

“Cells to Society”: A Course That Introduces  
New Students to Medicine’s Ideals, Values, and Culture

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**Abstract**

The authors and colleagues developed an introductory course for new medical students at the University of Virginia that is held on the first 2½ days of medical school. Called “Cells to Society”, it provides students with experiences that demonstrate the depth and breadth of medical education and medical practice. Students participate in a variety of active learning settings: the classroom, a resource fair, field trips to clinical sites and community organizations, patient interviews, small group discussions, independent learning in teams, and consultation with experts. Students report that they feel inspired and motivated by this participatory overview because it acquaints them with a wide variety of domains of knowledge and reminds them of the reasons they will be studying basic and clinical sciences: the care of patients. They also report pleasure and increased confidence as they become acquainted with fellow students and faculty in low-stress but purposeful activities.

## Introduction

The first few days of medical school present unique and often unrecognized educational opportunities. At most medical schools, and indeed until recently at the University of Virginia, the activities planned for new medical students during their first few days on campus generally do not receive the same level of thoughtful attention that is devoted to the rest of the curriculum. In a review of medical education literature, we found only one reference to integrating the first days of medical school with broader goals of the curriculum (Darling et al., 2006).

It is likely that most schools use this time, as we formerly did, to engage students in non-intellectual but necessary activities such as welcoming talks, registration, orientations to various services, and social events ranging from interest clubs to parties. Generally, these pre-curriculum activities are the accepted way to give students some transition time to acclimate and get to know each other prior to beginning the intense cycle of classes, labs, and studying that characterizes the first and second years.

This approach, however, represents a missed opportunity for students to encounter each other intellectually or to work together or with faculty on medical issues in a collegial spirit. Similarly, it provides no structure in which students can encounter faculty as intelligent, humane, and clinically skilled mentors.

But most importantly, this usual approach misses the unique opportunity to inspire students at the very beginning of their training with a vision of medicine as an integrated activity spanning science, clinical care, and social concern.

At the University of Virginia School of Medicine, an innovative two and one-half day course called “Cells to Society” seeks to present a broad and exciting experience of medicine to

about 140 newly arrived students. The program has been in place for the past five years and is now a cornerstone of our curriculum.

As were most of my classmates, I'm sure, I was very nervous about starting medical school, but this course helped me to remember exactly why I wanted to become a physician in the first place, and helped to transition my nervousness to excitement (quotation from student course evaluation).

### **Origins of the Course**

Faculty as well as medical students seek the “holy grail” of contemporary medical education: meaningful integration of the basic sciences with clinical medicine throughout the long years of medical school (Klein et al., 2002; Association of American Medical Colleges, 2004; Association of American Medical Colleges, 2006). In a similar quest for relevance, the public, government representatives, and health-related organizations and agencies express support for the application of scholarship to real-world problems in the form of translational (“bench to bedside”) research. These issues have intrigued and stimulated our School of Medicine and many others. In alignment with these trends, our dean asked us to develop a brief introductory course, Cells to Society (C2S), to demonstrate to students that taking care of a patient with an open and inquiring mind raises interesting questions in a variety of domains, including the clinical, biomedical, and social domains. Figure 1 shows the three medical domains addressed in the course with examples of the content of each.

—Insert Figure 1 about here—

We selected diabetes as a model illness that could readily be used to demonstrate the connections between and among the clinical, cellular, and social levels of medicine during the course. Our rationale included the following factors.

- Diabetes is widespread, serious, and costly (Centers for Disease Control and Prevention, 2008). All medical students will care for patients with diabetes during their training and all practicing physicians are aware of its impact on their patients.
- The care of a patient with diabetes always involves professionals in several disciplines and in multiple specialties.
- Thousands of scientists and clinicians worldwide carry out research on the basic science of diabetes and the clinical care of patients with diabetes.
- Because many of the risk factors for diabetes are modifiable with behavior change, the onset of type 2 diabetes can often be delayed or prevented. This focuses the interest in prevention that many medical students bring to medical school.
- Diabetes carries a powerful personal meaning for patients and families. Sharing their vivid and memorable stories about the course of the illness provides context and connection for the students.

