fall within a research question. Each transcribed interview, and the summaries of each that were generated from a first read through, were reread and a list of major themes was developed using a thematic analysis approach with reference to each research question. Meaning units (sections of text representing a single thought or meaning) in the text were identified and matched with a larger theme. Next, for each theme, all of the relevant meaning units from each interview were grouped and reviewed together. Key ideas were noted and key excerpts were selected that supported each key idea. The list of key ideas and their supporting excerpts were then re-examined and used to create a description for each theme. A summary of each theme was created and within each theme, exemplar quotations were selected that represented the responses related to that theme (Seidman, 1991).

The second step of the analysis of interview data was completed using an inductive approach by rater 2. Analyzing three of the six student interviews and the sole resident interview independently, this second rater identified themes in a similar fashion but did so without reference to the research questions. The result was the creation of a conceptual framework that described completely the qualitative data generated in the interviews but that was not intended to, and therefore did not, necessarily match the framework of the study's research questions. This framework was then reviewed by rater 1, who checked it against all of the interviews to ensure it represented all of the data.

Finally, the two raters came together to derive a single conceptual framework. The two sets of themes generated in the first two steps of the analysis were compared

with regard to conceptual structure and content. The two sets did not match perfectly, but the inductively produced framework was found to present a structure within which the deductively generated themes could be organized. The two sets of themes were then combined in this fashion, with some minor modification of both sets of themes to generate a single conceptual framework that was influenced by both the deductive and inductive approaches and was a reconciliation of the two approaches into a single coding structure (each framework is embedded in the Findings section).

The small number of responses in the open-response section of the post-encounter questionnaire and the tendency for responses to be limited to short sentence fragments precluded a full thematic analysis of these data. To avoid contaminating the interview findings with these incomplete data, the open-response items were excluded from the analysis.

Contributors' backgrounds related to the confidence of qualitative analyses.

For the purposes of establishing the validity of the qualitative analyses performed in this study, the backgrounds of the author and supervisors should be noted. The author designed and constructed all of the novel instruments used in this study, including all questionnaires and interviews. Prior to administration, each instrument was reviewed by the project supervisors, CP and JW. The author performed the deductive and combined thematic analyses as rater 1.

The author is a graduate of the class of 2007 of the University of Alberta medical school. He is currently completing his fourth year of residency training at the University of Alberta, the first two years of which were in the General Surgery program and the most recent two years were in the Clinical Investigator Program. The author is also a graduate student in the University of Alberta Master's of Education program in Educational Psychology in the area of Measurement, Evaluation and Cognition.

CP is an Assistant Professor in the Department of Educational Psychology at the University of Alberta in the area of Measurement, Evaluation and Cognition and holds a PhD in Education. Her research focuses on program evaluation and she has several years of experience in evaluating health sciences programs. Her methodological area of expertise includes mixed methods research techniques.

JW is an Associate Professor and a consultant surgeon in the Department of Surgery at the University of Alberta and he holds a Master's in Education. He is the head of the medical school's Undergraduate Surgical Education program. His research includes a focus on professional identity and his methodological area of expertise includes qualitative research techniques. JW performed the inductive and combined thematic analyses as rater 2.

Mixed methods analyses.

For each research question the following data sources, from both students and residents, were combined:

-quantitative subscale scores

-some individual quantitative questionnaire items

-small group interview findings

The approach used to combine the results of the different analyses performed was the concurrent triangulation mixed methods approach (Creswell, 2002). The first step was to interpret the results of the quantitative analyses. This involved both descriptive statistics as well as comparisons between the intervention and control groups. In doing so, numeric trends were generated that helped to partially answer each research question. In order to more fully understand those trends, they were next compared to the themes generated from interviews in a "side-by-side" style comparison (Creswell & Plano Clark,

2011, p. 223). Domains in which the results from the two strands could be compared were identified. Qualitative themes were then used to explain, confirm, or challenge the conclusions generated by the quantitative analysis in these domains. Differences between the two strands were dealt with by comparing the relative strength of the effects or themes found and generating a reconciled conclusion. Because themes were constructed both inductively and deductively, some themes were relevant to more than one research question. Finally, a general set of mixed methods conclusions was generated taking into account both the numeric trends from the quantitative analysis and the explanatory themes from the qualitative analyses for each research question.

Chapter 5: Quantitative Findings

Chapter 5 presents the findings of the quantitative analysis for each of the four research questions. The findings of the qualitative analysis are presented in Chapter 6 and the findings of the mixed methods analysis are presented in Chapter 7.

The results of the quantitative analysis are presented in three sections. First, the response rates for each questionnaire and description of the study's student participants are given. Second, the psychometric properties of the questionnaire subscales are provided. Finally, the quantitative findings related to each of the study's four research questions are presented, organized by research question.

Description of Student Participants

The response rates for the students in the RMSSP and control group as well as the residents in the RMSSP are reported in Table 10. As shown, the response rate was acceptable, being 70% or higher for each questionnaire, although it was lower in the post-encounter questionnaires, especially for the student groups. The differences in response rate are likely due to the fact that it was necessary to respond to the pre-encounter questionnaire in order to be enrolled in the RMSSP, which may have motivated more participants to respond, while this motivation was absent for the post-encounter questionnaire. 83 students were enrolled in the intervention group and 90 were assigned to the control group. No significant differences were found between the control and intervention student groups in terms of demographics, prior experience and knowledge of CanMEDS at the beginning of the study. The mean age across the two student groups were similar (control vs intervention, 23.26 vs. 22.86 years old $p = 0.312$), as were the gender distributions (45.3% male vs. 51.3%, $p = 0.894$). There were also no significant differences between the intervention and control groups in terms of the proportion of

students with previous experience in healthcare (86.3% vs. 83.7%, p = 0.65) or the mean duration of previous healthcare experience (24.6 vs. 26.2 hours, p = 0.68). The two groups were not different in the proportion of students who had heard of CanMEDS before (85.9% vs. 86.3%, p = 0.67) and the two groups were able to name a similar number of CanMEDS roles (2.1 vs. 2.3, p = 0.80).

The residents had a mean age of 27.7 years old and were composed of 51.4% males. All residents were enrolled in the intervention.

Table 10.

Response Rates of Questionnaires

Questionnaire	Number Selected	Number of Respondents	Response Rate
Student Pre-Encounter	180	173	96.1%
Student Post-Encounter (Control)	90	63	70.0%
Student Post-Encounter (Intervention)	83	63	75.9%
Resident Pre-Encounter	90	83	92.2%
Resident Post-Encounter	83	69	83.1%

Psychometric Characteristics of Questionnaires

The number of respondents (n), number of items (k), mean, standard deviation (SD), internal consistency (Cronbach's alpha) and standard error (SEM) for each subscale (Likert scale items only) are reported in Table 11. Each subscale had an acceptable value

of Cronbach's alpha, ranging from 0.78 to 0.96, as well as standard error of measurement, which ranged from 2.88 to 4.65.

Table 11.

Reliability Estimates of Questionnaire Subscales

Group	Subscale	n	k	Mean	SD	α	SEM
Student	Preparedness/Vocational Knowledge (pre)	173	18	54.4	7.3	0.79	3.35
	Understanding/Anxiety (pre)	173	13	42.2	8.3	0.88	2.88
	CanMEDS (pre)	173	49	229.1	13.3	0.95	2.97
	Preparedness/Vocational Knowledge (post)	126	18	59.2	8.0	0.78	3.75
	Understanding/Anxiety (post)	126	13	45.0	7.2	0.83	2.97
	CanMEDS (post)	126	49	225.6	16.8	0.96	3.36
	Experiences (post)	63	25	95.0	13.6	0.93	3.60
Resident	CanMEDS (pre)	83	49	214.9	17.5	0.95	3.91
	CanMEDS (post)	69	49	211.8	19.0	0.94	4.65
	Experiences (post)	69	28	99.21	12.8	0.90	4.05

Comparability of Intervention and Control Groups

To further ensure that the two groups differed only due to sampling error prior to the beginning of the RMSSP, respondents in the control and intervention groups were compared on the pre-encounter questionnaire's subscales. There were no significant

differences between the means of the two groups for each subscale (see Table 12). The means for both groups on the preparation/vocational knowledge and understanding/anxiety items were close to neutral (3/5) on the Likert scale, while the CanMEDS scores was higher, over 4.6 for both groups.

Table 12.

Comparison of Student Groups' Pre-Encounter Questionnaire Subscale Scores

Subscale	Control Group		Intervention Group		t	p
	Mean	SD	Mean	SD		
Preparedness/Vocational Knowledge	53.6	7.4	55.3	7.2	1.55	0.12
Understanding/Anxiety	42.1	9.1	42.4	7.3	0.28	0.78
CanMEDS	230.0	12.9	228.2	13.7	0.90	0.37

Participants' Experiences

A nearly equal percentage of students in the intervention group reported completing 3-4 (29.0%), 5-6 (27.4%) and 7-8 (29.0%) sessions with their resident, while 6.4% reported completing more than the suggested eight sessions. The mean reported length of an average shadowing session was 4.13 hours (SD = 1.28 hrs, range 1-8 hours). Students in the intervention group reported a mean total shadowing time (including shadowing done in, and/or independent of the RMSSP) of 44.5 hours during their first year of medical school, which was significantly larger than students in the control group shadowed independent of the RMSSP (28.6 hours, $p < 0.001$). Intervention group students were asked to rank nine topics in order of the time spent discussing each from 1

(most time spent) to 9 (least time spent). History taking had the lowest mean ranking (most time spent) of 3.25, followed by charting (3.80), physical examination (4.25), CanMEDS (4.66), CaRMS (5.05) and procedural skills (5.32). Finances (6.55), relationships (6.43) and stress (5.44) were rated the highest (least time spent).

Students in the intervention group rated their experience positively, as did residents, reflected in high ratings on the items shown in Table 13.

Table 13.

RMSSP Participants' Rating of Items Related to Enjoyment of The Program

Item	Students		Residents	
	Agreement (%)	Mean (/5)	Agreement (%)	Mean (/5)
I enjoyed participating in the RMSSP.	93.6	4.67	82.9	4.14
I would recommend this program to a colleague.	92.1	4.62	87.2	4.20
I would participate in this program again.	90.5	4.68	71.4	4.00
I would be interested in continuing with my partner after the program's completion.	84.2	4.32	55.7	3.64

Furthermore, students from both the intervention group and the control group, as well as residents, all demonstrated support for continuing the program at the University of Alberta, either as available or mandatory for all first-year medical students (see Table 14) although in each group a larger proportion thought that the program should be available than thought it should be mandatory.

Table 14.

Respondents Agreeing That the RMSSP Should be Continued

	Students (Control)	Students (Intervention)	Residents
Available	100	98.4	94.3
Mandatory	33.9	27.8	15.7

Of the residents, 58.5% agreed that the program increased their skills in teaching, while 5.7% disagreed (mean rating = 3.64). The majority of residents (68.5%) also agreed that the program increased their interest in teaching, while 10% disagreed (mean rating = 4.23). Of residents, 62.9% thought that the program gave them a better understanding of CanMEDS (mean rating = 3.70) and 47.1% thought that it increased their support for the framework's importance (mean rating = 3.44). There was no significant change in the residents' scores on the CanMEDS subscale (mean pre: 212.9, mean post: 211.8, $p = 0.7$). This results suggests that although the residents understanding or knowledge of CanMEDS increased, their attitudes towards the framework may not have changed.

Students' Preparedness for Clinical Training and Vocational Knowledge

There was a significant difference between the control and intervention groups' mean change scores (D) on the preparedness/vocational knowledge subscale, as shown in Table 15. The difference between the mean change scores ($D_I - D_c$) was 5.26.

Table 15.

Students' Mean Change on the Preparedness/Vocational Knowledge Subscale

Control Group		Intervention Group				
D_C	SD_C	D_I	SD_I	$D_I - D_c$	t	p
1.55	14.76	6.81	7.97	5.26	2.86	0.005

79.3% of intervention group students (mean rating = 4.05) and 74.3% of residents (mean rating = 3.87) thought that participation in the RMSSP had made the students better prepared for clinical rotations in third-year. For all skills investigated, the majority of students and residents thought that participation in the program improved the student's ability, with the exception of procedural skills (see Table 16).

Table 16.

RMSSP Participants' Agreement (Agrmt.) That Participation Improved the Student's Vocational Skills

	Students		Residents	
CanMEDS Role	Agrmt. (%)	Mean (/5)	Agrmt. (%)	Mean (/5)
Medical knowledge	87.3	4.25	65.7	3.66
Interacting with other health professionals	79.4	4.03	68.5	3.69
Interacting with patients	73.2	3.83	65.7	3.66
Physical exam	59.2	3.24	37.2	3.13
History taking	57.1	3.48	41.4	3.17
Procedural skills	33.3	2.98	17.1	2.47

Students' Understanding of, and Anxiety Towards, Clinical Training

There was no significant difference between the control and intervention groups' mean change scores on the understanding/anxiety subscale, as shown in Table 17. Both groups' mean scores were significantly lower on the post-encounter questionnaire than on the pre-encounter questionnaire, suggesting an increase in anxiety ($p<0.05$).

Table 17.

Students' Mean Change on the Understanding/Anxiety Subscale

Control Group		Intervention Group				
D_C	SD_C	D_I	SD_I	$D_I - D_c$	t	p
-4.38	3.85	-4.15	3.89	0.23	0.32	0.75

A majority of both intervention group students and residents thought that participation had increased the student's knowledge of the educational stresses of medical training while a minority of respondents thought that the program increased the student's knowledge of the financial or relationship stresses of medical training (see Table 18).

Table 18.

RMSSP Participants' Agreement That Participation Increased the Students' Knowledge of Stressors in Medical Training

	Students		Residents	
CanMEDS Role	Agreement (%)	Mean (/5)	Agreement (%)	Mean (/5)
Educational	65.1	3.62	55.7	3.51
Financial	27.0	2.84	25.7	2.89
Relationship	20.7	2.75	44.3	3.30

Students' Knowledge of, and Attitudes Towards, CanMEDS

There was a significant difference between the control and intervention groups' mean change scores on the CanMEDS subscale, as shown in Table 19. The intervention group's score increased on the subscale while the control group's score decreased. The difference between the mean change scores was 6.80. Intervention group students were also able to correctly name more of the CanMEDS roles (mean = 5.2) than the control group (mean = 1.9, $p < 0.001$).

Table 19.

Students' Mean Change in the CanMEDS Subscale

Control Group		Intervention Group				
D_C	SD_C	D_I	SD_I	$D_I - D_c$	t	p
-5.86	14.76	0.94	16.32	6.80	2.36	0.02

Of intervention group students, 61.3% (mean rating = 3.65), and 75.1% of residents (mean rating = 3.90), thought the program gave the student a better understanding of CanMEDS and 58.7% of students thought it increased their support for the importance of CanMEDS (mean rating = 3.63) (residents were not asked). The majority of intervention group students also thought their level of competence in each of the seven roles was increased by participation in the program, with the exception of Manager, although Manager did have a positive mean rating (see Table 20). The majority of residents thought their student's level of competency in each of the seven roles was increased by participation in the program, with the exception of Health Advocate and Scholar (for which 50% of respondents agreed while several were neutral) and Manager. All seven roles had positive mean ratings by both groups. The roles can be roughly

organized into three groups. Communicator, Professional and Medical Expert had ratings by the intervention group students of greater than 70%. Collaborator, Health Advocate and Scholar had ratings between 60% and 70% and Manager was rated less than 50%. The ratings by the residents followed a similar pattern, but their ratings for each role were consistently lower than the students' by approximately 10%.

Students and residents reported that the resident's typical method of teaching about CanMEDS combined discussing the assigned role and demonstrating the role, as seen in Table 21. Students most often reported that residents mostly demonstrated but also discussed the assigned role, while the residents most often reported an equal time spent discussing and demonstrating the roles.

Table 20.

RMSSP Participants' Agreement That Participation Improved the Student's Competence in the CanMEDS Roles

	Students		Residents	
CanMEDS Role	Agreement (%)	Mean (/5)	Agreement (%)	Mean (/5)
Communicator	76.1	3.89	64.3	3.66
Professional	73.0	3.87	62.9	3.64
Medical Expert	71.5	3.76	61.4	3.51
Collaborator	63.5	3.73	55.7	3.54
Health Advocate	63.5	3.65	50.0	3.46
Scholar	61.9	3.68	50.0	3.43
Manager	49.2	3.37	42.8	3.33

Table 21.

Participants' Selected Descriptions of the Typical Method of CanMEDS Instruction

	Students (%)	Residents (%)
Discussion was the main focus.	1.6	1.4
Roles mostly discussed but also demonstrated.	9.7	20.0
Equal time spent discussing and demonstrating roles.	19.4	40.0
Roles mostly demonstrated but also discussed.	53.2	32.9
Demonstration was the main focus.	16.1	5.7

Chapter 6: Qualitative Findings

Chapter 6 presents the findings of the qualitative analysis for this study. First the results of interviews with intervention group students and with residents are outlined at a main theme level. Second, each main theme is described in terms of its sub-themes.

The deductive framework developed by rater 1 is shown in Figure 4, while the inductive framework developed by rater 2 is shown in Figure 5. The final conceptual framework generated from analyzing the student and resident interviews is shown in Figure 6. This framework allowed coding of all the interviews into one organized structure with four main themes. The themes are presented in the order of general to specific ideas about the program and its effects on participants:

1) participants' (students' and residents') experiences,
2) the resident-student relationship,
3) what was learned by students, and
4) what was learned by residents.

Three sub-themes emerged within the student and resident experiences theme:

i) students' roles as learners,
ii) variety of experiences, and
iii) challenges and enablers.

One enabler emerged as its own main theme: the resident-student relationship, which contained two sub-themes:

i) approachability and relatability of residents, and
ii) residents' dedication to teaching.

The theme of what was learned by students included the following sub-themes:

i) formal learning,
ii) informal learning,

iii) excitement,

iv) preparation to be a clinical student, and

v) understanding what a resident is.

The fourth main theme, what was learned by residents, included two sub-themes:

i) teaching skills, and

ii) the professional role.

There was considerable interaction between many of the themes. For example, the resident-student relationship was frequently identified as enhancing other aspects of the program, such as enjoyment, medical knowledge and skills learning, and discussions about "non-medical" lifestyle topics. There was also fluidity between the students' understanding of, and experience with, the role of the clinical medical student, their understanding of the nature of clinical training and their abilities to perform the tasks of a clinical trainee, all of which came together to influence students' overall preparedness to become clinical medical students. Where possible, related themes were grouped together within main themes in the conceptual framework, but there was also some interaction across main themes.