We were able to get a taste of the big picture- how biochemistry, anatomy, and physiology all fit in to the clinical setting and society as a whole. Diabetes is a good example because everyone knows someone with diabetes and it is such a major health issue (quotation from student course evaluation).

### **Underpinnings of the Course**

We made a commitment to design the course using principles of adult learning (Knowles, 1990; Walker, 1999), recognizing that medical students are self-directed learners who can use their life experiences as a context for their learning. Medical students also are highly motivated by internal factors and ready to learn more. As future clinicians who anticipate caring for

patients, they look for practical, problem-solving knowledge and habits that will facilitate lifelong learning.

The faculty wanted the course to demonstrate that the School of Medicine values *teamwork* and *collegiality* as much as individual initiative and performance. On the very first day of classes, this course provides a programmatic counterpoint to the socially destructive aspects of competitiveness among students that can be part of the hidden curriculum (Hafferty and Franks, 1994).

Direct contact with live patients at the beginning of the course underscores one of the goals of medical education: caring and communicating effectively with persons who need medical assistance. Students hear first hand patients' personal stories about having diabetes and have the opportunity to question them about their medical histories, emotions, and experiences. This makes the experience authentic in terms of both educational content and personal perception.

Moreover, experiences out in the broader community help students to see the work of diabetes-related organizations and to understand some of the daily challenges of living with diabetes in the real world. Thus, they become aware that across the state there are many agencies and organizations that are working to reduce the burden of diabetes in Virginia.

It was both fun and exciting to get a brief preview of some of the things that we will be doing over our career. It was also a good way to get your feet wet and meet a lot of new people. I left the class excited about beginning medical school and starting my medical education (quotation from a student course evaluation).

### **Course Objectives**

With these underpinnings, the course objectives are to

- inspire and motivate students to learn the knowledge, skills, and values needed for the practice of scientific clinical medicine;
- help students focus on and connect the patient to all other aspects of the University of Virginia School of Medicine pre-clerkship curriculum; and
- provide a transitional experience that can help medical students begin to develop the relationships and skills that they need to succeed as students and to thrive as physicians.

### **Student Educational Objectives**

During the time that they participate in the course, we expect that each student will

- explain to peers a significant feature of diabetes in each of three areas: “clinical,” “cells,” and “society”;
- show peers how one or more clinical features of diabetes relates to a “cells” feature and to a “society” feature; and
- demonstrate respect for others, responsibility, and accountability during course activities.

These three objectives are the basis for a pass or fail grade.

### **Course Administration**

The course directors were appointed by the Dean and asked to form a committee to develop the course. Meeting over a period of 6 months, the committee developed the course goals and objectives as well as the student educational objectives and course activities. The curriculum committee was responsible for granting final approval; the same committee receives an annual report about the course and the evaluations completed by students.

We asked colleagues with specific expertise in diabetes to provide the short didactic sessions. Recruitment of faculty to co-facilitate small group activities was accomplished by sending e-mail invitations to clinical and other faculty members who had recently taught in the

first-year introductory clinical skills course and to faculty who were known as committed and effective teachers. We asked basic science course directors for recommendations of colleagues in the basic sciences. We have been delighted and gratified to have more than enough faculty participants every year. Similarly, it was easy to recruit hospital and community services, organization, laboratories, and individuals to participate in the resource fair and field trips. Almost all have been enthusiastic repeat contributors to the success of the course. Our budget is modest, between \$5000 and \$6000 per year. The most expensive items have been one lunch and one breakfast for the students and 3 or 4 busses for the field trips.

### **Course Activities: Day One**

#### **Overview of Course**

Welcoming the students to their first day of medical school classes, one of the course directors presents the course objectives, explains what is expected of the students (the student educational objectives), what will be assessed during the course, and describes the schedule of activities (see Table 1 for flow, length, group structure, and types of course activities).

—Insert Table 1 about here—

#### **Lecture: Pathophysiology of Diabetes**

From the very start, this course engages students and draws them into the puzzle of what diabetes is and how it is caused and treated. Since incoming students differ markedly with regard to their knowledge of diabetes, the course begins with an overview of what diabetes is, how it is diagnosed, its basic pathophysiology, and its long- and short-term complications. To do this successfully requires juggling the competing demands of breadth and depth of information. An experienced faculty member in endocrinology presents a lecture which provides an introduction to pathophysiology and clinical information about the disease.

**Lecture: Epidemiology of Diabetes**

The next step is to convey the impact that diabetes has on populations. While this would be important with any disease, it is fundamental to diabetes because of its rapid increase in prevalence, likened to a pandemic. A selected group of slides from the previous lecture are used in order to reinforce connections between the epidemiology of diabetes to its pathophysiology. For example, a slide from the pathophysiology lecture on the national prevalence of diabetes is used to introduce information on increases in diabetes prevalence over time as well as data on statewide and international prevalence. The lecture moves rapidly across and briefly explains topics such as diabetes risk factors, obesity, complications, and social correlates. Questions are posed throughout the lecture about the possible reasons for or implications of the data being presented. The questions serve to stimulate student thinking and provide possible starting points for the formulation of student learning objectives in the small group sessions (see Small Group Session One).

**Large Group Patient Interview**

Having listened to about an hour and a quarter of introductory information on diabetes, the students now encounter something less didactic and more “real.” A primary care physician introduces a diabetes patient who has volunteered to be interviewed before the whole student group.

So that the interview will be fresh and open to discovery, a patient is selected whom the physician has not met previously. It is important to choose a patient who can articulate the personal experience of managing the many medical, lifestyle, and familial aspects of diabetes self-care.

The patient interview draws the students in and makes them “co-investigators.” The physician conducts the first 10 to 15 minutes of the interview, getting basic clinical and historical information and putting the patient at ease. The physician also provides short, supportive explanations to the student audience as the patient brings up information that might be new to the students. When the interviewer asks the patient to respond to questions from the group, students invariably express appreciation to the patient and ask thoughtful, supportive questions. In addition, their questions sometimes reveal misconceptions or gaps in their understanding of diabetes that can then be clarified.

### **Interactive Presentation: How the Clinician Thinks**

After the patient leaves, the physician thinks out loud about the interview he has just conducted. Although all of our entering students have had some clinical experiences, they are often not very familiar with the core of physicians’ daily work: history-taking, physical examination, development of a differential diagnosis, and an evaluation and management plan.

As the interviewing physician explains why his line of questioning took the course it did, he shows the students his initial plan and explains any deviations. He points out statements by the patient that stimulated particular questions and makes comments about alternative possible lines of inquiry, explaining how what he has learned from the patient fits into his plan for further assessment and/or changes in the treatment plan. As a final part of this session, he invites students’ questions and comments on what they were thinking at various points in the interview.

I believe Cells to Society has made me aware of the need to keep myself grounded and in touch with disease processes and the experiences of my future patients (quotation from a student course evaluation).

### **Resource Fair**

Making use of diabetes-related services in the community and the hospital is a significant component of the patient's experience of having diabetes. Therefore, a diabetes resource fair is part of the first day so that the students can talk directly with representatives of groups that provide important diabetes services. Students are encouraged to use what they learn in selecting and developing team learning objectives in their small groups later that day.

The event is structured much like a job fair where there are no formal presentations. The participating services set up displays on tables and students are urged to explore, ask questions, and converse with groups that interest them. While the lack of structure creates anxiety for a few students, it conveys the message that knowledge in medicine is not spoon-fed and doctors are expected to be proactive in its acquisition.

Between 12 and 15 organizations participate in this activity, aggregated in separate rooms by three general themes: clinical services, finances, and information sources for patients and clinicians. While eating lunch, students can view a video depicting dozens of well-known public figures who have or have had diabetes.

I especially enjoyed seeing the way in which disease can impact so many parts of someone's life and the multiple medical domains that treat patients with the same condition (quotation from a student course evaluation).

### **Small Group Session One**

The small group session provides the environment for the students' most fundamental work in this course: developing their team learning objectives to research over the next day. Each small group comprises 9 students and 3 mentors – a basic scientist, a clinician, and a social scientist. After an introductory ice-breaking activity of the mentors' choice, they explain the purpose and schedule for the group.