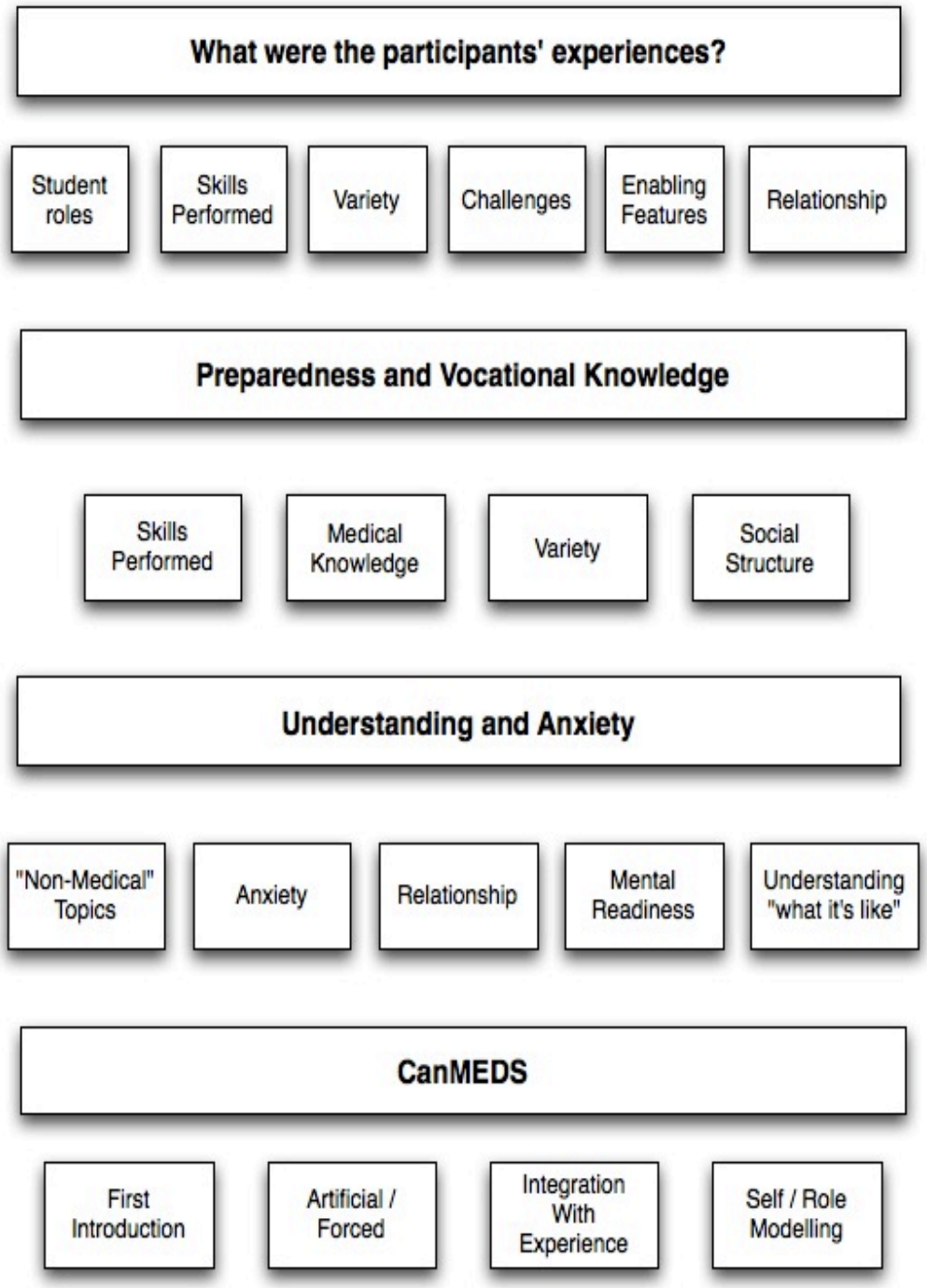

Figure 4. Rater 1's Deductive Coding Structure.

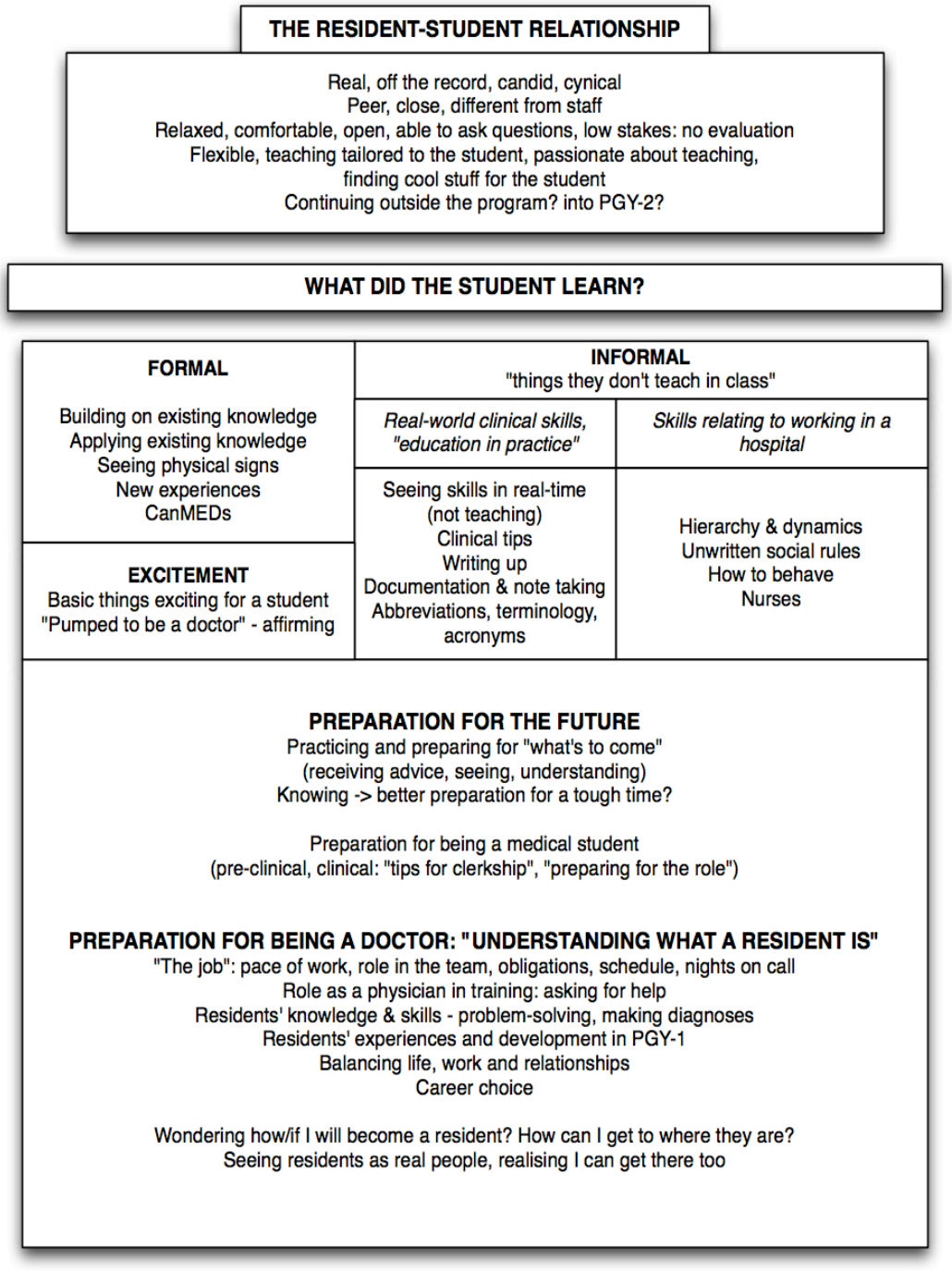

Figure 5. Rater 2's Inductive Coding Structure.

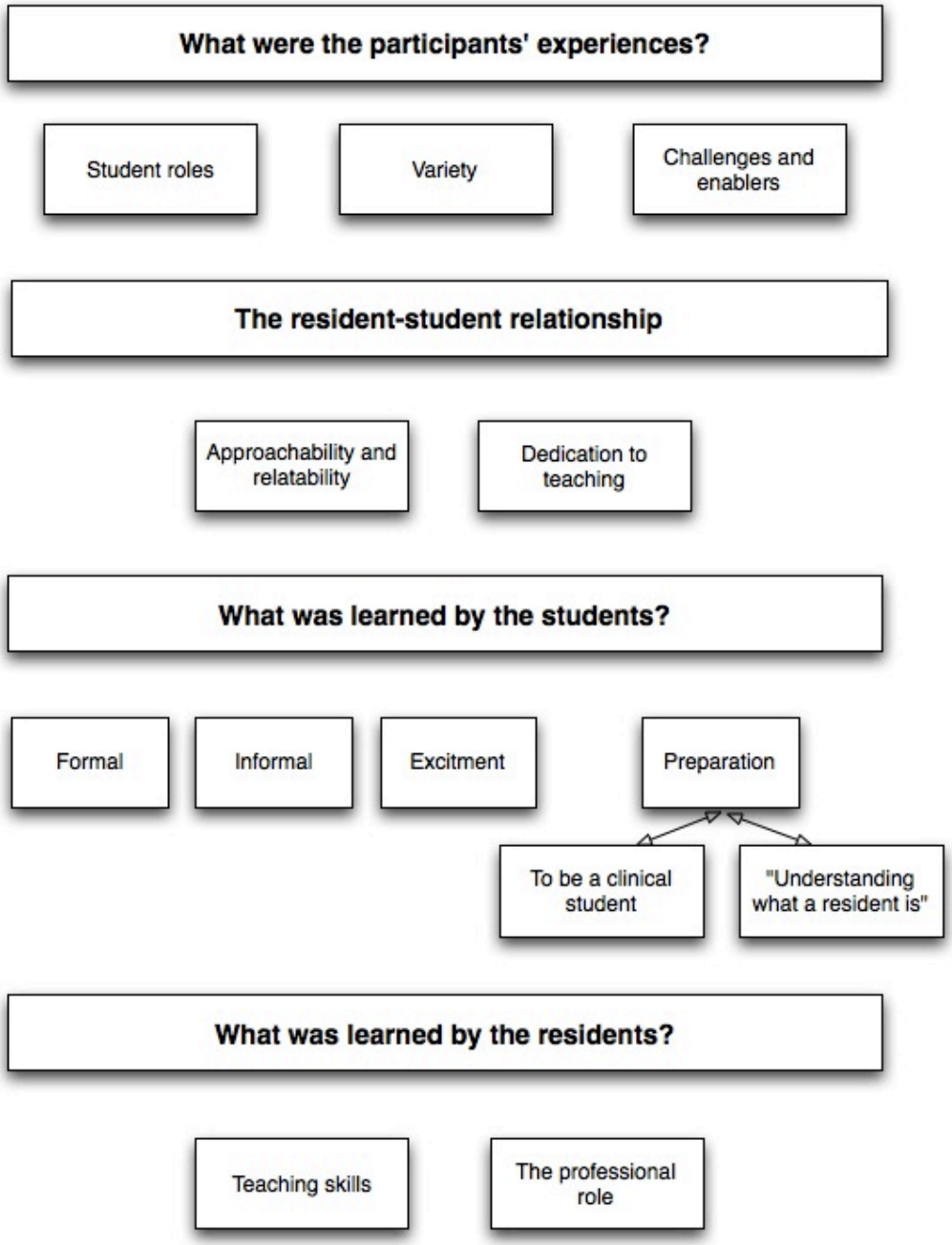

Figure 6. Final Coding Structure Generated From Student and Resident Interviews.

What Were the Participants' Experiences?

Overall, both the students and residents described their experiences in the RMSSP as positive, but their reasons varied. All of the students and residents spontaneously stated during the interviews that they enjoyed the program. Each participant also agreed that the program should be repeated again the next year and that it should be at least available to all medical students in first-year. Typical statements included: "Giving it to all students in first-year…(would be) a really good idea". Students reported that colleagues not randomly assigned to the RMSSP had described feelings of disappointment, jealousy or frustration at not having been involved in the program. Evidence of such feelings is provided by a representative quotation: "I would say if possible you need to get more people in the program…the one complaint I heard the most was from people who didn't have a resident who were really bitter…because everybody who did was so excited and happy." Students and residents were divided, however, in whether the experience should be simply available or mandatory for all medical students. Students and residents thought that the experience would be beneficial for everyone, and some believed that all students should be required to participate. However, some students disagreed, as one student stated:

> Pretty much everyone in our class wanted to do it so it's not like you would have to make it mandatory. I guess the couple people that don't want to do it aren't going to get much out of it anyway, because they are going to have a (negative) attitude.

The interest in the program was further evidenced by all students and residents who, when asked, indicated that they would enroll in the program again if it were offered to them in their second year and several stating that they were interested in, or already planned on, continuing the shadowing relationship with their partner, either into the

summer months or during the second year. One student in particular stated that the program was so successful that he thought it could be used to attract potential students to the school and that he would be willing to pay to participate if it were repeated, going on to say "it has definitely got the most value of all of first-year. If I was going to do anything next year I would definitely do more (shadowing)". Residents reported that the program was less work than they had expected, and thought that if all residents had known how little effort was necessary more would have enrolled.

Students and residents provided insight into what it was like to participate in the program through their descriptions of their experiences in the RMSSP (see Figure 7). The themes generated from these descriptions were organized into three main categories: the students' role as a learner, the variety of experiences encountered while shadowing and the challenges and enablers that students and residents perceived as affecting the RMSSP.

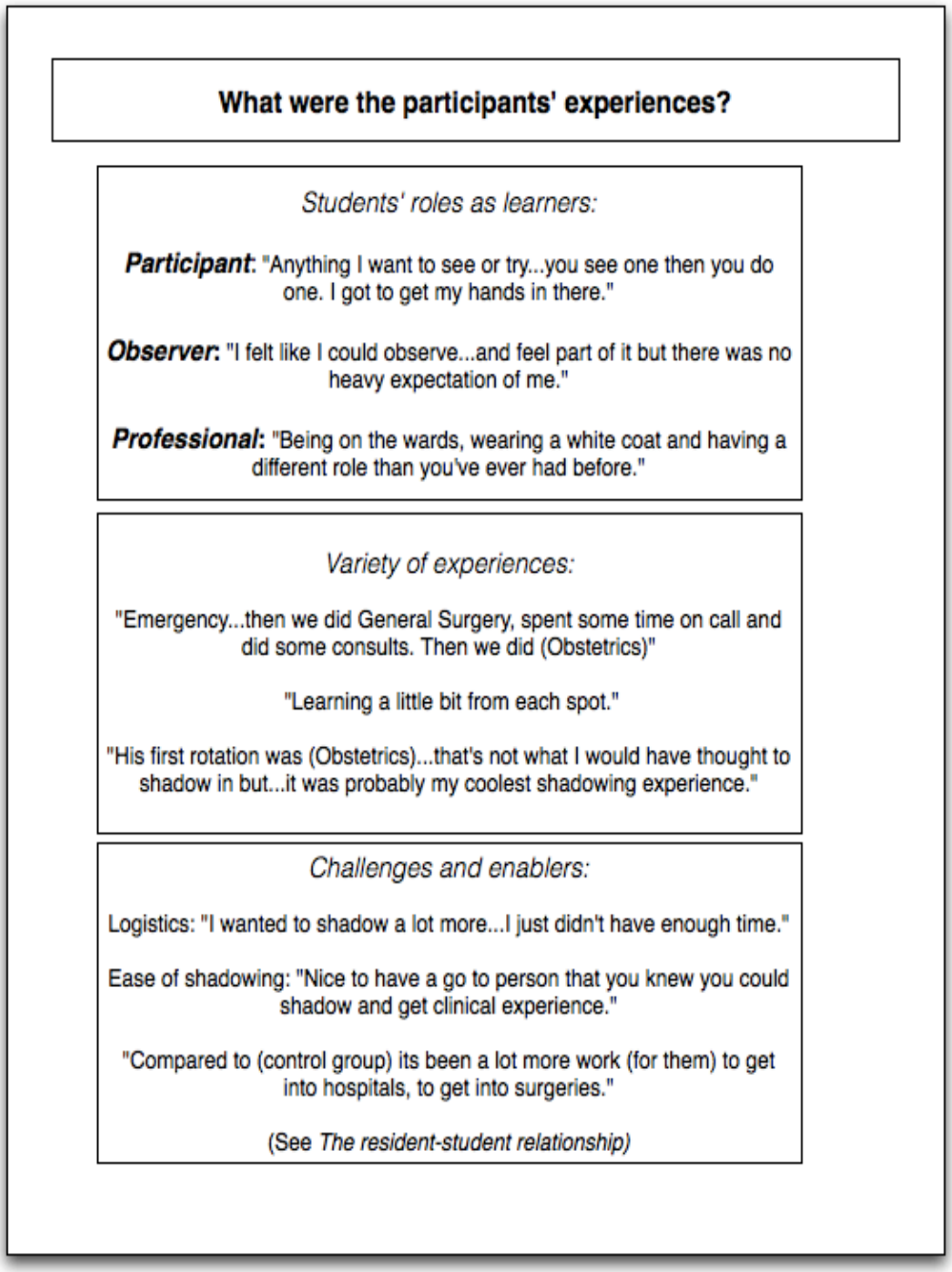

Figure 7. Themes Describing Participants' Experiences in the RMSSP.

Students' roles as learners.

The roles that students undertook in their learning experience in the RMSSP can be assigned to two categories: observer and participant. Students reported engaging in the two different roles based on their comfort level and at the discretion of the resident. Both roles were described by students as having distinct advantages.

While acting as an observer, students watched the resident perform specific clinical skills, most often "histories and physical (exams)", as well as other parts of their duties, including patient interaction, interaction with other health care professionals, or administrative duties such as charting. They emphasized that the opportunity to step back and observe made the experience more relaxed and less stressful than their experiences with staff physicians, but nonetheless useful, as evidenced by a representative quotation: "I didn't feel a pressure to know things and to perform, I felt like I could observe and stand and watch and feel part of it, but there was no heavy expectation of me."

Students were also given the opportunity to participate directly in patient care and other aspects of the residents' duties. Students typically reported being able to contribute more when working with their resident than with a staff physician, and being able to learn through this involvement: "If you're shadowing a (staff physician) you feel literally like just a shadow, whereas with residents you feel more like an assistant, which is kind of nice. You kind of learn these things as you go." At other times students participated directly in delivering patient care on their own, under direct supervision of their resident. Students and residents described an atmosphere that was not only welcoming of student participation, but that encouraged it. For example, one student remarked "Anything I want to see or try, (the resident) was very 'I show you one, and then you do one'. I got to get my hands in there." As a result, students were able to

perform and practice skills such as history taking and physical examination in a real world setting but under the watchful eye of their resident.

Whether observing or participating, students were exposed to a new role of a professional and a member of the healthcare team, the role they would enter full-time in their third year of medical school. When asked to describe the best part of the program, many students noted simply having the opportunity to experience the clinical environment: "Being in a hospital, experiencing patient care from a physician's perspective." This new role represented a major shift for students from being a fairly passive student in the classroom to an active participant in the healthcare system, and students described this role as seeing "what it's like working in a hospital" or "seeing what I would be doing day to day". Students reported that one of the fundamentally important experiences that set the RMSSP apart from other learning opportunities was "being on the wards, wearing a white coat and having a different role than you have ever had before", and this gave students a better idea of what their role would be in the clinical phase, as in this representative statement: "You have an idea of what to expect, so you are not starting out blindly. You just know what your roles are when you get there."

Variety of experiences.

In addition to the different roles that students assumed in the RMSSP, there were also a variety of different activities in which participants engaged, in terms of the environment in which shadowing occurred, the tasks performed and the specialties of medicine experienced. This variety occurred both within individual sessions and across sessions as part of the program. Students and residents reported spending time in several different environments, including clinics, emergency rooms, in-patient wards and operating rooms. Often, more than one of these environments were encountered in a single session and each required the use of different knowledge and skills. For some

students, the variety was their favorite aspect of the program, as stated by one student: "The diversity. There wasn't a typical day. That was kind of what was nice, you would end up getting to see everything from walking around, looking up charts, writing orders down, lots of history taking." The timing of sessions was likewise diverse, with shadowing occurring in the morning during in-patient rounds, in daytime clinics, on-call at night or on weekends. The variety of experiences afforded by the program was frequently cited as the "best part" of the RMSSP.

Students emphasized that one of the main benefits of shadowing a first-year resident was the diversity in their monthly schedule. Most of the residents rotated through a wide range of specialties in their first-year and students were able to experience working in each, as one student described typically, "Then we went on to Emergency… Then we did General Surgery, spent some time on call and did some consults. Then we went to (Obstetrics)." As the program was structured for one session each month and residents' schedules usually entailed one clinical rotation each month, students often shadowed the resident on a different rotation in each session. In each of these environments students were able to pick up something new and different, as described by one student: "learning a little bit from each spot". This variety of rotations allowed students to be exposed to areas of medicine in which they would otherwise not have sought out experience. As one student remarked:

> His very first rotation was in Obstetrics, and in October that's not what I would have thought to shadow in but…it was really, probably, my coolest shadowing experience. I scrubbed in on two C-sections…I had (barely) been in med school and it just blew my mind being there.

Challenges and enablers.

There were some challenges that students and residents faced in their experiences in the RMSSP, mostly related to logistical difficulties with scheduling. Due to the busy schedules of both students and residents, participants sometimes found it difficult to find a time suitable to both partners during which to schedule a session. Some consequently struggled to maintain the schedule of one session per month. One student remarked "I wanted to shadow a lot more than I did, I just didn't have enough time. My resident was very flexible …I really wanted to do more but I couldn't pack it in." Other logistical difficulties noted by the students were the parking and transportation required to shadow at the city's various hospitals and clinics.