The clinician takes the lead in preparing the students for interviewing a person with diabetes who comes to the group as a guest. There is no set agenda, other than getting to know the patient as a person and exploring with them their experience with the illness and with their health care team. To encourage collegiality, latitude is given as to whether to appoint a primary interviewer or to have students ask questions in a particular sequence or as questions occur to them. As the students interview the patient, mentors encourage them to delve a bit deeper into issues that are significant to the patient.

After the patient leaves, the mentor reviews the interview with the students, answering their questions about interviewing content and techniques, drawing their attention to particularly interesting aspects of the patient's story, and eliciting additional questions about the patient and his or her health that have come to mind.

Yes, I particularly enjoyed interviewing patients and talking with them about their experiences with diabetes. It gave me a 'light at the end of the tunnel' of the basic sciences years—to remember that I will be learning all of this science to help patients (quotation from a student course evaluation).

Students then choose two classmates from their small group and form a three-member team to develop their two learning objectives. One learning objective must relate a clinical feature of diabetes to a "Cells" feature, and the other must relate a clinical feature to a "Society" feature. The center triangle in Figure 1 illustrates the small group learning objectives as focusing on a topic that combines the clinical domain with either the cellular or social domain. Mentors guide the students to select appropriate objectives that fit those criteria, can be readily researched in an hour or so, and are sufficiently detailed to be interesting to the group as a whole—yet without focusing on minutiae. The course directors encourage creativity.

## **Course Activities: Day Two**

### **Introduction to On-Line Library Resources**

Using diabetes for her examples, a library staff member provides a presentation in which she demonstrates to the students the features of the UVa Health Sciences Library's website that will be helpful for researching their learning objectives as well as throughout the pre-clerkship curriculum. Her goal is to help them use search tools that are appropriate for the range and depth of their searches.

### **Field Trips**

Students take field trips to sites that relate to care or self-care for diabetes, e.g., research labs, clinical sites, grocery stores, neighborhood clinics, a prosthetics and orthotics shop, a podiatry office, a physical therapy unit, a dialysis unit, and a summer camp for children with illnesses. Each site is hosted by a faculty member or local employee who is knowledgeable about the work conducted at the site and the goals of the C2S course. The students are randomly assigned to sites and charged to learn about the organization or resource, its staff, and the services it provides. Each field trip lasts about one hour, plus travel time. Buses are provided for travel to off-site locations. Volunteer upper-class medical student guides help the new students find their sites.

### **Team Independent Study Time**

After returning from their field trips, students have three hours to research their two team learning objectives and develop a presentation for the other students and the faculty in their small group.

### **Small Group Session Two**

Each team presents the results of its research on two learning objectives that relate clinical features of diabetes to cells and society features. Students are told that each presentation must last less than 10 minutes. Presentations have included oral reports, skits, videos, and poems. Table 2 contains representative samples of student learning objectives. Afterwards, the students develop additional questions to ask the expert panel they will see the next day.

I particularly enjoyed the small group sessions, where students had to formulate learning objectives from a clinical standpoint and relate them to cells and society (quotation from a student course evaluation).

—Insert Table 2 about here—

### **Course Activities: Day Three**

#### **Lecture: Current Basic Science Research on Diabetes**

A basic scientist or a clinician with a basic science research background presents a brief overview of one of the exciting new developments in diabetes research being conducted at the University of Virginia. He or she focuses on how this research affects or has the potential to affect the clinical care of a patient.

#### **Lecture: National and International Epidemiological Perspective on Diabetes**

In order to cover the conjoined twin epidemics of obesity and diabetes and the exponential increase in resources that is outstripping these epidemics, a clinician-scientist—who was president of the American Diabetes Association (ADA)—reprises his 30-minute Presidential Address to the ADA (“The Sheep, The Ostrich, The Ant, Diabetes, and the Tragedy of the Common”). He asks the students to think about non-technological solutions, i.e., prevention, as the only sustainable approach.

#### **Expert Panel Discussion**

Next, students have the opportunity to question a panel comprising consumers of diabetes care and experts from the entire range of fields that study and treat patients with diabetes. The panel includes patients, their families, clinicians, basic scientists, and social scientists. A faculty mentor serves as moderator and ensures that each panel member has the opportunity to respond to at least one question in his or her area of expertise or experience.