Notwithstanding these logistical challenges, students and residents remarked on several features of the RMSSP that enabled both ease of participation and facilitation of learning, including the ease of arranging sessions, the warm welcome they received and the relationship they formed with their resident. One of the more frequent responses, and an unexpected one, when asked about the "best part" of the program was simply the ease with which the students were able to participate in shadowing. The students appreciated having a suggested schedule to follow that encouraged monthly sessions. "Maybe it's not every month, maybe it's not perfect, but you have that opportunity," stated one student. In this way, their resident was expecting their presence, which made it easier to arrange a meeting. Compared to other clinical opportunities, which involved contacting administrators and coordinating with busy staff physicians with whom the students did not have an established relationship, scheduling sessions with the resident was generally very easy for the students, as described in one typical student statement:

> It was really nice to have that go-to person that you knew that you could shadow and get clinical experience, and you weren't trying to connect with all different staff people and trying to coordinate several different schedules. It was just between you and the resident.

The students contrasted their situation with that of their colleagues who were not enrolled in the program, as captured in the following representative comment:

> Compared to some of the people in our class who don't have a resident, some of them have done shadowing but I know its been a lot more work to get into hospitals, to get into surgeries, to do things that we are just like, oh we are shadowing our resident. I think we have an advantage.

Furthermore, because residents generally work more hours in the clinical environment than staff physicians (largely because residents stay "in-house" when on-call) there were more opportunities to find time to shadow.

The ease with which students were able to shadow was enhanced by the reception they received from other members of the health care team. Senior medical students, other residents and staff physicians were often happily surprised to see a first-year medical student in the clinical environment. One student, who had experience working as a nurse prior to medical school, was particularly surprised at how welcome she was made to feel in the clinical environment:

> I was really amazed, coming from the other end, having worked in a hospital and had to fight for every opportunity. I was really amazed at how easy it was (for the resident) to say, "Oh this is (student's name), she's the first-year med student, can she come shadow…?" and they would say yes. I got to go right in to surgery, my first day.

The students stated that the ease of scheduling lead to them shadowing more than they otherwise would have, and more than their colleagues not enrolled in the program generally did. Several students made statements such as "I think I probably would not have shadowed nearly as much, especially at such an early time, but it made it a whole lot easier to just get out there." They also stated that because they were spared the rigmarole

of tracking down and dealing with various departments and administrators, they were able to gain experience in several different fields that otherwise would have been too difficult to arrange. One student remarked, "I would not have shadowed in (Obstetrics) or the neonatal intensive care unit because I would not really know where to go to do that, so this was just very convenient."

Another enabling factor that the students and residents both stressed in their descriptions of the program was the relationship they formed together. This particular factor was clearly the strongest enabler, and because of this, became its own main theme.

The Resident-Student Relationship

Both students and residents reported that the relationship formed between them was one of the most, if not the most, important aspects of the RMSSP and one that served to greatly enhance the educational potential of the program. Given a strong resident-student relationship, students and residents found the experience to be more conductive to learning by the students and more enjoyable. This relationship was fostered by two main factors: the approachability and relatability of the residents, and the residents' dedication to teaching (see Figure 8).

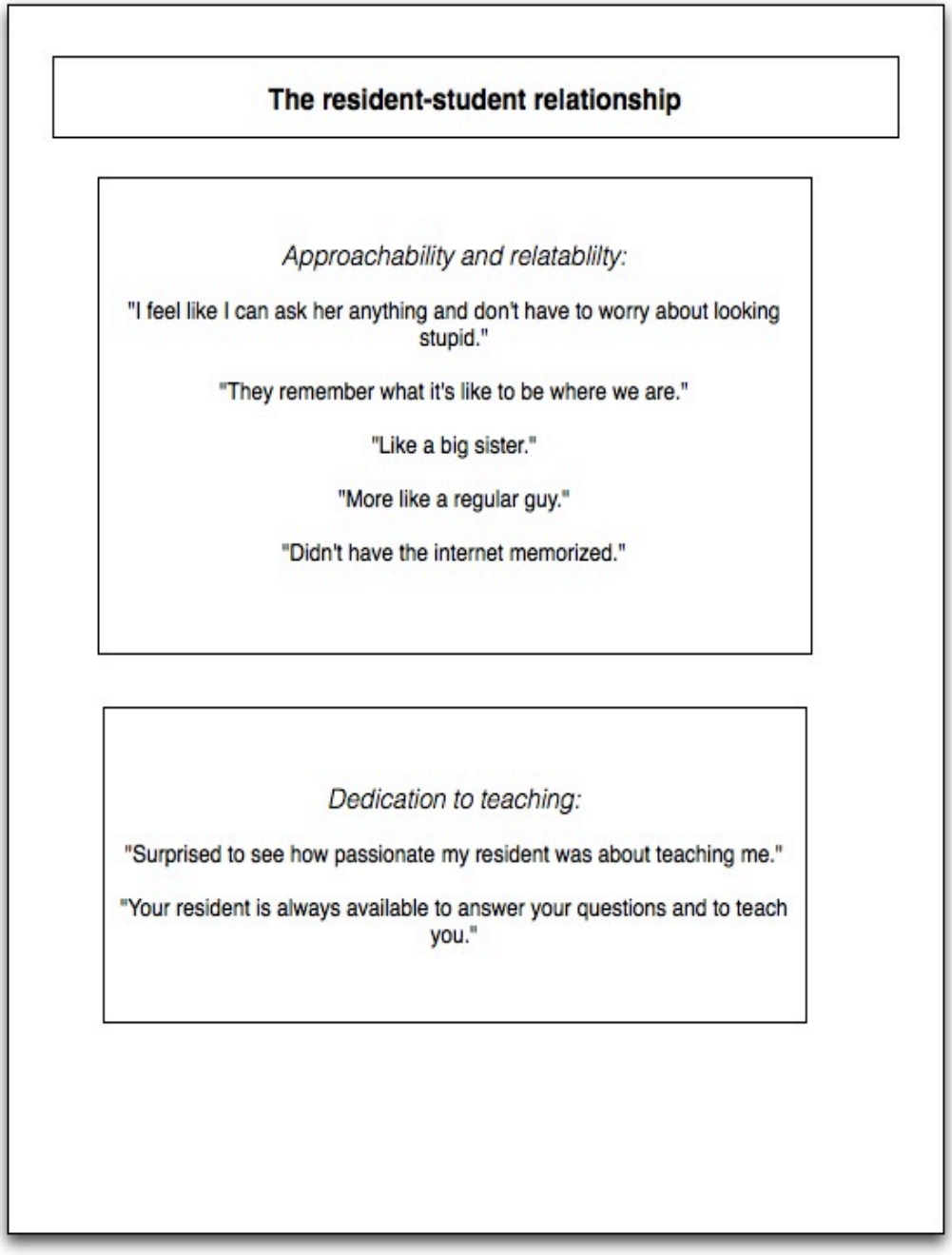

Figure 8. Themes Describing the Resident-Student Relationship.

The approachability and relatability of residents.

Students described viewing their residents as a "mentor", "friend" or "like a big sister" and they identified approachability and relatability as two of a number of reasons why they were able to foster such a close relationship. One reason for the approachability of residents was their affable nature. As one resident noted, "We're probably less intimidating than staff. I think (students) would be less intimidated to ask questions or even to ask to shadow." Students were surprised by how friendly the residents were and described them as being more "laid-back and relaxed" and less "high-strung" than they had anticipated before enrolling in the program. Although the residents were busy and under pressure from various stressors in their jobs they conveyed a genuine interest in the well-being of their students. In many cases the resident-student relationship was described to have been strengthened through non-medical interactions that allowed them to get to know each other better, for example sharing coffee or a meal in the hospital. Residents would often take the opportunity to relax with their students when a session was not too busy, for example by watching the 2010 Winter Olympics on television.

The students also reported that they found the residents to be easy to relate to on both a personal and professional level, especially in contrast to staff physicians. The proximity of the residents to the students in terms of age and educational level seemed to foster a mutual understanding. As one student said, in a typical statement:

> (Residents are) closer to you in age, they're closer to you in training…so they know what its like to be learning all of this stuff brand new. They're just easier to talk to and easier to ask questions from, easier to make jokes and you don't have to be at your tip-top professional behaviour. You can definitely be friendlier with your residents. It was much more relaxed shadowing for me, so I enjoyed it.

There was a clear impression shared by the students that because the residents were only three years ahead in their training, they had greater empathy and understanding for what

the students were experiencing. As one representative student commented, “They are fresh out of med school, they remember what its like to be where we are. It’s nice to build that relationship and have that trust.” This rapport between students and residents was further enhanced when the resident also went to medical school at the University of Alberta, as was often the case. These residents were able to remember with great specificity the experiences of being a University of Alberta medical student, including details about given courses, examinations and teachers. In contrast, other experiences shadowing staff physicians, who were more removed from the students’ situation, were frequently described more negatively:

> I think it was really nice to be able to shadow people who are a lot closer to where we are than a physician who has been there for 20 years, who is a lot busier, who has a lot more on their plate...Sometimes they don’t really care to bother explaining the stuff to you, whereas these guys, they obviously know a lot more than we do but they are only 3 years down the road. I felt like each time we went through something he would explain it in a level that I could really understand.

The students found that this ability of the residents to better understand their needs made it easier to relate to their resident and fostered a mentor/friend relationship.

As the year progressed, the repeated contact with the same resident reinforced the relationship. When compared to interactions with staff physicians, which tended to be one time occurrences, students were better able to strengthen their rapport with their resident over time. Students described having appreciation for “having somebody that you get to know throughout the year that you can always go to for shadowing.” As the mentor/friend relationship progressed, each partner was able to better understand the others personality, their needs and expectations. This knowledge of each other’s

personality and needs made it easier for students to focus on the clinical experience and get the most out of their residents. One student in particular found this to be the case:

> If I tried to shadow like this on my own, it would be a new person every time and you are dreading what kind of personality does this person have? How far can I push questions, what are their comfort zones? (Whereas) now you have been with this person five, six, seven times and you get there and you have that comfort level already. Even though you are thrown in with new nurses, new hospitals, new wards, you have that one element of continuity, and if you are comfortable with them, then I feel like you are comfortable elsewhere.

As the relationship developed, students reported becoming more comfortable and relaxed with their residents, which led to students being more relaxed in the environment in general. Students made statements such as "my resident was really great about holding my hand. Clinical experiences can be a bit nerve wracking at the beginning and he really helped me out." They described feeling less "pressure" to perform or to always "know the right answer," which allowed students to have more frank and honest discussions with their residents. When students were confused about a point of clinical knowledge or were unsure about how to perform certain tasks, such as physical examination maneuvers, they reported feeling at ease seeking help from their resident without fear of embarrassment or judgment: "I like that I can ask her anything, and don't have to worry about looking stupid" was a commonly expressed sentiment. In contrast, students reported that when dealing with staff physicians the pressure to perform well made them more reluctant to ask questions or engage in discussions, as reflected in the following representative quotation: "With the staff there is the pressure of being evaluated and having to perform to a set standard, whereas with the resident they're pretty nice and it makes it a relaxing environment."

This relaxing environment facilitated learning not only about medical topics, but about non-medical ones as well. Students and residents described an atmosphere in which both partners felt comfortable discussing a range of topics. One resident discussed her student "asking basic questions about medicine, residency, and I thought that was the best part, just low key chatting about stuff."

Residents' dedication to teaching.

In addition to the personal closeness that developed between shadowing partners, the students also described how the residents' dedication to teaching was a vital part of their interaction, as one student, in a typical statement remarked: "My resident was more than willing to explain new concepts and teach me". Despite their hectic schedules, residents consistently found the time to involve students in clinical experiences and to try to maximize the students' learning. Residents also took time before sessions to prepare, especially by reading about that month's assigned CanMEDS role. One student was particularly amazed by the commitment her resident showed to teaching, even outside the confines of a scheduled session:

> I was surprised about how passionate my resident was about teaching me…Weeks before I was going to do (Cardiology) rounds with him, he found a stress ball in the shape of the heart and he carried it around until I came so he could show me where the veins and arteries would be.

As one student simply summarized their perspective of the role of the resident, "your resident is always available to answer questions and to teach you."

Overall, the closeness of the resident-student relationship and the residents' commitment to teaching facilitated learning of several kinds by the students. A description of the knowledge and skills that students learned was another theme that emerged in the conceptual framework.

What was Learned by the Students?

The students and residents described a variety of domains about which the students learned during the RMSSP, including those knowledge and skills formally taught by the resident and those that were informally learned by the students, as well as a sense of excitement in the students for beginning clinical training and preparation for that training (see Figure 9).

Formal learning.

Residents explicitly taught their students a variety of clinical skills and knowledge that helped improve their vocational abilities. By observing their resident, or by participating in clinical duties themselves, students learned most often about taking a history from a patient and performing physical examinations. One resident described multiple occasions when his student was able to interview patients on her own and perform complete patient evaluations under his supervision. Residents reported trying to highlight "teaching along the way, pertinent to the case" as often as possible. One resident described the process as follows, in a typical statement:

> She would come with me while I was doing a consult or a history. I would try to pick learning points that would help her with her clerkship, the mnemonic for orders, how to write a note properly, pertinent labs to order, points in history.

Especially with regards to basic skills such as history taking and physical examination, students emphasized the importance of being able to apply what they had learned elsewhere to a practical setting. Students stated that, while they had received introductory instruction on performing histories and physical exams, this was their first opportunity to apply the skills in a real world setting and see the connection to actual disease processes.

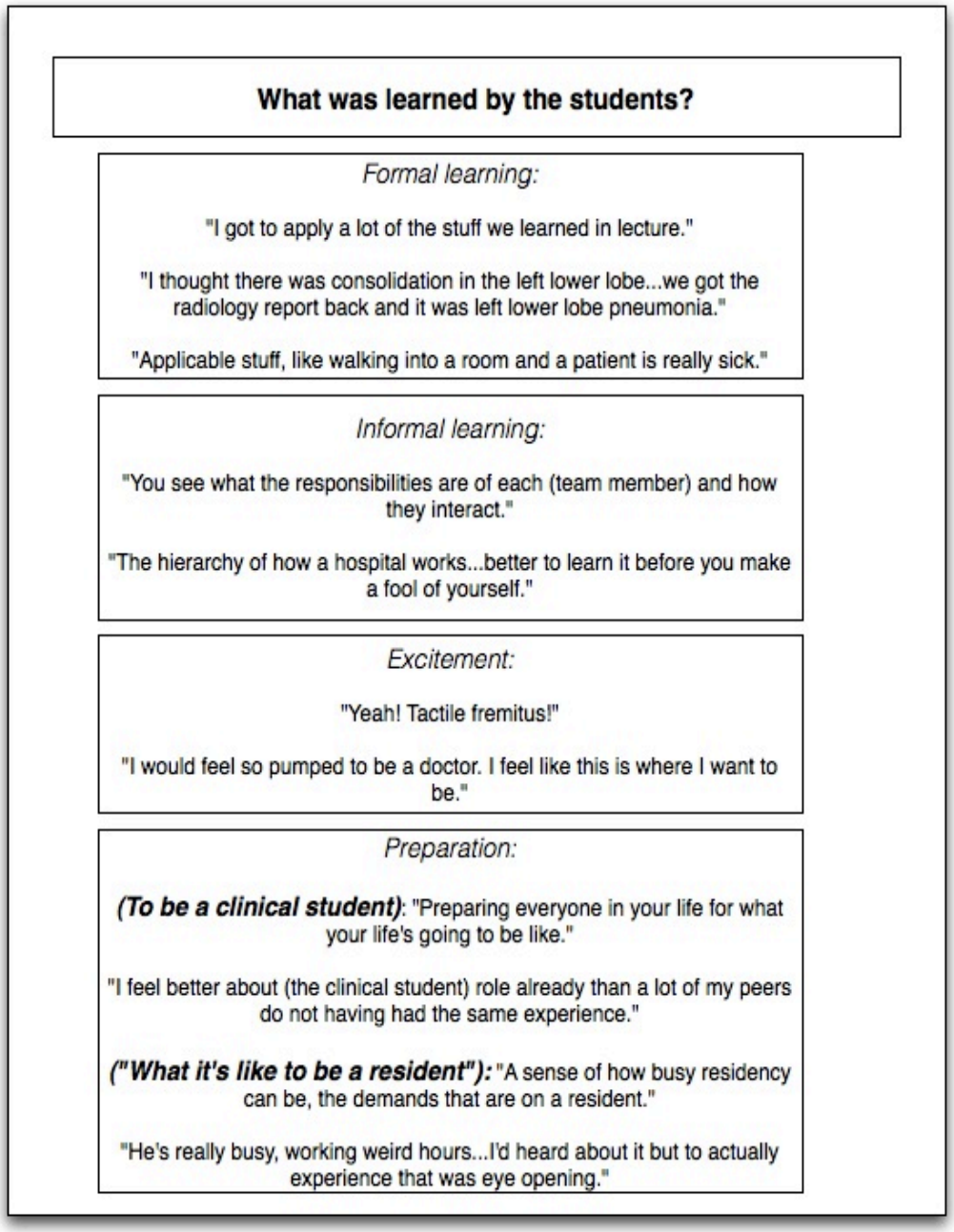

Figure 9. Themes Describing What Was Learned by the Students in the RMSSP.

In this respect the RMSSP was often compared to the Gilbert's Scholars program, in which groups of medical students are paired with a staff physician who teaches them basic history taking and physical examination skills. Students stated that while Gilbert's taught them the "theoretical" basics of these skills and provided a good introduction, students described the opportunities to practice the skills in Gilbert's as "artificial" and, according to some students, aimed more at performance on practical examinations (OSCEs-Objective Structured Clinical Examinations) than with real patients. In contrast, students emphasized the reality of the experience in the RMSSP. They reported an appreciation for the chance to practice their skills with actual sick patients and to put the skills to use in those patients' care as well as the chance to perform these skills under one-to-one supervision. One student summarized the difference between the two programs in a representative statement:

> Gilbert's is good to give you the basics, what do you need to have in terms of information on a patients history…especially for an OSCE... But if you want to learn applicable stuff, like you are walking into a room and a patient is really sick, how are you going to address the patient, talk to that patient, make them feel better or reassure them, you are not going to get that from Gilberts because your patients are standardized or they are happy, healthy or somewhat healthy patients who can sit there in interviews with 6 people. But the people I was seeing with my resident were not necessarily like that.

Students often expressed a belief that the RMSSP prepared them better for performing these skills with real patients, as opposed to in an exam situation:

> The only time we ever really take histories is in a 10 minute OSCE or in (Gilbert's) where we have an hour with each patient, whereas you are never going to do that in the hospital. So he was really good at explaining how to know what is important, make sure you don't miss anything, but still take a few

minutes with the patient, which is a skill that you need but we never get any exposure to.

In addition to histories and physical exams, students were able to practice or observe several other skills. The skills mentioned varied greatly between students, as one student remarked to another, "so you did codes (cardiac resuscitation) and I did ingrown toenails." Communication skills, especially, were stressed by the students, who stated they learned a great deal from practicing communication themselves and also by observing their resident and other physicians, as stated by one student: "Every time you get to see a different doctor talk to patients it's like an extra little skill in your arsenal, like that's a good thing to say or that's not really what I would say." The most frequently noted other skills were communicating with patients and other healthcare professionals, obstetrical deliveries and charting, including writing orders. Some students described opportunities to practice many facets of the resident's duties, ("Whatever he did, I did") but most students stated they largely observed these additional skills, often being given instruction without a chance to perform the skills themselves. Other skills that were mentioned less frequently included scrubbing into the operating room, dictating, use of the electronic health record Netcare and general charting, as well as "procedural skills" like suturing wounds, Pap smears, CPR and starting intravenous lines. One student described becoming more proficient in the use of Netcare than the third-year students working in the same team, to the extent that she had to coach one of them through the program.

Students also described being taught a great deal of declarative medical knowledge by their residents. Frequently, they told of reciprocal interactions between the learning done in the curriculum and the learning done in the RMSSP. The students were able to use what they had learned in class with the patients they saw while shadowing.

Several students made comments such as "I got to apply a lot of the stuff we learned in lecture and (problem based learning) and I actually could connect things." Some students expressed surprise that they were actually able to contribute to the diagnosis or treatment of real patients using their classroom knowledge. Many of them stressed that the ability to apply their knowledge to real situations helped reinforce that knowledge and seemed to help them learn, giving them "hangers to put (knowledge) on". They found that seeing diseases and treatments in real life made them easier to understand, "like the hematology, to see it clinically is so different than learning about it, and he was able to show me how to tie those together in ways to help me remember…and that was very different." In addition, students stated they were able to take things that they learned first while shadowing and apply them in class. "You learn an extra piece of anatomy, or an extra drug," described one student of his experience, while another noted "We pretty much read every ECG in the hospital when I was in my (Cardiology) block so I could get practice for that." When the resident's rotation fell around the time of the student's course block in the same area, the students felt that the program reinforced the learning they received in class especially well, as described by one student in particular: "A lot of them coincided with my coursework really well. I got really lucky…I did (Cardiology) rotation just before (the cardiology block of lectures) so I walked into cardiology knowing what heart failure was already."

One area in which both students and residents reported that the educational experience could be improved was in regards to CanMEDS. Both the students and residents reported that the didactic discussions of the month's assigned role seemed "forced" or "artificial" compared to the otherwise experiential style of learning in the program. Participants also stated that having one role assigned per month was not conducive to connecting the role to the clinical experience. For example, if, during the session designated for discussing the Manager role, examples of residents acting as

Managers were not frequent, participants reported finding it difficult to make the role a focus of the session. As a result, the CanMEDS discussions took a backseat to pursuing clinical experiences, and "a cursory part of our times together" was a typical description. Those times when a given role was relevant to a clinical encounter were more effective teaching opportunities. Residents reported that they were able to link situations with roles to reinforce their meaning and give them a real world significance, putting the framework "in the context of each patient". Overall, the students stated that they learned much more about CanMEDS by observing their resident than through formal discussions about the framework, as evidenced by the fact that most students were able to describe a time when their resident performed a role well, often the Communicator role: "Communicator, I saw that in action…he would show (the roles) a lot." Students also reported becoming aware of performing the roles themselves as they participated in care: "I got to Communicate quite a bit." In this way, the program gave students an introduction to CanMEDS they would not have had otherwise, as evidenced by a representative student quotation: "I feel like I would not know what CanMEDS were if it were not for this program."

Informal learning.

In addition to the medical skills and knowledge that residents explicitly taught their students, students also learned a great deal about the implicit nature of the clinical environment, largely through observation. Students repeatedly described learning "things they don't teach you in class." The most commonly raised aspect of this informal learning related to the social structure of the healthcare setting. Students observed and learned how a hospital worked and how to interact in a hospital setting, based on the basic behaviour and basic etiquette of the clinical environment, and how these are determined by a social hierarchy, as in this characteristic statement:

> You get to see the third-year (students)…and you see the resident, and the senior residents and the staff, you start to see what the responsibilities are of each, and what the expectations are of each and how they interact.

Respectful interaction with senior members of the hierarchy was stressed as important, and several students reported being glad to learn about this social structure before they were immersed in it:

> Things that you would not know, like the order of, honestly, the hierarchy of how the hospital works…its kind of better to learn it before you make a fool of yourself, or before you make an enemy from somebody, because you know, we don't really know how these things work.

Students also reported learning about the roles of other healthcare professions, both in the care of patients and in the social structure. Nursing was the most commonly discussed profession outside of Medicine:

> I always knew that nursing staff did a lot of work but I didn't ever realize how fundamental they are to making sure everything in the hospital works right… I thought there was a lot more 'doing' (on behalf of doctors), but it seemed like that was more like nursing or respiratory therapy.

One student in particular was excited to gain insight into the role of pharmacists: "We rounded with pharmacists and I was like 'That's what a pharmacist does on rounds!'" Students also described picking up other useful pieces of information, such as the jargon of clinical work and shorthand for taking notes, as reported by one student:

> You even learn lingo. He was writing things down and he was like, yeah so here are the "lytes". And I said what are you talking about, and he said "electrolytes". He said that's what everyone calls it on the wards, but we would not know that because we never do anything on the wards. And taking notes too…If there's 'HEENT' and then a zero with a slash through it I know that means nothing

remarkable in the head, ears, eyes, nose and throat…when I take notes in (small group sessions) now it's a lot quicker.

Excitement.

Another effect on students that may not have been explicitly focused on by the residents, but was nonetheless present, was simply a sense of excitement that students gained about clinical training. Students and residents described students having low expectations of their experiences in the RMSSP and were satisfied, as one student described, with "just being in the hospital." However, because the program gave students what was, for many of them, their first experience with an actual patient, there were many occasions for students to become energized about the experience. As one student stated, "I just really enjoyed the clinical exposure…after I would finish shadowing I would feel so pumped to be a doctor. I feel like this is where I want to be. I'm going to have so much fun!" Some expressed the thrill of hearing their "first heart murmur", despite having started out not knowing how to use a stethoscope. Accordingly, residents described their students as being "keen" and "interested." The students also reported being excited to be able to employ their knowledge and skills with actual patients and connect their training to reality. One student described a particularly exhilarating pulmonary physical examination: "I said I thought I had heard inspiratory crackles and I thought there was consolidation in the left lower lobe…we went and got the (x-ray) report back and it was a left lower lobe pneumonia, and I was like 'Yeah! Tactile fremitus!' " To the residents, experiences such as these were described as being so routine that they seemed boring. In fact, several times residents would stop to apologize to the student that nothing interesting was going on, only to find that the student was relishing every minute. Some students reported that the clinical training experience was so enjoyable that they would seek it out as a refuge from other stresses: "I have to say it kept my sanity a couple times.

It made me feel useful, like I could do something. When I was frustrated with class or sick of being a student I would just go for the night and apply myself…it was great."

Preparation to be a clinical student.

The students and residents described students' preparation to be a clinical student in two ways: in terms of their preparedness to perform the tasks of a clinical trainee, and in terms of their understanding of the clinical role. As students looked ahead to the clinical phase, they reported feeling better prepared for the transition, as their experience had given them both a better ability to perform the job of a clinical trainee and an appreciation for role of a clinical student and the life and lifestyle that go with it. Students reported that the experience gained in the RMSSP "might separate (them) in third-year" from colleagues who had not been in the program. Part of that feeling of preparation was related to the practical skills and knowledge that they learned in the RMSSP and that would be useful to them as clinical trainees. A typical statement was: "In third-year you are going to have seen it so when you get asked to do (something) you are going to learn just that little bit quicker than everyone else." Residents agreed that the program had made students better prepared for third-year. As one stated, "I think my student will benefit from this early clinical exposure. Who knows? Maybe he'll remember this experience and the start of clerkship will be an easier transition as a result." Another resident noted, "I felt my med student became more comfortable just being around and talking with patients."

Students also reported gaining an understanding about the nature of clinical training as they discussed the life and lifestyle of clinical training during their shadowing sessions. As described above, one of the fundamental experiences that students reported was entering the role of the clinical trainee, and through experiencing that role and through discussions with their residents, students' understanding of that role was

increased in the RMSSP. Although some students reported discussing only medically related topics with their residents, several students reported asking their residents about strategies for finding time to pursue outside interests, how to cope with long hours and how to control the impact of training on personal relationships. Some stated that they were "already dealing" with financial and educational stressors and discussed with their residents ways of handling that stress in the present and in the future as a clinical trainee. Further, as students experienced acting as a clinical trainee, they stated they gained a better understanding of the professional role: "I'd never really been in a hospital before...so I feel like I stepped into a role that I've never had before and I feel like I was able to learn a lot from the other side." Another typical student also commented on adopting a new role: "I feel better about (the clinical student) role already than a lot of my peers do not having had the same experience." Part of that better understanding was achieved through observing what their life would be like in the coming years. They were able to get an idea of the stresses and pressures that come with clinical training. One student suggested "it's not going to make it any better when it's happening (to you), but…you're still better prepared." Another student used the experience to help him ready people close to him for the shift in lifestyle that he would undergo upon entering the clinical phase, noting that he was able to "tell my girlfriend 'This is what it's going to be like, don't expect that I'm going to be around all the time'…Kind of preparing everyone in your life for what your life's going to be like." Being able to experience the life of a clinical student firsthand removed some doubt and anxiety about their contemplation of that phase. Understanding the experience "made the stuff more real and approachable, so when the time comes and we get there we don't have to be as nervous."

"Understanding what a resident is."

Much of the students' understanding of the experience of being a clinical student was extracted from observing the experiences of the residents, and students gained a deeper understanding of the nature of being a resident, both in terms of what a resident is, and what a resident experiences. One of the first things students reported noticing about their residents was how similar they were to themselves, "more like a regular guy." In this sense it seemed the students observed a pair of seemingly contradictory characteristics in their residents. On the one hand, students stated they were generally impressed with the degree of knowledge and ability possessed by their residents: "I thought my resident was really, really smart. I was blown away by how much he knew and how polished he was talking to patients". However, they reported being relieved to observe that residents were also fallible, that they still had to look things up. According to one student, her resident had "a book in every pocket". One student reported feeling thankful to learn that he did not "have to have the Internet memorized." The normalness of the residents seemed to demystify them and the job of the resident in general. The students noted that this made the residents more approachable and easier to relate to. Several students reported that seeing that the residents were regular people just like them made the prospect of becoming a clinical student

> more relatable and real life, and it stressed me out a lot less. My stress reduced big time. Sometimes in lecture I think I'm never going to be smart enough to be a doctor…but then you see that (residents) are real people and you will get the experience and you will get there.

Furthermore, just as students were able to experience for themselves the pressures of clinical training, they reported that they were also able to observe similar pressures being exerted on their residents and were able to ask the residents about them.

Of these topics, one that was of great interest to students was how the resident's work interacted with their personal life. Students reported asking their residents about how their family and romantic relationships were affected by long work hours. One resident was particularly busy: "He's in plastics so he's working 100 hours pretty much every week, so he was talking to me about how he tries to balance his schedule." Another student described a similar situation with his resident: "He's always really busy, working weird hours…I mean I had heard about that but to actually experience that was eye-opening. And…he has a girlfriend, so I asked how do you manage your relationship and being in residency?" Students noted that the comfort level needed to ask such personal questions would only have been possible by shadowing a resident, as in this typical statement:

> I found mine to be a lot more approachable than most physicians I shadowed. They have been out of things for 30 years so it's kind of awkward asking 'So how was your love life in medical school?' But my resident … was more like a friend than some kind of authority figure.

The close relationships between students and residents was reported by several participants as enabling them to discuss many aspects of being a resident in a frank manner, such as family planning during residency, the process of applying for residency and how to know what specialty was the right one to pursue:

> I would be pretty hesitant to just walk up to some big shot attending and say 'What's the best way to prepare a CaRMS application?' whereas I could totally sit down with (my resident) and say I have some questions about the future.

Residents also thought that it was important for students to "see what it's like to be a resident", each listing that as among the most important features of the program for the students. As one resident stated, "I think that's a good experience for them…to get a sense of how busy residency can be, the demands that are on a resident."

What was Learned by the Residents?

As the residents engaged in teaching their students, they themselves were also learning from the experience, but in two distinct domains (see Figure 10). The residents reported gaining expertise in teaching, especially as it related to teaching more novice students. They also learned about their role as professionals in the medical system, including gaining an understanding of how the CanMEDS roles pertained to their own practice as residents.

Teaching skills.

Residents noted that their first-year students presented them with some unique opportunities and challenges that helped to improve their teaching skills. On one hand, residents reported that teaching first-year students was an easy introduction into the residents' new role as a teacher. The low starting knowledge and skill levels of the first-year students was described as putting less pressure on residents to be an expert in a given topic, making teaching easier given that they "(did not) have to teach at the same depth". This allowed them to become accustomed to being teachers and have a sense of satisfaction of having made an impact, as in this representative quotation: "Having the opportunity to have someone that I could teach…nice simple things. You feel like you're actually teaching them something."

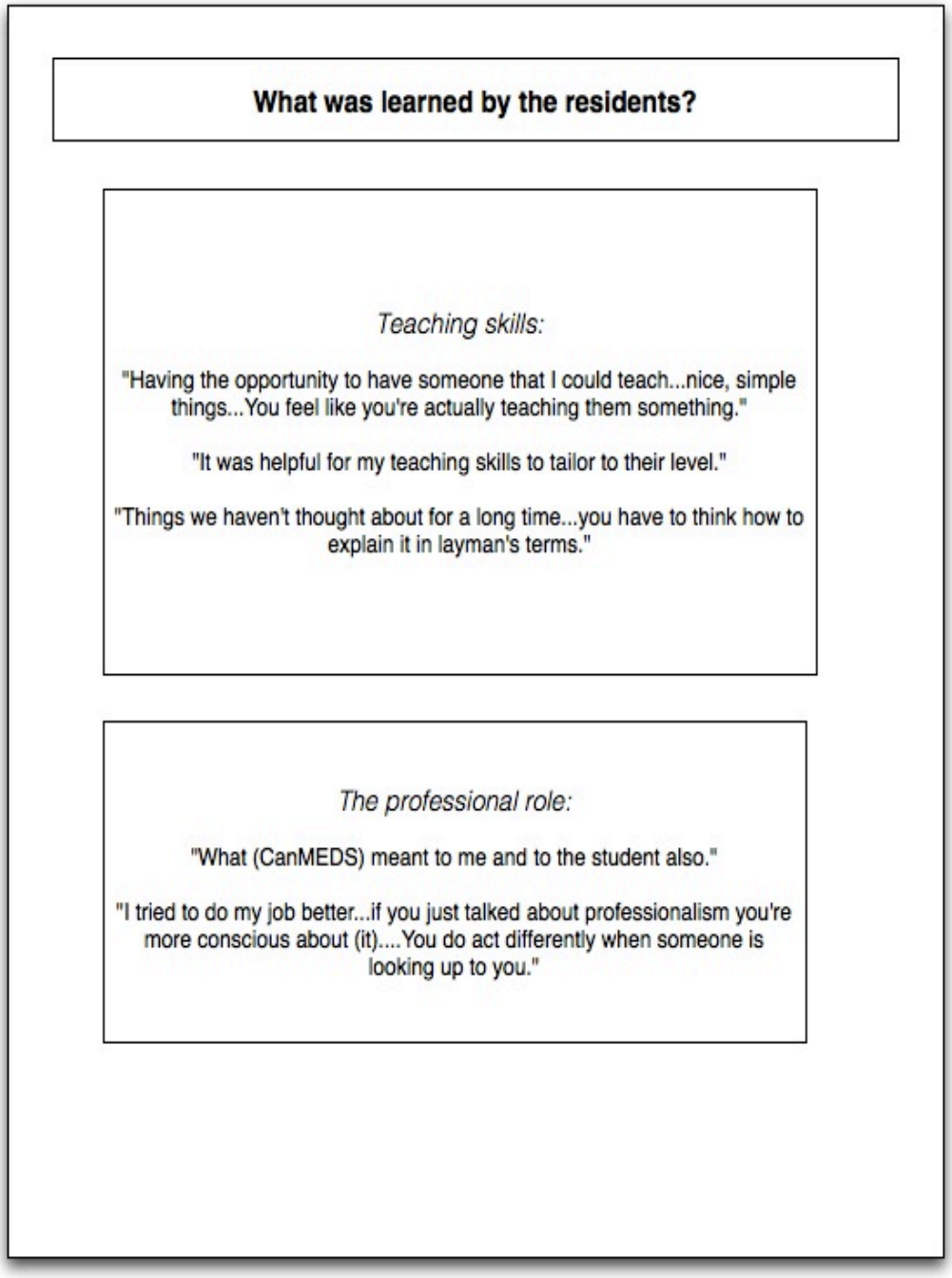

Figure 10. Themes Describing What Was Learned by the Residents in the RMSSP.

Conversely, the residents also found that the first-year students posed a unique teaching challenge that stemmed from their early phase of training. Coming from the phase of medical education that puts emphasis on the basic scientific underpinnings of disease and health, the students' questions often addressed fundamental concepts that the residents had not actively thought about recently, and the three residents interviewed noted that "Those are things we haven't thought about for a long time, the basic things, like about terminology and you have to think how to explain it in layman's terms." One resident stated that the need to phrase topics in such basic terms helped inform his communication with patients and families. "You realize sometimes you talk to patients with too much medical terminology." Overall, the residents found the experience to be a useful chance to "practice my teaching" at a level with unique educational needs, with some of the residents noting this as the best part of the program for them.

The professional role.

In addition to the role of the teacher, residents also found that their experience in the RMSSP helped them become more proficient at another role, that of physician. Much of the residents' learning about how to be a professional came through experiences with teaching CanMEDS to the students. At the most basic level, residents reported learning more about the content of the framework itself. They stated that they would repeatedly review the distributed CanMEDS materials as preparation for teaching the student and by being compelled to read the framework, they gained a better understanding of its concepts than they would have otherwise:

> The thing is it actually forces us to read the roles, otherwise we would just look at them and say 'Ok well, a professional or a medical expert…that's very intuitive', but we wouldn't actually sit down and read the actual description. It

> has forced me to actually sit down and browse what it meant to me and to the student also. Verbalizing it helped too.

The residents also reported finding that the need to model the CanMEDS roles helped them become more proficient in the roles themselves. “I tried to do my job better…if you just talked about professionalism you are more conscious about that particular aspect. I think I am (professional) in general but you do act differently when someone is looking up to you,” stated one resident. By not only studying the roles but by also being made conscious of their importance in the work of a clinical trainee, and one resident stated that he learned about “What (CanMEDS) meant to me, and to the student also.”

Chapter 7: Mixed Methods Findings

Chapter 7 presents the findings of the mixed methods analysis for this study. For each research question, the quantitative findings are explained and expanded upon using the qualitative findings to arrive at a more complete understanding of each question. Where the findings from the two strands do not appear to strictly agree, an attempt is made to explore possible reasons for the divergence.

For each of the study's four research questions, data was generated from both the quantitative and qualitative strands. A summary of key findings in each strand as they relate to each research questions is given in the data matrix in Table 22. In addition to summarizing the findings, this table also demonstrates that the instruments used in the present study were effective at generating data from both strands that were relevant to each of the study's four research questions.

Participants' Experiences

Data from the questionnaires and interviews gave insight into three main areas of participants' experiences in the RMSSP: they provided a detailed description of the structure of the experiences in the program and described positive ratings of the experience by students and residents as well as some specific benefits for the residents.

Structure of experiences.

Findings from both the quantitative and qualitative strands provided an understanding of the structure of participants' experiences in the RMSSP, including the number and duration of sessions and typical activities. In the questionnaire, most students reported completing between three and eight sessions with their residents, despite the program's schedule calling for at least eight sessions. The inability of some

Table 22.

Matrix of Data Related to Each Research Question

Research Question	Quantitative Data	Qualitative Data
What were participants' experiences?	-3 – 8 sessions, mean 4.13 hours -more shadowing experience hours by intervention group than control -common activities: history, charting, physical exam -positive ratings from students and residents -residents reported increased teaching skills and CanMEDS understanding	-ease of shadowing -some logistical challenges -students observed and performed history taking and physical examination -students' excitement and enjoyment facilitated by resident-student relationship -residents had chances to practice teaching and model CanMEDS roles
Does participation increase students' preparedness for clinical training, including their vocational knowledge?	-intervention group had larger increase in scores on the preparedness scale than control -intervention students and residents reported students were more prepared for clinical duties, abilities increased in 5/6 skills	-students observed and performed history taking and physical examination, other skills -chance to apply skills and knowledge to actual patients -resident-student relationship made students comfortable asking questions
Does participation increase students understanding of the nature of clinical training and thereby reduce their associated anxiety?	-no difference in scores on understanding scale -uncommon topics of discussion: finances, relationships, stress -students and residents reported students increased understanding of educational stressors only	-students gained understanding of clinical environment and roles -resident-student relationship only close enough in some pairs to foster "non-medical topics" discussions
Does participation improve students' knowledge of, and attitudes towards, CanMEDS?	-intervention group had larger increase in scores on the CanMEDS scale than control -students and residents reported students increased CanMEDS understanding and ability in most roles -mixture of discussion and demonstration most frequent description of CanMEDS teaching	-students learned about CanMEDS by observing roles modeled by the residents and by modeling roles themselves -students' learning enhanced by seeing practical applications of roles -didactic discussions less effective at teaching CanMEDS

students to complete the suggested number of sessions may be explained by some of the logistical difficulties that students and residents described in interviews, most notably the difficulty in coordinating partners' schedules. Nonetheless, students in the intervention group did complete nearly twice as many hours of shadowing in their first year than students in the control group. The relative ease of shadowing in the context of the RMSSP compared to outside of the program, as well as the warm welcome they received was noted by several students in interviews to have contributed to them shadowing more than they otherwise would have. Students also reported appreciating the expectation of shadowing at least once per month, even if they didn't stick to the schedule, as a factor in helping to facilitate arranging sessions. Both the ease of shadowing and the expectation of adhering to a schedule likely contributed to students in the RMSSP shadowing more than the control group. The reported length of sessions from the questionnaire, ranging from 1 to 8 hours with a mean of 4.13 hours matches well with what students and residents reported during the interviews. Both students and residents reported varying the length of sessions spontaneously, depending on the amount of activity happening during a particular shift, with students leaving early when work was quiet and staying late when things were more interesting.