### **Lecture: Motivational Wrap Up**

As a demonstration of how the cells to society concept applies beyond diabetes, the dean who suggested C2S as a course tells the story of his personal experience as a pediatric cardiologist treating a patient with congenital heart disease. He intertwines his own clinical and basic science research that resulted in a life-saving medication being recommended for children who had undergone corrective surgery for Tetralogy of Fallot. He then describes the fatal consequences for one of his patients who could no longer afford her medication after her Medicaid ran out when she turned 19. This dramatic story links the cellular, clinical, and societal ramifications of caring for patients.

I felt like the course was successful in tying together the biology/biochemistry and social impact of the disease for me. I liked being able to discuss both in the same setting, and to see where the two sides met (quotation from a student course evaluation).

### **Course Evaluation**

Because of the innovative nature of the C2S course, we have been particularly eager to hear the students' reactions. An anonymous, web-based evaluation questionnaire invites their subjective and experiential narratives. Students are asked for their reactions to the course as a whole: "Was it helpful to start medical school with a broad introduction to a medical topic?" In

addition, we ask for their reactions to each course components. Students are asked what they learned about the faculty, classmates, and themselves. Their suggestions are solicited for improving the course and they are asked to grade the course.

The students' response to this course has been overwhelmingly positive. When asked whether it was helpful it was to start medical school in this way, 99.49% of the students have responded "Yes." In the comments, several themes emerge: excitement at experiencing the scope of medical practice, affirmation of their attraction to medicine and to patient care, delight at getting to know their bright and collegial classmates, and appreciation of the dedication of faculty and community participants in the course. They also express relief at being gently eased into the academic challenges of medical school after at least a summer away from school. Based on the Resource Fair and Field Trip experiences, students comment on their new appreciation for the wide range of professionals that care for persons with diabetes and their interest in eventually working as part of an interprofessional team.

Student comments about the faculty have been so positive as to make us wonder what they had been expecting. In response to an open ended query, "What did you learn about the faculty?" students consistently remark on the friendliness of their small group mentors and their interest in teaching. "Helpful" and "approachable" were the two most commonly used terms. Students also comment on the mentors' interest in continuing their own learning.

In response to being asked what they have learned about themselves and their classmates, they reveal their relief at fitting in with fellow students from very diverse backgrounds and a common interest in science and service. Pleased with their performance on the learning objective team, they often remark about their enjoyment of collaborative rather than competitive learning. Their suggestions about potential improvement in the course are usually positive and helpful. For

example, the patient interview in the small groups was added in the second year of the course on the basis of suggestions by students. Clinical field trips are always favorites and we strive to place as many students as possible in settings where they can encounter or envision “real patients”.

The course grade has ranged between A- and B+, and is generally the second highest rating among the first year courses.

In summary, students tell us that they have received and absorbed a credible message of welcome to the school. The course immerses them in collegial non-competitive interactions with faculty and classmates in low stress situations. They have become introduced to the school’s learning culture and they express enthusiasm about the educational challenges ahead.

They have also learned that taking care of a patient requires a physician to attend to issues that range from the molecular level through the clinical realm and into socio-cultural spheres—the basic premise of this course. Students tell us that they look forward to applying knowledge and skills in all three areas. As one student noted, “Cells to Society places us on the path to being patient-oriented physicians.”

An unexpected benefit of the course is the student perception that they have demonstrated their individual competence as learners, and specifically as medical students. We believe that their C2S experience will also serve as a realistic model for the kind of life-long learning that they will engage in after their formal training ends. Continuing medical education conferences generally rely on lecture and small group formats, and most clinicians interact on a daily basis with allied health professionals and community service organizations in a variety of roles. Later in medical school, several students have asked us, “Why can’t all of medical school be taught like Cells to Society?” When asked to elaborate, they seem to be seeking a high degree of

integration of basic science with clinical material in active self-directed learning environments.

As the UVa curriculum undergoes significant change in precisely these directions, it promises to meet this expressed need.