Participants indicated that on the questionnaire that history taking, charting and physical examination were the three activities on which the most time was spent. Students and residents in the interviews confirmed these findings somewhat, stating that history taking and physical examination were the most frequently occurring tasks. Students and residents reported that the students had chances to both observe and perform both of these skills frequently. These skills were likely the most commonly occurring because they were the ones that residents happened to encounter the most during their duties. Both students and residents described the experience as being organized by

whatever the resident's duties happened to be during the scheduled session, although some participants would try to plan sessions for times when more patient encounters were likely to occur.

Positive ratings of experiences.

The highly positive questionnaire ratings that students gave to their experiences in the RMSSP were confirmed in interviews and explained by several themes emergent from the analysis of the interviews, including their excitement to enter the clinical environment, the ease of shadowing and the resident-student relationship. For many students, the RMSSP provided their first experience in the clinical environment and their first encounters with actual patients. The excitement and enjoyment that students reported from these experiences undoubtedly played a role in their overall positive view of the program. Moreover, as mentioned above, the experiences were relatively easy to arrange, which may have also contributed to their positive ratings. Finally, the nature of the resident-student relationship emerged, which was emphasized strongly in both student and resident interviews and underpinned many of the other themes. The formation of a friendship or mentorship relationship with a resident made the experience more relaxed and comfortable and presumably more enjoyable as a result. The residents' interest in, and dedication to, teaching may have also contributed to students' enjoyment by making them feel more valued and welcome. The students also reported enjoying the opportunity to ask their residents both medical and non-medical questions, as is discussed below.

A high proportion of both students and residents on the questionnaire stated that the program should be made available to all first-year students, while a smaller proportion stated that it should be mandatory. Similarly, in the interviews some students believed the program should be mandatory but most thought that requiring participation

would only cause the few uninterested students who wouldn't otherwise have participated to have poor experiences.

The residents also rated their experiences positively on the questionnaire, related to a variety of reasons. In interviews the residents stated that they enjoyed interacting with "keen" and "interested" students and they also stressed the relationship that formed with their shadowing partner. In addition, there were two distinct benefits for the residents themselves, which were also highlighted in the interview, and which likely also contributed to their enjoyment of the program.

Benefits for residents.

The two benefits for residents that emerged from the interview (i.e., improved teaching skills and an increased understanding of their professional role, including the CanMEDS framework) confirmed what was found in the questionnaire: a majority of residents reporting that the program increased their skills and interest in teaching as well as their understanding of CanMEDS. With regards to the reported increase in teaching skills, residents attributed this in the interview partly to an opportunity to practice teaching at a low knowledge level. This provided residents with an easy introduction to their new role as teachers and gave them a chance to hone their skills early on. The students' basic level of knowledge also presented a unique challenge to the residents as information needed to be conveyed to them in simpler terms, addressing more fundamental concepts, than the residents were accustomed to. The combination of easy practice and a unique challenge may account for the residents' reported increase in both skills and interest in teaching.

Residents' self-reported increase in understanding of the CanMEDS framework also appears to be influenced by their teaching experiences in the RMSSP. Residents in the interview reported that the act of studying the framework in preparation to teach, as

well as the act of teaching the framework to students, helped to improve their knowledge of its contents. Furthermore, residents reported that having someone observing their behaviour made them more conscious of their professionalism in general and lead them to appreciate how the CanMEDS roles relate to their every day work as a resident. The questionnaire results demonstrated that while residents thought that their knowledge about CanMEDS had changed, their attitudes did not. The interview data does not contradict this finding, as the residents in interviews did not report a change in their attitudes towards CanMEDS, so much as their understanding of it.

Students' Preparedness for Clinical Training and Vocational Knowledge

The increase in students' scores on the preparedness/vocational knowledge subscale was significantly larger for the intervention group than for the control group and a majority of both students and residents thought that participation had made their students better prepared for clinical rotations. This might be explained by the knowledge and skills that students and residents reported that students learned in the RMSSP. Students were reported to have learned mostly about taking histories and performing physical examinations, as well as a variety of other non-procedural skills. This converges with the results of the questionnaire, in which a majority of both students and residents reported that participation in the program had improved the students' abilities in all of the skills listed, with the exception of procedural skills. Students' improvement in the skills "interacting with other health professionals" and "interacting with patients" were rated even higher than their history taking and physical examination skills and these skills were also emphasized during interviews, while procedural skills were rated lowest on the questionnaire and infrequently mentioned during interviews. Students reported that the RMSSP gave them their first, and most frequent, opportunities to interact with both patients and health professionals in a real way. This was one of the major advantages

noted by students in the comparison to the Gilbert's Scholars program, in that the RMSSP provided real world interactions with both of these groups, especially with patients. The resulting increase in students' abilities in interacting with patients and with health professionals would, thus, be expected. Students also reported a chance to consolidate, and to add to, the knowledge they learned in lectures through their practical experiences while shadowing, which confirms students' and residents' questionnaire results regarding the students' increase in medical knowledge. By acquiring the skills and knowledge that are relevant to the clinical trainee's duties, the students became more prepared to perform those duties than they would have been had they not participated in the RMSSP.

Students' ability to acquire the necessary skills and knowledge were affected by the resident-student relationship that permeated their experience in the program. The friendly relationship that formed enabled students to be more comfortable both being involved in clinical duties and asking questions related to medical knowledge. Without this close, longitudinal relationship, students likely would not have gained as much out of their experience, regardless of how many hours of shadowing occurred. In this sense, students and residents described students' preparedness in terms of their ability to perform the duties of a clinical medical student. However, there was also evidence in both questionnaires and interviews that students gained preparation in another way, by gaining an understanding of clinical training and by achieving a mental readiness for the transition to the clinical phase.

Students' Understanding of, and Anxiety Towards, Clinical Training

While data from the questionnaire presents some evidence of change in students understanding of, and anxiety towards, clinical training, a minority of students and residents thought that participation had improved students' knowledge of financial and

relationship stressors in medical training and there was no difference in the change scores of the intervention and control group on the understanding/anxiety subscale. Several reasons for this lack of change may be found in the data. First, there was a decrease in both groups' scores on the post-encounter questionnaire from the pre-encounter questionnaire, indicating an increase in anxiety. This may suggest that as time passes and students approach the beginning of clinical training their associated anxiety increases, and whatever gains may have been made through the RMSSP were not enough to counteract this trend. Evidence from the interviews, however, suggests that some gains were made. Students reported a better understanding of the nature of clinical training and their role as a clinical student, having experienced both first-hand. Furthermore, some students also discussed non-medical topics such as educational, financial and relationship stress, although some students did not, with CaRMS, finances, relationships and stress being ranked among the least frequently discussed topics on the questionnaire. As with other aspects of students' learning in the program, these discussions, when they occurred, were enhanced by the resident-student relationship, which made students more comfortable engaging their resident on personal topics. Indeed, in one questionnaire item, regarding educational stress, a majority of both students and residents reported that participation did increase students' knowledge. However, while it would appear from the interview data that a benefit for at least some students' understanding and anxiety regarding clinical training was achieved, it may be that the impact of the RMSSP on students was not strong enough to overcome the considerable anxiety produced by the approaching clinical phase.

Alternatively, it may be that the questionnaire lacked sensitivity to identify the types of learning that occurred in the RMSSP, with students in the interviews discussing such topics as the roles of clinical students and residents, the experience of interacting with actual patients and the social hierarchy of the clinical environment that were not

represented in the understanding/anxiety subscale. As revealed by the interview analysis, students' preparation or mental readiness was a concept that encompassed multiple aspects, and that involved both preparedness to perform duties and the mental understanding and readiness to adopt a role. The concept of preparedness was framed by participants in terms of two interacting concepts: the ability to perform a skill, and the understanding needed to place that skill within the context of the clinical student role. For example, communication with patients is an important task that clinical medical students must perform. In order to perform that task they presumably not only must possess the requisite communication skills, they also have to have an understanding of the relationship between doctor and patient and the role of the clinical medical student as it relates to that relationship. Questionnaire items dealing with the professional role, interacting with patients, the social hierarchy etc., were included in the preparedness/vocational knowledge subscale and not the understanding/anxiety subscale and so the latter may not have been representative of the domain as students expressed it in their interviews.

Students' Knowledge of, and Attitudes Towards, CanMEDS

Evidence from the questionnaire suggests that students' knowledge of, and attitudes towards, CanMEDS were improved by participation in the RMSSP, and this is supported by findings from the interviews. With regards to CanMEDS related knowledge, a majority of both students and residents reported in the questionnaire that participation gave the students a better understanding of CanMEDS and improved their competence in most of the CanMEDS roles (six out of seven as rated by students, four out of seven as rated by residents). Although both students and residents found the planned didactic discussions on each month's assigned role to be an impractical way to teach students about CanMEDS, students and residents reported in interviews that they

were able to find their own ways to explore the content and the relevance of the framework. Students were able to observe their resident actually performing different roles as they interacted with patients and other health care professionals, and at times students were also able to perform the roles themselves. This was also reflected in the questionnaire item in which both students and residents rated their typical method of CanMEDS instruction as a mixture of discussion and demonstration. Thus, despite the design of the RMSSP calling for didactic discussions that students and residents did not find to be productive, residents were still able to convey knowledge about CanMEDS to their students in the same way that other knowledge and skills were taught in the program, through students' observation and practical experience.

With regards to attitudes towards CanMEDS, intervention students' change in attitudes was reflected in their larger change score on the CanMEDS subscale than the control group and by a majority of students reporting in the questionnaire that participation increased their support for the importance of CanMEDS. As with the students' knowledge of CanMEDS, this may be explained by the experiences with the roles while shadowing that students described in interviews. Through residents role-modeling the roles and students modeling for themselves, students were able to see the framework applied to actual clinical settings, which may have fostered an appreciation for the importance of the roles and their key competencies as they relate to the real world practice of medicine. By seeing their resident acting as a Communicator, or by communicating themselves with a patient or another healthcare professional, students gained a much more tangible understanding of the significance of what otherwise might have been fairly abstract concepts.

Chapter 8: Discussion

Chapter 8 presents a discussion of the study's major findings, the methods used and their limitations, conclusions, implications for practice and suggestions for future directions. First, the findings of the study are discussed in light of the study's initial intent and related to the work of other researchers in the literature, in order to place the study within a broader context. Second, the mixed methods design used to conduct the study and the limitations thereof are discussed. Third, taking into account the study's limitations, the conclusions that may be drawn from this study are stated. Finally, implications for the future development of the RMSSP and suggestions for future research in this area are discussed.

The motivation for conducting this study was born both out of personal reflection and from a review of the scholarly literature. At its most basic level, the intent of this study was to improve the training of medical students at the University of Alberta. Having experienced medical school at the University of Alberta myself, I was acutely aware of the challenges that students face in their training, in particular during the transition to the clinical phase. Reflecting on my own experiences, I identified three areas for improvement in the preclinical curriculum: students' preparedness for clinical training and vocational knowledge; their understanding of, and anxiety towards clinical training; and their knowledge of, and attitudes towards, CanMEDS. A review of the literature confirmed that these issues were ones that affected medical students at other institutions as well. Gaps in the literature also helped to suggest a novel solution: a preparatory program for medical students delivered through long-term clinical experience under the guidance of residents. With this in mind, the Resident-Medical Student Shadowing Program was created, and it was in order to examine the RMSSP that this study was

performed. In essence, this study addressed the simple question: Does the RMSSP work to help make students ready for clinical training?

Discussion of Findings

There are two aspects to the question of whether or not the RMSSP is an effective program for training medical students: is the program well received by both students and residents, and to what extent does the program make students more ready for clinical training? Kirkpatrick and Kirkpatrick (2005) described a model of program evaluation that has applications in the field of medical education and education in general (Smidt, Balandin, Sigafoos & Reed, 2009). This model describes the evaluation of a program as occurring at four levels:

Level 1: Reaction – participants' satisfaction with the program

Level 2: Learning – improvements in knowledge, skills and attitudes

Level 3: Behaviour – subsequent performance in the work environment

Level 4: Results – outcomes measured external to the learner (e.g., patient outcomes)

The Kirkpatrick levels provide a useful framework for discussing the findings of the present study. In the terms of this model, this study achieves an examination of the RMSSP at Levels 1 and 2. Level 1 is reflected in the ratings that both intervention group students and residents gave to their experiences in the RMSSP, or whether the program was well received by participants. Level 2 is reflected in the extent to which students' learned knowledge and skills necessary to perform as a clinical trainee and changed their attitudes in a way that will further facilitate that performance.

The RMSSP was well received by both students and residents (Kirkpatrick Level 1).

Both students and residents positively described their experiences in the program, and for a variety of reasons. Both groups of participants would recommend the program to a colleague, would participate again if given the chance, and would be interested in continuing to shadow with their partner in the future. Both groups also thought the program should be continued the next year and be made at least available for all medical students. For the students, the enthusiasm for the program can likely be explained by the excitement they felt at experiencing the clinical environment, the positive relationship formed with their resident, and the learning they benefited from in the program.

The positive ratings given by residents may also be explained by the benefits they derived from participating in the program. To the residents, the most salient benefit was an improvement in their teaching skills, given the opportunity to practice teaching at an easy knowledge level. The ease of teaching first-year students avoided the potential difficulty identified by Weissman, Bensinger and Koestler (2006) of having residents teach students about material in which they were not yet experts, although the residents in the present study were challenged by the need to frame teaching in terms of fundamental concepts. The minimal effort required by residents in the present study to supervise the first-year students also makes less likely another possible challenge, identified by Yedida, Schwartz, Hishkorn and Lipkin (1995), that of balancing the demands of patient care with those of teaching. The residents also reported a further benefit: an improved understanding and competency related to CanMEDS and of professionalism in general. This observation of having learned through teaching, a phenomenon known as *docendo discimus* (Latin: By teaching, we learn) (Sosman, 1956) supports proponents of near-peer teaching such as ten Cate and Durning (2007) who have suggested that the act of teaching in such programs is an effective way to learn. The residents' own explanations for this

effect match well with established theories on learning through teaching that emphasize the effects of internal verbalization while preparing for teaching, increased intrinsic motivation to master the material being taught, and placement of the material in a context relevant to the teacher (2007). Specifically, the effect of learning about their role as medical professionals agrees with the findings of Amorosa, Mellman and Graham (2011) who found that medical students with experience in teaching saw "teaching as a way of preparing for their future careers as physicians" (p. 141). However, while Amorosa et al. studied teaching by medical students, this study demonstrates similar findings with residents.

In general, the finding that the program was enjoyable to both students and residents suggests that the RMSSP has a role in helping to train future medical students for the years to come. As stated by Kirkpatrick and Kirkpatrick (2005), success at Level 1 is important to the effectiveness of a program for several reasons. Positive reactions may improve students' motivation to learn, which has implications for the three higher levels. In addition, the positive experiences of one cohort may encourage other students and residents to participate in the future, and may influence the support for continuing the RMSSP at the University of Alberta or for adopting similar programs at other institutions.

The RMSSP helped to make students ready for the clinical phase (Kirkpatrick Level 2).

There were two major aspects of the RMSSP that set it apart from other similar programs and that contributed to the effectiveness of the program. The first aspect was the long-term pairing with a resident upon which the program was based. Previous programs that intended to prepare students for clinical duties have tended to be of a short duration, and few studies have described programs in which first-year students are matched with first-year residents. By providing repeated interaction with a mentor close

to the students in age and training, the RMSSP created the potential for the development of a strong relationship between student and resident that was one of the driving factors behind the learning students experienced in this program. The second unique aspect of the RMSSP was the focus on introducing students to the professional role. This introduction was accomplished in three ways. First, students were immersed in the clinical environment and allowed to observe, and participate in, the role of the clinical trainee. Second, students were able to observe as their residents role modeled professional behaviour in their interactions with patients and other health professionals. Finally, the program's explicit focus on the CanMEDS framework provided students with a well-defined framework for describing the professional role. By providing this emphasis on professional development, the RMSSP taught students not just medical knowledge and skills, but how to be a clinical trainee, something not well taught in previously studied programs.

In the design of this study, students' training for the clinical phase was conceptualized into three areas: preparedness relating to vocational knowledge and skills and the ability to perform certain tasks; understanding of the stressors of clinical training and students' associated anxiety; and knowledge and attitudes regarding CanMEDS. However, while these three categories were used to frame the study's inquiries, the mixed methods analysis of the data revealed that there was considerable interaction between these concepts. Together, all three contributed to a student's overall readiness for clinical training. Thus, although these concepts were framed separately as research questions, they must be discussed together in assessing the effectiveness of the RMSSP. Because the term *preparedness* has some specific connotations in the present study stemming from the way it has been framed in research questions and investigations, the term *readiness* will be used instead in the discussion of findings to describe the extent to which students are equipped to begin clinical training.

Data from this study provides evidence that the RMSSP helped to make students more ready for the clinical phase in three ways: by allowing them to develop an understanding of the nature of the clinical environment, by introducing them to the role of the clinical trainee, and by teaching them the knowledge and skills needed to perform that role. First, participation provided students with experiences that foreshadowed their future responsibilities, thereby developing in them a better understanding of what lay ahead in the clinical phase, both in terms of the nature of the clinical training environment, and their role in it. With regards to the nature of the clinical training environment, students were able to experience that environment firsthand and with the guidance of a mentor close to them in training, or a "near-peer", an experience that is not otherwise available to first-year students. Ten Cate and Durning (2007) stress that exposure to near-peer role models can benefit students by providing insight into future experiences and confidence in adopting new roles. Through the gradual introduction to the clinical environment afforded by the RMSSP and facilitated by the near-peer interaction with residents, students were exposed to, and appear to have gained a better understanding of, these basic elements of the clinical environment. Indeed, Sarikaya, Civaner and Kalaca (2006) found preclinical medical students were unsure about even the most basic aspects of the clinical experience, for example not getting lost in the hospital, and participation in the RMSSP at its most basic level oriented students to these fundamental aspects of the environment.

The students' readiness to participate in the clinical environment was increased by an introduction to more complex aspects of the environment as well. Students learned about the roles of staff physicians, residents and other healthcare professionals, as well the unwritten rules governing how those roles interact within a social hierarchy. This topic has been termed the "hidden curriculum" by researchers, "a set of influences that function at the level of organizational structure and culture…customs, rituals and taken-

for-granted aspects of what goes on in the life-space we call medical education" (Hafferty, 1998, p. 404). Components of the hidden curriculum may include unspoken aspects of professional identity and social organization (Gaufberg, Batalden, Sands & Bell, 2010). An important step in medical education, therefore, is socialization into the customs and mores of the clinical environment. As observed by Schon (1986) "when someone learns a practice, he is initiated into the traditions of a community of practitioners and the world they inhabit. He learns their conventions, constraints, languages" (p.36-37). By interacting with residents, staff physicians and other health professionals, and by seeing how they interact with each other, students in the RMSSP were afforded with a unique, early opportunity to learn about the hidden curriculum and to begin the socialization process. As a result, studnets may be better prepared to engage in the clinical environment when the clinical phase begins than students who were not afforded this opportunity. Finally, students were also exposed to a wide variety of medical specialties, including some in which they would otherwise not have sought out an experience and may have gained a better understanding of the different specialties and the different experiences that are available to clinical trainees.

Students also learned about the role of the clinical trainee, the role they were to adopt full-time a year after completion of the RMSSP. This was a new role for students, representing a major shift from their usual role of a student in the classroom to a member of a healthcare team, and a contributor to patient care. This finding is similar to the findings of Prince, Boshuizen, van der Vleuten and Scherpbier (2005), which revealed that students arriving in the clinical setting were found to be "uncertain as to how to behave and act, mainly because they didn't know what was expected of them" (p. 704). Students in the RMSSP were able to experience the role of the clinical trainee and see firsthand what the duties of a clinical phase medical student are, so that when they arrive in the clinical environment in their third year they will know what is expected of them.

This finding confirms what has been found in studies of other similar preparatory programs, such as the program developed by Chittenden, Henry, Saxena, Loeser and O'Sullivan (2009) in which students were introduced to real world interactions with patients, resulting in increased role clarity and confidence. However, Chittenden et al.'s program, as with most such programs, was no longer than one week in duration (Poncelet & O'Brien, 2008). In contrast, the RMSSP took place over the course of eight months, offering a much greater volume and duration of clinical exposure. This increased amount of experience likely further contributed to the students' understanding of their role in the clinical environment and represents a distinct advantage of the RMSSP.

Another unique aspect of the RMSSP that contributed to the students' understanding of the professional role was the focus on CanMEDS. The roles in the CanMEDS framework are designed to describe the professional role of clinical trainee. By both observing their residents exemplifying the roles and by performing the roles themselves, students gained a better understanding of how those roles related to the job a clinical trainee, especially the roles of Medical Expert, Communicator and Collaborator, and acquired an appreciation for the importance of the roles. Students also improved their abilities to perform the roles, with the possible exception of Manager. Despite the growing importance of CanMEDS, a major criticism is the lack of tools available to teach the framework to trainees (Mickelson & MacNeily, 2008). The RMSSP was effective at not only giving students an introduction to the framework that they otherwise would not have had, but also at providing real world evidence as to how and why the framework is relevant to the overall professional role of a clinical student.

In addition to teaching students about the role of the clinical trainee, the RMSSP also increased the ability of students to perform that role by teaching them the requisite knowledge and skills. Students learned how to take histories and perform physical examinations, how to communicate with patients and other health professionals, and

about many other aspects of the clinical trainee's duties. They also consolidated and added to their medical knowledge, needed to accurately diagnose and treat patients. This skill and knowledge instruction was enhanced by its occurring in a practical context with real patients. Furthermore, because the residents were themselves clinical trainees, observing and participating in the resident's duties taught students skills and knowledge that were necessarily relevant to the clinical trainee role. As indicated by Jones, Willis, McArdle and O'Neill (2006), "the (resident) can teach you the (resident's) job, because that's what they know" (Jones, Willis, McArdle & O'Neill, 2006, p. 292). This eliminates the potential obstacle of trying to design a preparatory curriculum that will include only the skills and knowledge that students will need in the clinical environment, and represents an improvement on other preparatory programs whose curriculum may not be relevant to the job of the clinical trainee (Chumley, Olney, Usatine & Dobbie, 2005). By conducting the training in the clinical environment, the "curriculum" set itself, based on what skills and knowledge a clinical trainee uses in practice. By learning to perform these aspects of the clinical trainee's duties, students increased their competence to fulfill that role, including in three areas in which students are often under-prepared, as identified by the survey of clinical phase directors by Windish, Paulman, Goroll and Bass (2004), namely history taking/physical examination, communication and professionalism. As such, the RMSSP not only informed students about the nature of clinical training and the role of the clinical trainee, it also provided them with the tools needed to succeed in that environment and in that role.

In helping students to become ready for clinical training, the RMSSP provides support for the apprenticeship learning theory of Lave and Wenger (1991) who stated that as novices enter a vocation and gradually participate in more complex tasks they learn both about the "community of practice" itself and about how to perform that vocation. In the case of the RMSSP, the vocation in question is that of the clinical medical student. By

engaging in what Lave and Wenger called legitimate peripheral participation, the students in the RMSSP were essentially acting as apprentices learning a new vocation. The benefits observed in the present study of supervised gradual exposure to the work environment can be applied to other vocations and the apprenticeship model of training in general.

The effectiveness of the RMSSP at readying students for the clinical phase was enhanced greatly by the relationship formed between students and residents. A lack of mentor figures was identified by Radcliffe and Lester (2003) as contributing to students' poor preparation for clinical training. The RMSSP provided students with mentors, and the relationship between them positively impacted several aspects of the program. Because of the long-term nature of the program, students were able to continually strengthen their relationship with their resident over time. Each repeated interaction was a chance to further develop the comfort level that had previously been established, as opposed to having to get to know a new supervisor for each clinical experience that occurred outside of the RMSSP. Because of this relationship, students felt more comfortable in the clinical environment and enjoyed the experience more. They also felt more able to ask questions when they did not understand a topic or were unfamiliar with a skill. This finding supports what was suggested by ten Cate and Durning (2007), that "a trusting relationship with a peer who holds no position of authority might facilitate self-disclosure of ignorance and cognitive errors, enabling subsequent diagnosis and correction" (ten Cate & Durning, 2007, p. 549). Furthermore, the proximity of the residents in age and training level to their students gave the residents greater understanding of the students' needs and allowed more effective teaching. This proximity "allows the…teachers to use language that their learners understand and to explain concepts at an appropriate level" (Lockspeiser, 2008, p. 362). The residents were also dedicated to their role as teachers, which likely added to their impact on the students'

learning. While the use of residents as teachers of medical students has been supported by the findings of previous studies (Minor & Poenaru, 2002, Jones, Willis, McArdle & O'Neil, 2006), this study demonstrates a novel environment in which such teaching can take place and provides further characterization of the factors that make the resident-student interaction such an effective one.

One area in which the RMSSP did not appear to be as effective was in reducing students' anxiety about the clinical phase. Although some students did report feeling less anxious, and some students and residents discussed the stressors associated with clinical training, the questionnaire failed to demonstrate decreased anxiety or increased understanding of the stressors of clinical training in the intervention group overall, with the exception of the understanding of educational stressors. It may be that the resident-student relationship, while effective at facilitating learning in other areas, may not have been strong enough in all cases to allow discussions of a highly personal nature. In addition, it may be that the clinical phase is a potent enough anxiety provoking stimulus that the RMSSP intervention was not sufficient to overcome it, especially given students' and residents' reports that sessions were focused on clinical learning and not on "non-medical" topics. However the reports from some of the students of feeling less anxious, as well as indications from both students and residents that the program had improved the students' knowledge of educational stressors, suggests that there may be some benefit in this domain for some RMSSP participants, and perhaps future improvements in the program might allow this benefit to be increased enough to be detectable at the group level.

As stated by Kirkpatrick and Kirkpatrick (2005), "it is important to measure learning because no change in behaviour can be expected unless (learning occurs)" (p. 42). Ultimately, it was the goal of the RMSSP that students who participated in the program would be able to function more effectively as clinical trainees than they would

have been otherwise. By learning about the clinical environment, their role within it, and by developing vocational knowledge and skills, the ability of students to perform the role of the clinical trainee was improved, reflecting success at Level 2. This finding suggests that when students eventually begin clinical training, their behaviour may be different and they may perform their role more effectively, reflecting Level 3: Behaviour.

Discussion of Methods

A concurrent triangulation mixed methods design was well suited to providing a comprehensive understanding of the effectiveness of the RMSSP because it allowed exploitation of the strengths of each separate strand followed by an integrated analysis that compensated for the limitations of both the quantitative and qualitative methods. This design was able to generate rich data from both strands relevant to each of the study's four research questions.

In order to determine what, and by how much, change occurred due to participation in the RMSSP, quantitative data was an effective means that allowed for easy responses, contributing to a high response rate of questionnaires. Likert scale items allowed an investigation of respondents' knowledge and attitudes regarding a set of pre-determined areas of importance to the study, ensuring that respondents provided data related to certain specific outcomes. By combining individual items within a subscale into subscale scores, generalizations about overall effects in defined domains related to the study's research questions were possible. Furthermore, by using these methods in the format of a randomized control trial, it was possible to demonstrate and measure the difference between participation and non-participation in the RMSSP in a causal fashion. The major limitation of Likert scale items was that they do not allow students to provide unexpected responses, as interviews do.

The use of interviews, however, allowed for a full, rich understanding of the lived experience of participants. Data was collected in the participants' own voices, generating personal information and in some cases providing unexpected insight into the functioning of the RMSSP, for example the impact of the resident-student relationship. This occurred because interviews allowed students and residents to report their experiences directly and not limited by the framework of a Likert scale item. The limitation to using interviews is the time and effort required by participants to provide responses, which may explain the lower participation in interviews than in questionnaires.

The use of a randomized control trial embedded within a mixed methods design was a novel way of analyzing a program for preparing medical students for clinical training, and provided a more complete examination of the program's effects. Through the use of a concurrent triangulation mixed methods design, the strengths of both the qualitative and quantitative methods used complemented each other and balanced out the other's weaknesses. Where questionnaire findings suggested that an effect was either present or absent, these were compared with interview data to explain the trends and differences and make conclusions more meaningful. For the most part the qualitative and quantitative findings were in agreement, lending validity to the study's conclusions and allowing for a fuller understanding of the answers to each research question.

In addition to being an effective means for examining the RMSSP, the design of the present study was also unique in this field. As noted in Chapter 2, previous studies of preparatory programs for medical students have been limited by their use of a single, retrospective method such as questionnaires or interviews and small sample sizes. The use of controls has been uncommon and when they were used they were historical controls. Finally, studies have tended to focus on one perspective, either that of the

learners or of the teachers, in examining these programs. The present study avoids each of these limitations through the use of a prospective, mixed methods study with an embedded randomized control trial and a large sample size that examined the perspectives of both the learners and the teachers in the program.

Creswell and Plano Clark (2011) provided a list of strategies to combat threats to validity in mixed methods studies. The strategies relevant to this study are listed in Table 23. As shown, all were addressed in the present study with the exception of the use of equal sample sizes for the quantitative and qualitative strands.

Table 23.

Strategies to Combat Threats to Validity in Mixed Methods Studies

Strategy	Performed?
Sample from the same population for each strand.	Yes
Use separate collection procedures for each strand at the end of the experiment.	Yes
Address the same questions in parallel in each strand.	Yes
Find quotations that support the statistical analysis.	Yes
Use appropriate statistics.	Yes
Generate straightforward qualitative themes.	Yes
Address each research question with each strand.	Yes
Present both strands equally.	Yes
Use equal sample sizes for quantitative and qualitative strands.	No

Limitations

The response rate for the questionnaire was much higher than the participation rate for the interviews. Consequently, the sample size for both students and residents

were much larger for the quantitative data collection strand than for the qualitative strand. For example, of the 83 students in the RMSSP, 29 participated in interviews while 63 responded on the post-encounter questionnaire. In the case of the residents, only three participated in interviews, compared to the 69 who responded on the post-encounter questionnaire. As such, the quantitative results were based on samples more representative of the populations of interest than the samples were for the qualitative data, creating a disparity between the reliability of one strand over another. Everything else being equal, with equal sample sizes the quantitative and qualitative strands can be given equal weight in the mixed methods analyses, as they would be equally representative of the study population. In this study the mixed method analyses had to be interpreted with the understanding that the qualitative data may therefore have been less representative. However, the situation is tempered by the finding that the quantitative and qualitative results tended to agree and were not discordant, suggesting that the two samples were representative of their populations. The small sample size for the resident interviews can be explained by the initial focus of the study, which was on the experiences of students. Because the experiences of residents were not the major focus, less effort was made to recruit residents for the interviews. As the study proceeded, unanticipated findings such as the resident-student relationship and benefits for residents made the residents' experiences a more salient aspect of the study as a whole, and this would have been better explored if it were possible to recruit more residents.

One potential source of bias in the interview data is acquiescence bias, the tendency for participants in interviews to reach false consensus or agree with the strongest personality in the group, which can include attempts to appease the moderator (Seidman, 1991). The extent to which such acquiescence bias affects these data is thought to be acceptably low given that each interview featured some degree of disagreement between interview participants and given the willingness of participants to

point out the program's major failings. Moreover, although the use of a program administrator as the interviewer can potentially encourage acquiescence bias, it can also "substantially increase the validity and reliability of the data" (Patton, 2002, p. 401) when the administrator, as in this study, has similar experiences to the participants by creating a rapport with participants, ensuring clarity of language and creating a non-threatening atmosphere. Furthermore, the use of open ended, neutral and non-leading questions, neutrality of verbal and non-verbal feedback from the interviewer, and the use of a consistent guide also contribute to the confidence in the interview data (2002).

A potentially more serious form of bias in both interviews and questionnaires is participation bias (Byrt, Bishop & Carlin, 1993). Students who had overall negative experiences in the program may have been less likely to volunteer to participate in interviews or to complete post-encounter questionnaires. As such these results must be interpreted with the understanding of the potential for participation bias. Generally, there was homogeneity in the responses between each of the interview groups and, to an extent, within individual interviews, although varying viewpoints on most themes did emerge, and interview findings tended to be corroborated by questionnaire data. Furthermore, the findings from the qualitative analysis tended to agree well with the quantitative findings.

The interviews in this study also only addressed the experiences of one of the student groups, the intervention group. A better understanding of the control group's experiences in the first year of medical school would have been possible if control group students had been interviewed in addition. Descriptions of the shadowing experiences that they managed to arrange outside of the RMSSP and the challenges that they faced in becoming prepared for clinical training would provide a useful contrast to the experiences of the students in the RMSSP.

In addition, confidence in the qualitative analysis would be strengthened through the use of a measure of inter-rater reliability for the thematic coding structure (Pope,

Ziebland & Mays, 2000). Likewise the validity of the questionnaire would be enhanced through a more in-depth validation process, for example using cross-validation with other instruments or by employing the Delphi procedure (Beech, 1999).

This study is also limited by a lack of long-term follow-up with the participants, especially the students. The purpose of the RMSSP was to prepare students for the transition to clinical phase. The successes of the RMSSP that the present study demonstrated in Kirkpatrick Level 2 (Kirkpatrick & Kirkpatrick, 2005) in terms of improving students knowledge and skills suggest that students' performance of the clinical role will be improved when they begin clinical training two years after completion of the RMSSP (Level 3). However, it is unknown whether the improvement in students' knowledge and skills will be lasting or temporary, or whether this learning will effectively translate into improved performance. In order to more fully study Level 3, by conclusively demonstrating that students are better able to perform their role when they reach clinical training, further observations would have to be made of the students as they enter their third year of medical school. Unfortunately, this was not possible given the scope of this study.

Conclusions

Taking into account the limitations of the present study, the conclusions that may be drawn from its findings are as follows:

1) Both students and residents found participation in the RMSSP to be enjoyable.
2) Both students and residents found the RMSSP to be useful for helping to make students ready for clinical duties in that:

a) students gained an understanding of the clinical environment,

b) students gained an understanding of the role of the clinical trainee within that environment, and

c) students learned knowledge and skills necessary to perform that role.

3) The benefits students derived from the RMSSP were greatly enhanced by the resident-student relationship.

4) Residents also benefited from their participation in the RMSSP in terms of:

a) increased skill and interest in teaching, and

b) increased understanding of their professional role.

5) A concurrent triangulation mixed methods design with an embedded randomized control trial was an effective means of examining the effectiveness of the RMSSP.

Implications for Practice

The value of this study is that it demonstrates that the RMSSP, a fairly simple intervention, requiring no financial cost, minimal administration and little or no effort from staff physicians, can help make students ready for clinical training and contribute to the professional development of residents. In addition, participation in the program was enjoyable for both students and residents. Given the minimal resources required and the number of benefits observed, the RMSSP should be considered for repeated implementation at the University of Alberta and elsewhere.

In addition to demonstrating the successes of the RMSSP, the findings of this study also suggest some ways in which it could be improved. Four areas for improvement in the program include: recruitment of residents, scheduling of sessions, CanMEDS instruction and reduction of students' anxiety. The hypothetical ideal program would recruit enough residents so that all interested students could participate and would include a mechanism to ensure students were able to schedule sessions at least

once per month. It would also emphasize practical applications of CanMEDS and would address students' anxiety about the transition to clinical duties. Some of these issues might be addressed by incorporating the RMSSP into the official curriculum of the University of Alberta medical school. Doing so might allow for the introduction of incentives for resident participation, such as teaching credits, certificates of participation, or financial incentives. By encouraging more residents to participate, more mentors would become available so that more students could enroll in the program. Official incorporation into a school's curriculum could also facilitate the scheduling of sessions by helping to identify and coordinate times in the students' and residents' schedules that would work best for both participants. The danger of giving control of a program such as the RMSSP to the University administration is that the organic and spontaneous nature of the experience may be lost. There may be a tendency to over regulate the experience, which could remove some of the excitement and fun that was such an important part of the program for both students and residents and could impact the formation of genuine resident-student relationships. A possible solution for this drawback is to all the program to be administered by the Medical Students Association, or a similar group, so that the goals and expectations of the students themselves are upheld.

With regards to CanMEDS instruction, the students and residents in this study observed that the planned didactic discussions regarding CanMEDS topics were not as informative as having the roles modeled by the residents and by the students themselves when interacting with patients and other healthcare professionals. Therefore, in the future, instruction of CanMEDS should be focused on demonstrating practical applications of the roles and not on didactic discussions. This would fit well with the rest of the program, as the other teaching in the RMSSP was done in this practical fashion.

A challenge that may be more difficult to overcome is the reduction of students' anxiety towards clinical training. Although some modest benefits were seen in this

domain, there is definite room for improvement. One way that this issue might be addressed is through efforts to strengthen the resident-student relationship. This relationship was a major factor in facilitating students' learning in the RMSSP, but it may be that not all relationships were personal enough to allow students and residents to engage in the types of conversations that might alleviate students' anxiety, such as discussing the relationship, physical and financial stressors of clinical training. The resident-student relationship might be bolstered in several ways. First, the program could be lengthened so that students and residents would continue to shadow in their second year. As time progresses the relationship between shadowing partners may continue to strengthen and more frank discussions might become possible. In this matter it is encouraging that both students and residents in this study were interested in continuing to shadow after the program was completed. Another way to encourage the bond between students and residents would be to allow students to select their resident based on clinical specialty and/or gender. Being matched to a resident from a specialty which the student is interested in pursuing professionally or who has the same gender as the student might encourage more of an interest in the resident's life and lifestyle. However, the downside of this would be the loss of the breadth of experiences that matching to a random resident gave to students.

Future Directions for Research

There are several steps that could be taken to expand on this study, including attempted replication of its findings and expansion of its scope. The most straightforward avenue of future research would be a repetition of the study with a second cohort of students and residents, in order to demonstrate whether this study's findings can be replicated. Any such study would benefit from reviewing this study as a type of pilot, allowing for the refinement of research questions and instruments. The design of the

questionnaire and interviews could be improved by taking into consideration the findings of this study. For example, the subscales in the questionnaire were intended to represent three distinct domains: preparedness, anxiety and understanding, and CanMEDS. However, the findings of this study suggest that there is considerable interaction between these domains and this observation could be used as a guide to shape the construction of subscales that reflect their inter-related nature. In addition, the open response items, which were not analyzed in this study because of the lack of information they provided, might be altered to improve their sensitivity regarding complex domains such as professionalism and CanMEDS. The portion of this study related to validation of the questionnaire could also be improved upon in future research. The questionnaire subscales could be cross validated against other existing scales representing the same or similar domains, or the judges' panel validation could be expanded upon using the Delphi technique. In addition, the pool of judges could be altered to improve the validity of the results. The panel could be expanded to include experts from outside the University of Alberta, allowing greater generalization. Alternatively, instead of using staff physicians as judges, residents might be considered as experts, given that this study demonstrates that their proximity in training to medical students gives them a better insight into students' training needs.

It would also be interesting to examine the impact of a resident teacher-training course on the effectiveness of the program. Research, as reviewed by Wamsley, Julian and Wipf (2004), supports the use of training courses to help residents become more skilled teachers. In response to this study's findings, residents should be trained with an emphasis on demonstrating CanMEDS roles and incorporating CanMEDS teaching into clinical encounters rather than using the didactic approach that was encouraged in this iteration of the RMSSP. Residents could also be oriented to the need to address students'

anxieties about clinical training and encouraged to engage in discussions about related topics, in so far as their comfort level allows.

As mentioned above, the long-term impact of the program could also be investigated in order to determine whether the effects demonstrated here are temporary or lasting and whether the program is successful in achieving Kirkpatrick Level 3, an improvement in behaviour or performance in the clinical environment (Kirkpatrick & Kirkpatrick, 2005). Repeated observation of this cohort of students at the start of clinical training, one year into the clinical phase and during residency would address this question. It would also be of interest to determine if, and how, the student-resident pairs formed in the RMSSP continue to interact in future years and what impact any ongoing relationship has on students and residents. When this cohort of students enters residency, it would also be interesting to see the extent to which they themselves become mentors for students in the RMSSP or similar programs. In order to address Level 4, outcomes external to the learner, a study of the health outcomes of patients cared for by former participants of the RMSSP compared to controls could be performed.