Similarly, course faculty have told us on course evaluations as well as in person how much they enjoy being with the new students as they experience active learning in a low stress setting. They appreciate the students' respectful curiosity about patients, their thoughtful questions about diabetes, and their creativity and energy in developing their presentations of their learning objectives to their small group.

My experience as a mentor was both fulfilling and enjoyable, especially in discussing the societal aspects of diabetes. The students seemed to be quite engaged with all three domains, and asked thoughtful interview questions and presented extremely interesting responses to their learning objectives (quotation from a faculty course evaluation).

The clearest indication of their enjoyment of the course is that more than half of the faculty presenters and small group co-mentors have volunteered to participate in at least three of the past five years for four hours of teaching within one week – in early August! We have not directly reimbursed faculty for their time, but their departments receive funding from the dean's office for their participation in medical education.

### **Discussion**

What have we achieved by implementing C2S as the introductory medical school experience for our students? Students tell us that they have received and absorbed a credible message of welcome to the school. They report that they have been excited by exposure to important parts of the larger world of medicine. In addition, they have succeeded in collaborative

work with classmates and they have produced something tangible to share with their classmates and to serve as evidence of what they have learned. We acknowledge that assessing any lasting impact the course might have is difficult, if not impossible. We accept the students' comments in their evaluations as evidence of a short-term positive effect.

Beyond the experiences that the students readily perceive and appreciate, however, we think we see additional benefits to the students and to the institution. We believe that they have participated in a genuinely meaningful orientation to a true vision of what medical school can be. The students are open and susceptible to influence in their first days at the institution. This allows them to partake of a thorough, total-immersion, and multidimensional experience of connection with medicine, medical education, their classmates, faculty and often, with one or more patients. They tell us clearly that they feel reassured that medical school will prepare them for caring for patients at several levels: biomedical, personal and socio-cultural.

In addition, faculty participants speak of the rewards of working with newly discovered colleagues from a different type of discipline in a uniquely collaborative and integrative teaching model.

I enjoyed my participation as a clinical mentor. All three of the mentors played an important role in bringing out different issues/factors around diabetes (quotation from a student course evaluation).

As proponents of quality in medical education, we and our colleagues had ambitious reasons for creating this course and spending time and effort to support it each year. In our view, the first week of medical school is not only an introduction to four years of undergraduate medical education; it is the beginning of a lifelong learning process in medicine. As such, we

think the experience provided to students during their first formal exposure to medicine should be emblematic of its ideals and culture.

Our immediate aim is to provide a better way to orient new students to four years of medical school, but our long-term goal is to inspire our students toward a vision of medical practice that transcends the narrowing of focus that will necessarily occur in coursework and clinical training. We believe this vision is shared by many faculty members at UVa because each year, our course mentors tell us how important this teaching commitment is to them and change their schedules where necessary so that they can participate. We wish to encourage curriculum administrators and decision makers at other medical schools to reflect on the use of the initial week of medical school and consider using the time to accomplish broader educational goals.

#### **Practice Points**

- The first few days of medical school present a unique opportunity to engage new medical students in learning activities that introduce them to and immerse them in an institution's academic and cultural values.
- Students and faculty respond very positively to an intense, multi-dimensional introduction to a common disease and to the perspectives of a wide range of professionals, both in the university and the community, who help patients with that disease.
- Students feel privileged to be able to be able to engage patients in meaningful discussions of their disease as part of their introduction to medical school and the medical community.
- As they begin their medical school experience, students very much value the opportunity to interact with their peers in a series of cooperative, rather than competitive, learning experiences.

- Students appreciate seeing firsthand that their medical school experience will prepare them to understand and work with patients at biological, clinical, and societal levels.