Based on preliminary results of this study, the University of Alberta Faculty of Medicine adopted the RMSSP as a formal part of their elective curriculum the following academic year, 2010-11. In order to allow all students a chance to participate in the RMSSP, the Faculty of Medicine changed the program so that enrollment was offered preferentially to students entering their second year of medical school who had not been matched to a resident in their first year. The impact of students participating in the RMSSP in their second year instead of in their first year should be studied. Participation in the first year has the potential advantage of reaching students earlier while they are potentially more impressionable and allowing for the formation of a longer-term relationship between the resident and student that could possibly be continued into the second year and beyond. In contrast, enrollment of second-year students has the potential

advantage of reaching students when they have a stronger foundation of knowledge upon which to build and are closer to the clinical training for which the RMSSP is intended to prepare them. In order to determine which of these approaches is more effective, a comparison of the experiences, learning and clinical performance of the two cohorts should be conducted.

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VII: Appendices

Appendix I: Student Pre-Encounter Questionnaire Items (rejected items in italics)

Demographics items.

1) Prior to starting medical school, did you have any experience working or volunteering in the healthcare field? (Yes/No)
2) If yes, how long was your experience (in months)? (open-response: O.R.)

CanMEDS items.

3) Outside of the context of the Resident-Medical Student Shadowing Program, have you heard of CanMEDS? (Yes/No)
4) If yes, where/from whom? (O.R.)
5) List as many of the CanMEDS competencies as you can by name. If you are unable to give the name, you can describe the main idea of the competency in your own words. If you are unable to name or describe the competency, leave the field blank. (O.R.)
6) Please describe what you think it means for a doctor to be a "medical expert". (O.R.)
7) To what extent do you agree with the statement "It is important for a doctor to be a medical expert"? (Likert)
8) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Ability to integrate all of the CanMEDS roles.
    b. Possession of an appropriate body of clinical skills and knowledge.
    c. Ability to perform a complete assessment of a patient.
    d. Effective use of preventative interventions.
    e. Effective use of therapeutic interventions.
    f. Willingness to seek appropriate consultation from other health professionals.
9) Please describe what you think it means for a doctor to be a "communicator". (O.R.)
10) To what extent do you agree with the statement "It is important for a doctor to be a communicator". (Likert)
11) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Ability to develop rapport and trust with patients.
    b. Ability to develop rapport and trust with families.
    c. Ability to accurately elicit information from patients.
    d. Ability to accurately elicit information from families.
    e. Ability to accurately elicit information from colleagues.
    f. Ability to develop a common understanding on issues with patients.
    g. Ability to develop a common understanding on issues with families.
    h. Ability to develop a common understanding on issues with colleagues.
    i. Ability to convey effective oral communication about a medical encounter.

    j. Ability to convey effective written communication about a medical encounter.

12) Please describe what you think it means for a doctor to be a "collaborator". (O.R.)
13) To what extent do you agree with the statement "It is important for a doctor to be a collaborator"? (Likert)
14) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Effective participation in an inter-professional healthcare team.
    b. Effective resolution of conflicts with other healthcare professionals.
15) Please describe what you think it means for a doctor to be a "manager". (O.R.)
16) To what extent do you agree with the statement "It is important for a doctor to be a manager"? (Likert)
17) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Contribution to the effectiveness of healthcare organizations.
    b. Contribution to the effectiveness of health systems.
    c. Effective management of a career.
    d. Ability to allocate finite healthcare resources appropriately.
    e. Participation in administration and leadership roles.
18) Please describe what you think it means for a doctor to be a "health advocate". (O.R.)
19) To what extent do you agree with the statement "It is important for a doctor to be a health advocate"? (Likert)
20) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Responsiveness to an individual patient's health needs.
    b. Responsiveness to a community's health needs.
    c. Ability to identify the determinants of health of the population.
    d. Promotion of the health of individual patients.
    e. Promotion of the health of communities.
    f. Promotion of the health of populations.
21) Please describe what you think it means for a doctor to be a "scholar". (O.R.)
22) To what extent do you agree with the statement "It is important for a doctor to be a scholar"? (Likert)
23) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Critical evaluation of information.
    b. Application of information to healthcare decisions.
    c. Facilitation of the learning of patients.
    d. Facilitation of the learning of families.
    e. Facilitation of the learning of students.
    f. Facilitation of the learning of other healthcare professionals.
    g. Contribution to the creation of medical knowledge.
    h. Contribution to the dissemination of medical knowledge.
24) Please describe what you think it means for a doctor to be a "professional". (O.R.)

25) To what extent do you agree with the statement "It is important for a doctor to be a professional"? (Likert)
26) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Commitment to patients.
    b. Commitment to the medical profession.
    c. Commitment to society.
    d. Participation in profession-les regulation.
    e. Commitment to physician health.

Preparedness/vocational knowledge items.

27) To what extent do you agree with the following statement? I think I will be well prepared for clinical duties by the start of third year. (Likert)
28) Please rate you agreement with the following statements. Please note that some statements are positive, and some are negative. Make sure you carefully read each statement before responding. (Likert)
    a. I am comfortable writing medical orders.
    b. I am comfortable writing medical progress notes.
    c. I do not know how to complete a full history.
    d. I do not know how to complete a full physical exam.
    e. I am able to perform a variety of simple medical procedures (e.g. suturing, inserting a urinary catheter or NG tube).
    f. I do not know what to expect when I am on-call in the future.
    g. I understand how to make contacts in the medical profession to help with my future career.
    h. I am confident in my ability to interact with patients.
    i. I am confident in my ability to interact with patients' families.
    j. I am not familiar with the roles of each team member in morning rounds.
    k. I understand how to communicate with other members of the medical team.
    l. I understand how to communicate with other health professionals.
    m. I am not comfortable searching the medical literature.
    n. I understand the role of a doctor in allocating healthcare resources.
    o. I do not understand the role of a doctor in healthcare organizations.
    p. I understand the role of a doctor in promoting health issues.
    q. I am willing to make a professional commitment to my patients.
    r. I am not willing to make a professional commitment to society.
    s. I am willing to participate in doctor-lead regulation of the medical profession.
    t. I understand what residency is and how it works.
    u. I do not understand what CaRMS is and how it works.

Understanding/anxiety items.

29) To what extent do you agree with the following? I am looking forward to starting my third year of medical school as a student intern. (Likert)
30) How would you describe how you feel about starting your clinical duties in third year? (O.R.)

31) To what extent do you agree with the following statements? Please note that some statements are positive, and some are negative. Make sure you carefully read each statement before responding. (Likert)
    a. I know what financial stresses to expect in the upcoming years of med school.
    b. I know what relationship stresses to expect in the upcoming years of med school.
    c. I do not know what physical/health stresses to expect in the upcoming years of med school.
    d. I know what educational stresses to expect in the upcoming years of med school.
    e. I know what financial stresses to expect in residency.
    f. I do not know what relationship stresses to expect in residency.
    g. I know what physical/health stresses to expect in residency.
    h. I do not know what educational stresses to expect in residency.
    i. I know where I can access resources for help with financial stress.
    j. I know where I can access resources for help with relationship stress.
    k. I do not know where I can access resources for help with physical/health stress.
    l. I do not know where I can access resources for help with educational stress.
32) To what extent do you agree with the following statement? I feel informed and prepared to make my choice of residency. (Likert)
33) Have you decided what you plan to select as your residency? (Definitely/Maybe/No)
34) If definitely or maybe, what specialty? (O.R.)

Personal code.

35) What are the last two letters of your first name?
36) What are the last two letters of your mother's maiden name?
37) What is your gender? (M=male, F=female)
38) In what year were you born? (e.g., 1985 = 85)
39) On what date of the month were you born? (e.g. August 3 = 3)

Appendix II: Student Post-Encounter Questionnaire Items (rejected items in italics)

CanMEDS items (numbered here to be consistent with Pre-Encounter questionnaire).

1) List as many of the CanMEDS competencies as you can by name. If you are unable to give the name, you can describe the main idea of the competency in your own words. If you are unable to name or describe the competency, leave the field blank. (O.R.)
2) Please describe what you think it means for a doctor to be a "medical expert". (O.R.)
3) To what extent do you agree with the statement "It is important for a doctor to be a medical expert"? (Likert)
4) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Ability to integrate all of the CanMEDS roles.
    b. Possession of an appropriate body of clinical skills and knowledge.
    c. Ability to perform a complete assessment of a patient.
    d. Effective use of preventative interventions.
    e. Effective use of therapeutic interventions.
    f. Willingness to seek appropriate consultation from other health professionals.
5) Please describe what you think it means for a doctor to be a "communicator". (O.R.)
6) To what extent do you agree with the statement "It is important for a doctor to be a communicator". (Likert)
7) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Ability to develop rapport and trust with patients.
    b. Ability to develop rapport and trust with families.
    c. Ability to accurately elicit information from patients.
    d. Ability to accurately elicit information from families.
    e. Ability to accurately elicit information from colleagues.
    f. Ability to develop a common understanding on issues with patients.
    g. Ability to develop a common understanding on issues with families.
    h. Ability to develop a common understanding on issues with colleagues.
    i. Ability to convey effective oral communication about a medical encounter.
    j. Ability to convey effective written communication about a medical encounter.
8) Please describe what you think it means for a doctor to be a "collaborator". (O.R.)
9) To what extent do you agree with the statement "It is important for a doctor to be a collaborator"? (Likert)
10) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Effective participation in an inter-professional healthcare team.

    b. Effective resolution of conflicts with other healthcare professionals.
11) Please describe what you think it means for a doctor to be a "manager". (O.R.)
12) To what extent do you agree with the statement "It is important for a doctor to be a manager"? (Likert)
13) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Contribution to the effectiveness of healthcare organizations.
    b. Contribution to the effectiveness of health systems.
    c. Effective management of a career.
    d. Ability to allocate finite healthcare resources appropriately.
    e. Participation in administration and leadership roles.
14) Please describe what you think it means for a doctor to be a "health advocate". (O.R.)
15) To what extent do you agree with the statement "It is important for a doctor to be a health advocate"? (Likert)
16) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Responsiveness to an individual patient's health needs.
    b. Responsiveness to a community's health needs.
    c. Ability to identify the determinants of health of the population.
    d. Promotion of the health of individual patients.
    e. Promotion of the health of communities.
    f. Promotion of the health of populations.
17) Please describe what you think it means for a doctor to be a "scholar". (O.R.)
18) To what extent do you agree with the statement "It is important for a doctor to be a scholar"? (Likert)
19) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Critical evaluation of information.
    b. Application of information to healthcare decisions.
    c. Facilitation of the learning of patients.
    d. Facilitation of the learning of families.
    e. Facilitation of the learning of students.
    f. Facilitation of the learning of other healthcare professionals.
    g. Contribution to the creation of medical knowledge.
    h. Contribution to the dissemination of medical knowledge.
20) Please describe what you think it means for a doctor to be a "professional". (O.R.)
21) To what extent do you agree with the statement "It is important for a doctor to be a professional"? (Likert)
22) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Commitment to patients.
    b. Commitment to the medical profession.
    c. Commitment to society.
    d. Participation in profession-les regulation.
    e. Commitment to physician health.

Preparedness/vocational knowledge items.

23) To what extent do you agree with the following statement? I think I will be well prepared for clinical duties by the start of third year. (Likert)
24) Please rate you agreement with the following statements. Please note that some statements are positive, and some are negative. Make sure you carefully read each statement before responding. (Likert)
    a. I am comfortable writing medical orders.
    b. I am comfortable writing medical progress notes.
    c. I do not know how to complete a full history.
    d. I do not know how to complete a full physical exam.
    e. I am able to perform a variety of simple medical procedures (e.g. suturing, inserting a urinary catheter or NG tube).
    f. I do not know what to expect when I am on-call in the future.
    g. I understand how to make contacts in the medical profession to help with my future career.
    h. I am confident in my ability to interact with patients.
    i. I am confident in my ability to interact with patients' families.
    j. I am not familiar with the roles of each team member in morning rounds.
    k. I understand how to communicate with other members of the medical team.
    l. I understand how to communicate with other health professionals.
    m. I am not comfortable searching the medical literature.
    n. I understand the role of a doctor in allocating healthcare resources.
    o. *I do not understand the role of a doctor in healthcare organizations.*
    p. I understand the role of a doctor in promoting health issues.
    q. I am willing to make a professional commitment to my patients.
    r. I am not willing to make a professional commitment to society.
    s. I am willing to participate in doctor-lead regulation of the medical profession.
    t. I understand what residency is and how it works.
    u. I do not understand what CaRMS is and how it works.

Understanding/anxiety items.

25) To what extent do you agree with the following? I am looking forward to starting my third year of medical school as a student intern. (Likert)
26) How would you describe how you feel about starting your clinical duties in third year? (O.R.)
27) To what extent do you agree with the following statements? Please note that some statements are positive, and some are negative. Make sure you carefully read each statement before responding. (Likert)
    a. I know what financial stresses to expect in the upcoming years of med school.
    b. I know what relationship stresses to expect in the upcoming years of med school.
    c. I do not know what physical/health stresses to expect in the upcoming years of med school.
    d. I know what educational stresses to expect in the upcoming years of med school.

e. I know what financial stresses to expect in residency.
f. I do not know what relationship stresses to expect in residency.
g. I know what physical/health stresses to expect in residency.
h. I do not know what educational stresses to expect in residency.
i. I know where I can access resources for help with financial stress.
j. I know where I can access resources for help with relationship stress.
k. I do not know where I can access resources for help with physical/health stress.
l. I do not know where I can access resources for help with educational stress.

28) To what extent do you agree with the following statement? I feel informed and prepared to make my choice of residency. (Likert)

29) *Have you decided what you plan to select as your residency? (Definitely/Maybe/No)*

30) If definitely or maybe, what specialty? (O.R.)

RMSSP items.

31) Were you matched to a resident in the Resident-Medical Student Shadowing Program? (Yes/No)

32) Please rate your agreement with the following statements about your experiences in the Resident-Medical Student Shadowing Program: (Likert)
a. I enjoyed participating in the RMSSP.
b. I would recommend this program to a colleague.
c. I would NOT participate in this program again.
d. This program gave me a better understanding of CanMEDS.
e. This program increased my support for the importance of CanMEDS.
f. This program DEcreased my interest in teaching.
g. I would be interested in continuing to shadow my resident after the program's completion.

33) Please rate your agreement with the following statements about your competence in CanMEDS: (Likert)
a. The RMSSP increased my level of competency as a Medical Expert.
b. The RMSSP increased my level of competency as a Communicator.
c. The RMSSP increased my level of competency as a Collaborator.
d. The RMSSP increased my level of competency as a Health Advocate.
e. The RMSSP increased my level of competency as a Manager.
f. The RMSSP increased my level of competency as a Scholar.
g. The RMSSP increased my level of competency as a Professional.

34) Please rate your agreement with the following statements about your experience in the RMSSP: (Likert)
a. This program increased my knowledge of CanMEDS.
b. This program increased my knowledge of the financial stresses of medical training.
c. This program DID NOT increase my knowledge of the academic stresses of medical training.
d. This program increased my knowledge of the relationship stresses of medical training.
e. This program increased my history taking skills.
f. This program DID NOT increase my physical exam skills.

g. This program WILL NOT help me be prepared for clinical rotations in third-year.
h. This program improved my ability to interact with patients.
i. This program DID NOT improve my ability to interact with other health professionals.
j. This program DID NOT improve my medical knowledge.
k. This program improved my procedural skills.

35) How many shadowing sessions did you complete with your resident partner? If you are unsure of the exact number, give your best guess (range from 0 to >16, intervals of 2).
36) If you completed more, or fewer, than the suggested number of 8 sessions, why did this occur? (O.R.)
37) Approximately how long was your average shadowing session (in hours)? (O.R.)
38) Please rate the following topics by the amount of time you spent on each from 1 (most time spent) to 9 (least time spent). (rating scale)
39) Are there other topics your resident spent time teaching? If yes, please list them. (O.R.)
40) Which of the following best describes your typical shadowing experience?
    i. My resident discussed the assigned CanMEDS role as the main focus of the sessions but only rarely demonstrated any of them.
    ii. My resident discussed the assigned CanMEDS role and occasionally demonstrated the roles as part of their work duties.
    iii. My resident spent an equal amount of time discussing the assigned CanMEDS role and demonstrating the roles as part of their work duties.
    iv. My resident performed the CanMEDS roles as they carried out their work duties and occasionally discussed the assigned role.
    v. My resident performed the CanMEDS roles as they carried out their work duties but only rarely discussed the role.
41) Please provide any comments you have, positive or negative, about your experiences in the program. (O.R.)
42) What was the best aspect of the program? (O.R.)
43) What was the worst aspect of the program? (O.R.)
44) How could the program be improved? (O.R.)
45) Please respond to the following statements: (Likert)
    a. The Resident-Medical Student Shadowing Program should, at a minimum, be AVAILABLE for all first-year medical students at the U of A.
    b. The Resident-Medical Student Shadowing Program should be MANDATORY for all first-year medical students at the U of A.
46) Approximately how many hours, IN TOTAL, of clinical shadowing have you done in the first year of medical school? (Include hours done in the Resident-Medical Student Shadowing Program IF applicable) (O.R.)

Personal code.

47) What are the last two letters of your first name?
48) What are the last two letters of your mother's maiden name?
49) What is your gender? (M=male, F=female)
50) In what year were you born? (e.g. 1985 = 85)
51) On what date of the month were you born? (e.g. August 3 = 3)

Appendix III: Resident Pre-Encounter Questionnaire Items

CanMEDS items.

1) Outside of the context of the Resident-Medical Student Shadowing Program, have you heard of CanMEDS? (Yes/No)
2) List as many of the CanMEDS competencies as you can by name. If you are unable to give the name, you can describe the main idea of the competency in your own words. If you are unable to name or describe the competency, leave the field blank. (O.R.)
3) Please describe what you think it means for a doctor to be a "medical expert". (O.R.)
4) To what extent do you agree with the statement "It is important for a doctor to be a medical expert"? (Likert)
5) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Ability to integrate all of the CanMEDS roles.
    b. Possession of an appropriate body of clinical skills and knowledge.
    c. Ability to perform a complete assessment of a patient.
    d. Effective use of preventative interventions.
    e. Effective use of therapeutic interventions.
    f. Willingness to seek appropriate consultation from other health professionals.
6) Please describe what you think it means for a doctor to be a "communicator". (O.R.)
7) To what extent do you agree with the statement "It is important for a doctor to be a communicator (Likert)
8) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Ability to develop rapport and trust with patients.
    b. Ability to develop rapport and trust with families.
    c. Ability to accurately elicit information from patients.
    d. Ability to accurately elicit information from families.
    e. Ability to accurately elicit information from colleagues.
    f. Ability to develop a common understanding on issues with patients.
    g. Ability to develop a common understanding on issues with families.
    h. Ability to develop a common understanding on issues with colleagues.
    i. Ability to convey effective oral communication about a medical encounter.
    j. Ability to convey effective written communication about a medical encounter.
9) Please describe what you think it means for a doctor to be a "collaborator". (O.R.)
10) To what extent do you agree with the statement "It is important for a doctor to be a collaborator"? (Likert)
11) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Effective participation in an inter-professional healthcare team.

    b. Effective resolution of conflicts with other healthcare professionals.
12) Please describe what you think it means for a doctor to be a "manager". (O.R.)
13) To what extent do you agree with the statement "It is important for a doctor to be a manager"? (Likert)
14) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Contribution to the effectiveness of healthcare organizations.
    b. Contribution to the effectiveness of health systems.
    c. Effective management of a career.
    d. Ability to allocate finite healthcare resources appropriately.
    e. Participation in administration and leadership roles.
15) Please describe what you think it means for a doctor to be a "health advocate". (O.R.)
16) To what extent do you agree with the statement "It is important for a doctor to be a health advocate"? (Likert)
17) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Responsiveness to an individual patient's health needs.
    b. Responsiveness to a community's health needs.
    c. Ability to identify the determinants of health of the population.
    d. Promotion of the health of individual patients.
    e. Promotion of the health of communities.
    f. Promotion of the health of populations.
18) Please describe what you think it means for a doctor to be a "scholar". (O.R.)
19) To what extent do you agree with the statement "It is important for a doctor to be a scholar"? (Likert)
20) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Critical evaluation of information.
    b. Application of information to healthcare decisions.
    c. Facilitation of the learning of patients.
    d. Facilitation of the learning of families.
    e. Facilitation of the learning of students.
    f. Facilitation of the learning of other healthcare professionals.
    g. Contribution to the creation of medical knowledge.
    h. Contribution to the dissemination of medical knowledge.
21) Please describe what you think it means for a doctor to be a "professional". (O.R.)
22) To what extent do you agree with the statement "It is important for a doctor to be a professional"? (Likert)
23) Please rate how important you feel the following characteristics are in a doctor. If you don't know how the statements relate to the practice of medicine, select "Don't Know". (Likert)
    a. Commitment to patients.
    b. Commitment to the medical profession.
    c. Commitment to society.
    d. Participation in profession-les regulation.
    e. Commitment to physician health.

Personal Code.

24) What are the last two letters of your first name?
25) What are the last two letters of your mother's maiden name?
26) What is your gender? (M=male, F=female)
27) In what year were you born? (e.g. 1985 = 85)
28) On what date of the month were you born? (e.g. August 3 = 3)

Appendix IV: Resident Post-Encounter Questionnaire Items

RMSSP items.

1) Please rate your agreement with the following statements about your experiences in the Resident-Medical Student Shadowing Program: (Likert)
    a. I enjoyed participating in the program.
    b. I would recommend this program to another resident.
    c. I would NOT participate in this program again.
    d. This program gave me a better understanding of CanMEDS.
    e. This program increased my support for the importance of CanMEDS.
    f. I think this program should be AVAILABLE to all first-year medical students at the U of A.
    g. I think this program should be MANDATORY for all first-year medical students at the U of A.
    h. This program DEcreased my interest in teaching.
    i. This program increased my skills in teaching
    j. I would be interested in having my student continue to shadow me after the program's completion.
2) Please rate your agreement with the following statements about your medical student partner's competence in CanMEDS: (Likert)
    a. The RMSSP increased my student's level of competency as a Medical Expert.
    b. The RMSSP increased my student's level of competency as a Communicator.
    c. The RMSSP increased my student's level of competency as a Collaborator.
    d. The RMSSP increased my student's level of competency as a Health Advocate.
    e. The RMSSP increased my student's level of competency as a Manager.
    f. The RMSSP increased my student's level of competency as a Scholar.
    g. The RMSSP increased my student's level of competency as a Professional.
3) Please rate your agreement with the following statements about your experience in the RMSSP: (Likert)
    a. This program increased my student's knowledge of CanMEDS.
    b. This program increased my student's knowledge of the financial stresses of medical training.
    c. This program DID NOT increase my student's knowledge of the academic stresses of medical training.
    d. This program increased my student's knowledge of the relationship stresses of medical training.
    e. This program increased my student's history taking skills.
    f. This program DID NOT increase my student's physical exam skills.
    g. This program WILL NOT help my student be prepared for clinical rotations in third-year.
    h. This program improved my student's ability to interact with patients.
    i. This program DID NOT improve my student's ability to interact with other health professionals.
    j. This program DID NOT improve my student's medical knowledge.
    k. This program improved my student's procedural skills.

4) How many shadowing sessions did you complete with your medical student partner? If you are unsure of the exact number, give your best guess (range from 0 to >16, intervals of 2).
5) If you completed more, or fewer, than the suggested number of 8 sessions, why did this occur? (O.R.)
6) Approximately how long was your average shadowing session (in hours)? (O.R.)
7) Please rate the following topics by the amount of time you spent on each from 1 (most time spent) to 9 (least time spent). (rating scale)
8) Are there other topics you spent time teaching? If yes, please list them. (O.R.)
9) Which of the following best describes your typical shadowing experience?

    i. I discussed the assigned CanMEDS role as the main focus of the sessions but only rarely demonstrated any of them.

    ii. I discussed the assigned CanMEDS role and occasionally demonstrated the roles as part of my work duties.

    iii. I spent an equal amount of time discussing the assigned CanMEDS role and demonstrating the roles as part of my work duties.

    iv. I performed the CanMEDS roles as I carried out my work duties and occasionally discussed the assigned role.

    v. I performed the CanMEDS roles as I carried out my work duties but only rarely discussed the role.
10) Please provide any comments you have, positive or negative, about your experiences in the program. (O.R.)
11) What was the best aspect of the program? (O.R.)
12) What was the worst aspect of the program? (O.R.)
13) How could the program be improved? (O.R.)

CanMEDS items.

14) Outside of the context of the Resident-Medical Student Shadowing Program, have you heard of CanMEDS? (Yes/No)
15) List as many of the CanMEDS competencies as you can by name. If you are unable to give the name, you can describe the main idea of the competency in your own words. If you are unable to name or describe the competency, leave the field blank. (O.R.)
16) Please describe what you think it means for a doctor to be a “medical expert”. (O.R.)
17) To what extent do you agree with the statement “It is important for a doctor to be a medical expert”? (Likert)
18) Please rate how important you feel the following characteristics are in a doctor. If you don’t know how the statements relate to the practice of medicine, select “Don’t Know”. (Likert)
    a. Ability to integrate all of the CanMEDS roles.
    b. Possession of an appropriate body of clinical skills and knowledge.
    c. Ability to perform a complete assessment of a patient.
    d. Effective use of preventative interventions.
    e. Effective use of therapeutic interventions.
    f. Willingness to seek appropriate consultation from other health professionals.
19) Please describe what you think it means for a doctor to be a “communicator”. (O.R.)

20) To what extent do you agree with the statement “It is important for a doctor to be a communicator”. (Likert)
21) Please rate how important you feel the following characteristics are in a doctor. If you don’t know how the statements relate to the practice of medicine, select “Don’t Know”. (Likert)
    a. Ability to develop rapport and trust with patients.
    b. Ability to develop rapport and trust with families.
    c. Ability to accurately elicit information from patients.
    d. Ability to accurately elicit information from families.
    e. Ability to accurately elicit information from colleagues.
    f. Ability to develop a common understanding on issues with patients.
    g. Ability to develop a common understanding on issues with families.
    h. Ability to develop a common understanding on issues with colleagues.
    i. Ability to convey effective oral communication about a medical encounter.
    j. Ability to convey effective written communication about a medical encounter.
22) Please describe what you think it means for a doctor to be a “collaborator”. (O.R.)
23) To what extent do you agree with the statement “It is important for a doctor to be a collaborator”? (Likert)
24) Please rate how important you feel the following characteristics are in a doctor. If you don’t know how the statements relate to the practice of medicine, select “Don’t Know”. (Likert)
    a. Effective participation in an inter-professional healthcare team.
    b. Effective resolution of conflicts with other healthcare professionals.
25) Please describe what you think it means for a doctor to be a “manager”. (O.R.)
26) To what extent do you agree with the statement “It is important for a doctor to be a manager”? (Likert)
27) Please rate how important you feel the following characteristics are in a doctor. If you don’t know how the statements relate to the practice of medicine, select “Don’t Know”. (Likert)
    a. Contribution to the effectiveness of healthcare organizations.
    b. Contribution to the effectiveness of health systems.
    c. Effective management of a career.
    d. Ability to allocate finite healthcare resources appropriately.
    e. Participation in administration and leadership roles.
28) Please describe what you think it means for a doctor to be a “health advocate”. (O.R.)
29) To what extent do you agree with the statement “It is important for a doctor to be a health advocate”? (Likert)
30) Please rate how important you feel the following characteristics are in a doctor. If you don’t know how the statements relate to the practice of medicine, select “Don’t Know”. (Likert)
    a. Responsiveness to an individual patient’s health needs.
    b. Responsiveness to a community’s health needs.
    c. Ability to identify the determinants of health of the population.
    d. Promotion of the health of individual patients.
    e. Promotion of the health of communities.
    f. Promotion of the health of populations.
31) Please describe what you think it means for a doctor to be a “scholar”. (O.R.)

32) To what extent do you agree with the statement “It is important for a doctor to be a scholar”? (Likert)
33) Please rate how important you feel the following characteristics are in a doctor. If you don’t know how the statements relate to the practice of medicine, select “Don’t Know”. (Likert)
    a. Critical evaluation of information.
    b. Application of information to healthcare decisions.
    c. Facilitation of the learning of patients.
    d. Facilitation of the learning of families.
    e. Facilitation of the learning of students.
    f. Facilitation of the learning of other healthcare professionals.
    g. Contribution to the creation of medical knowledge.
    h. Contribution to the dissemination of medical knowledge.
34) Please describe what you think it means for a doctor to be a “professional”. (O.R.)
35) To what extent do you agree with the statement “It is important for a doctor to be a professional”? (Likert)
36) Please rate how important you feel the following characteristics are in a doctor. If you don’t know how the statements relate to the practice of medicine, select “Don’t Know”. (Likert)
    a. Commitment to patients.
    b. Commitment to the medical profession.
    c. Commitment to society.
    d. Participation in profession-led regulation.
    e. Commitment to physician health.

Personal code.

37) What are the last two letters of your first name?
38) What are the last two letters of your mother’s maiden name?
39) What is your gender? (M=male, F=female)
40) In what year were you born? (e.g. 1985 = 85)
28) On what date of the month were you born? (e.g. August 3 = 3)

Appendix V: Judge's Validation Questionnaire

Students are asked to rate their agreement to the following statements. We would like you to judge the degree to which each statement is relevant to the stated objective.

The first objective of the survey is to assess students' understanding of the stresses associated with medical school and residency training.

1) Please indicate the degree to which each statement fits with the objective "to assess students' understanding of the stresses associated with medical school and residency training" (1= Poor Fit, 5 = Excellent Fit).

    a. I know what financial stresses to expect in the upcoming years of med school.
    b. I know what relationship stresses to expect in the upcoming years of med school.
    c. I do not know what physical/health stresses to expect in the upcoming years of med school.
    d. I know what educational stresses to expect in the upcoming years of med school.
    e. I know what financial stresses to expect in residency.
    f. I do not know what relationship stresses to expect in residency.
    g. I know what physical/health stresses to expect in residency.
    h. I do not know what educational stresses to expect in residency.
    i. I know where I can access resources for help with financial stress.
    j. I know where I can access resources for help with relationship stress.
    k. I do not know where I can access resources for help with physical/health stress.
    l. I do not know where I can access resources for help with educational stress.

    Comments:

2) Do the above questions adequately represent the topic of students' understanding of the stresses associated with medical school and residency training? (Yes or No)
3) If no, what additional questions should be asked in order to adequately cover the topic?

The second objective of the survey is to assess students' feeling of readiness for clinical duties.

4) Please indicate the degree to which each statement fits with the objective "to assess students' feeling of readiness for clinical duties" (1= Poor Fit, 5 = Excellent Fit).
    a. I am comfortable writing medical orders.
    b. I am comfortable writing medical progress notes.
    c. I do not know how to complete a full history.
    d. I do not know how to complete a full physical exam.
    e. I am able to perform a variety of simple medical procedures (e.g. suturing, inserting a urinary catheter or NG tube).

f. I do not know what to expect when I am on-call in the future.
g. I understand how to make contacts in the medical profession to help with my future career.
h. I am confident in my ability to interact with patients.
i. I am confident in my ability to interact with patients' families.
j. I am not familiar with the roles of each team member in morning rounds.
k. I understand how to communicate with other members of the medical team.
l. I understand how to communicate with other health professionals.
m. I am not comfortable searching the medical literature.
n. I understand the role of a doctor in allocating healthcare resources.
o. I do not understand the role of a doctor in healthcare organizations.
p. I understand the role of a doctor in promoting health issues.
q. I am willing to make a professional commitment to my patients.
r. I am not willing to make a professional commitment to society.
s. I am willing to participate in doctor-lead regulation of the medical profession.
t. I understand what residency is and how it works.
u. I do not understand what CaRMS is and how it works.

Comments:

5) Do the above questions adequately represent the topic of students' understanding of the stresses associated with medical school and residency training? (Yes or No)

6) If no, what additional questions should be asked in order to adequately cover the topic?
7) Please name the highest position you have held in medical education administration (e.g., Clinical Coordinator, Program Director, Assistant / Associate Dean).
7) How many years have you been involved in teaching clinical level medical students and/or residents?
9) Questions/Comments.

Appendix VI: Sample Student Interview Guide

1) To start off, how was your shadowing experience?

    i) *What was the best part of the program?*
    ii) *What was the worst part of the program?*
    iii) *Why would you recommend the program to other students?*
    iv) *Should the program be continued next year? Should it be offered to all students?*

2) In a few sentences, take me through your typical shadowing experience.

    i) *What sort of tasks did your resident have you do?*
    ii) *What sort of tasks were you able to observe your resident doing?*
    iii) *What sort of practical things did you learn to do through the program?*
    iv) *How did this program compare to Gilbert's scholars?*

3) How did the program change your impression of what it means to be a doctor?

    i) *What were you expecting your resident to be like?*
    ii) *How were they different from what you expected?*
    iii) *Has the program affected what residency you are interested in?*

4) What did you learn about CanMEDS?

    i) *Was the program effective at teaching you about CanMEDS? Why or why not?*
    ii) *Describe a time you saw your resident use a CanMEDS role well.*
    iii) *Describe a time a situation might have been made better if your resident had used a CanMEDS role more effectively.*
    iv) *Did you learn about CanMEDS more by observing your resident or by performing the roles yourself?*
    v) *Is there something you did personally while shadowing that taught you about a particular role?*

5) What topics outside of medical knowledge did you discuss with your resident?

    i) *Did you discuss what it is like to be a student intern or a resident?*
    ii) *What did you learn about the stress involved with those jobs?*
    iii) *Do you feel more prepared to handle life as an intern or resident because of this experience?*

6) If you had a magic wand and could change anything at all about this program, what is the one thing you would change?

7) Have we missed anything?

Appendix VII: Resident Interview Guide

1) To start off, how was your shadowing experience?

    a. *What was the best part of the program?*
    b. *What was the worst part of the program?*
    c. *Why would you recommend the program to other residents? Would you do it again next year? Are you planning to have your student continue to shadow you?*
    d. *Was the workload more or less than you expected?*
    e. *Should the program be continued next year?*

2) In a few sentences, take me through your typical shadowing experience.

    a. *What sort of tasks did you have your student do?*
    b. *What sort of practical things did you teach your student to do through the program?*
    c. *How does supervising a first-year student compare to supervising third and fourth-year students?*
    d. *How did staff physicians react to your student's presence?*

3) What do you think your student learned about CanMEDS?

    a. *Was the program effective at teaching your student about CanMEDS? Why or why not?*
    b. *Did you teach about CanMEDS more by demonstrating the roles or by specifically discussing them?*
    c. *Do you think you learned about CanMEDS through your involvement with this program?*

4) What topics outside of medical knowledge did you discuss with your student?

    a. *Did you discuss what it is like to be a student intern or a resident?*
    b. *Did you discuss the stress involved with those jobs?*

5) If you had a magic wand and could change anything at all about this program, what is the one thing you would change?

6) Have we missed anything?

Appendix VIII: RMSSP Format, Rules and Guidelines

Introduction.

Welcome to the Resident-Medical Student Shadowing Program. This program is voluntary for both first year medical students and first year residents. As this is a pilot-study of a program in preparation for its future full-scale implementation data will be collected for research purposes. Participation in the program requires expressed written consent on behalf of all student and resident participants.

Matching.

Each resident participant will be randomly matched with a single medical student. In the event that there are more medical students than resident volunteers, medical students will be randomly assigned to either the intervention (matched with a resident partner) or control groups (not matched with a resident partner). All participants, regardless of group assignment, are required to provide informed consent. All matching is random and is not influenced by race, gender, professional interest etc.

Shadowing.

Shadowing will begin in September once medical student participants are recruited and matched to their resident partners. From then on, each pair will be expected to meet at least once per month for the duration of the medical school academic year (September-May). As such, a minimum of 9 meetings will take place. Pairs may elect to meet more often than once per month, depending on the interest and availability of both parties. Shadowing is to take place during the resident's regularly scheduled clinical activities. Possible shadowing environments may include but are not limited to:

-hospital ward
-outpatient clinic
-operating room
-emergency room
-any in–house on-call duties
-radiology/diagnostic imaging/laboratory

Shadowing may occur at any time when the resident would normally be working, depending on the medical student's availability. Each meeting should last approximately 4-6 hours, for example one morning, afternoon or evening. Medical students must not miss any of their regularly scheduled academic activities (lecture, small groups etc.) to shadow their resident. Each pair is encouraged to devise a schedule for shadowing times that will not compromise either's ability to perform their regular academic or work requirements. For example an over-night shift the night before a medical school exam would not be ideal.

CanMEDS.

Each month will be assigned one of the seven CanMEDS roles, with October being slated for a general introduction to the concept of CanMEDS. Each resident will be provided with an overview of the CanMEDS framework as well as information about each separate role. Residents are expected to have familiarized themselves with the

designated role before each shadowing session so that they can dedicate part of whatever time is available to informing their student about that role and how it relates to their practice as a resident. As one of the central goals of this project is for both residents and students to learn about CanMEDS, this aspect of the program should not be ignored in favor of purely clinical teaching.

Student responsibilities/supervision.

Medical students are to remain under the direct supervision of their resident partner during any and all patient interactions. Students are not to be employed solely for "scut" work without any educational benefit. However residents are encouraged to expose their student partner to all aspects of their job in order to gain a better understanding of the day-to-day work of a resident. The activities in which each student participates will vary from session to session and will be dependant on what the resident's duties are on that particular day. The amount of patient care responsibilities given to students must be carefully judged, keeping in mind the student's very junior level. For many students these will be the first patient interactions of their career, and their responsibilities should be assigned accordingly. In all settings, and especially in the realm of procedural skills, writing orders or providing medical advice, medical students must be closely supervised and never placed in a situation that would compromise patient safety. In all situations, the ultimate authority rests with the attending physician responsible for a given patient. Their decision regarding the extent of a medical student's patient care responsibilities is final.

Resident-student interaction.

This program is intended to foster an academic relationship between the participants, similar to the relationship between mentor and pupil. This interaction may extend into social settings if both parties agree, but in no circumstances is a romantic or sexual relationship between the resident and student permissible and will result in removal from the program.

Residents must not use their professional status to take advantage of their student partner in any way.

Any participant who is found to be using their position in the program as a means to take advantage of their partner will be removed from the program and reported to their program director and the Faculty of Medicine and Dentistry.

Participants are free to withdraw at any time without adverse consequences.

Evaluation of the program.

This program is the subject of a research study approved by the Human Ethics Research Board of the University of Alberta. All participants are considered research subjects and must provide informed consent in order to participate. The study of how this program functions will allow us to improve the program for future years and will hopefully provide the impetus for the creation of an official shadowing program for all future first year medical students at the U of A.

The efficacy of the program will be evaluated through the use of:

-Surveys –for both residents and students, to be completed at the beginning and the completion of the shadowing program. The consent form for the study will be included at the start of the first survey, therefore this survey must be completed before any matching or shadowing can take place.

-Evaluations –Students will be asked to evaluate the efficacy of their resident as a teacher and likewise residents will be asked to assess their student's progress over the course of the program

-Exam scores-The medical scores on selected exams will be used to assess their performance of skills related to CanMEDS

All results and data generated will be entirely anonymous and used only for research purposes. Survey responses, evaluations and OSCE scores will not be viewable by anyone but the investigators and will not impact participants in any way, including academically or professionally.

Tips/suggestions

-Try to relate your assigned CanMEDS role to something you are doing that day. For example if the role is Collaborator, demonstrate the aspects of that role as you consult another service, request a test/procedure, interact with other healthcare disciplines.

-Schedule your sessions in a time that is likely to be busy enough to be interesting and worthwhile, but not so hectic that it makes any teaching interaction impossible. Try to find the quick moments between working to sneak in your CanMEDS pearls.

-Residents, when appropriate, give your attending physicians and fellow residents a heads-up the day before your session. That way they will know what to expect when your student partner arrives and may even be eager to participate in teaching.

-Feel free to meet more often than once a month if you like. You can even continue your mentorship interaction beyond May into summer and even into the next academic years.

-Have fun!