### **Notes on Contributors**

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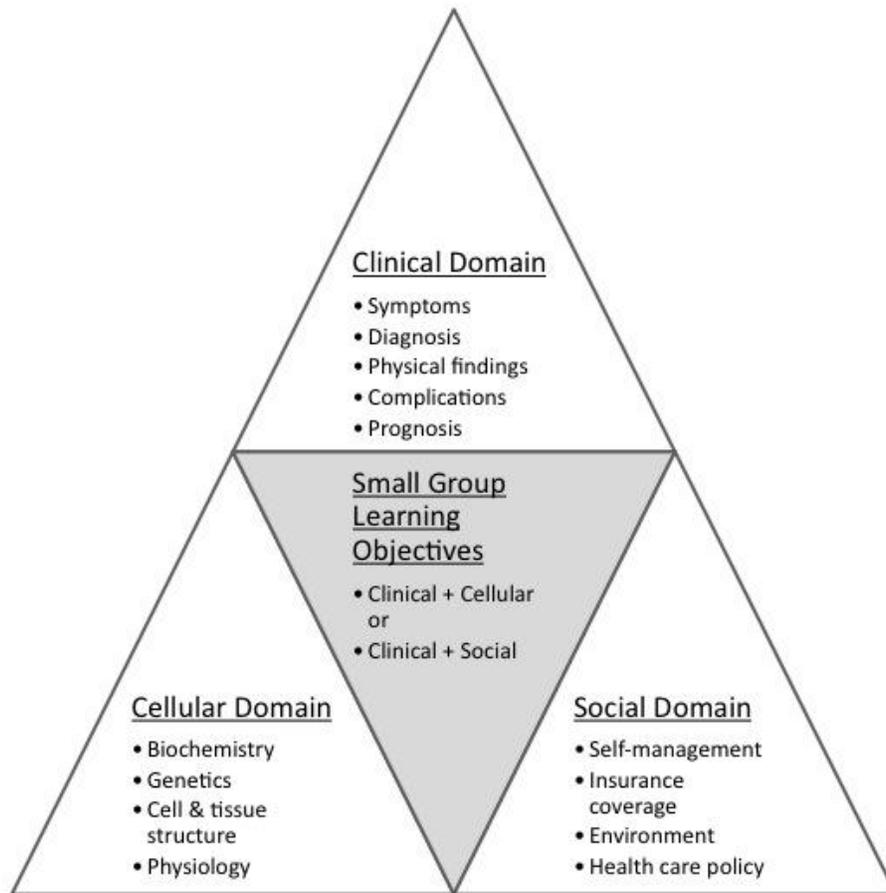
### **Declaration of Interest**

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*Figure 1.* Pyramid showing the three medical domains addressed in the C2S course with examples of the content of each. The center triangle shows the small group learning objectives as focusing on a topic that combines the clinical domain with either the cellular or social domain.

Table 1

*Flow, Length, Group Structure, and Types of Course Activities*

Day 1 Course Activities	Overview of Course	Pathophysiology of Diabetes	Epidemiology of Diabetes	Patient Interview	How the Clinician Thinks	Resource Fair	Small Group
Length (minutes)	30	35	30	30	35	135	120
# of student groups (# of students per group)	1 (140)	1 (140)	1 (140)	1 (140)	1 (140)	4 (35)	16 (8-9)
Type of learning activity	Lecture	Lecture	Lecture	Interactive question and answer	Interactive lecture	Self-directed exploration and learning	Group discussion/patient interview
Day 2 Course Activities	Library Presentation		Field Trips	Independent Learning		Small Group	
Length (minutes)	60		120	180		120	
# of student groups (# of students per group)	1 (140)		19 (2-19)	Individual (140)		15 (9-10)	
Type of learning activity	Demonstration/lecture		Presentation/observation/discussion	Self-directed study		Student presentations and group discussion	
Day 3 Course Activities	Current Basic Science Research on Diabetes	National and International Epidemiological Perspective on Diabetes		Expert Panel		Wrap Up Lecture	
Length (minutes)	30	30		60		45	
# of student groups (# of students per group)	1 (140)	1 (140)		1 (140)		1 (140)	
Type of learning activity	Lecture	Lecture		Interactive question and answer		Motivational lecture	

Table 2

*Representative Student Learning Objectives*

Clinical + Cellular Objectives	Clinical + Social Objectives
Persons with diabetes often develop numbness in their feet. What is the molecular mechanism of diabetic neuropathy?	Amputation rates for complications of diabetes are higher in certain ethnic groups. What are the factors that contribute to these higher rates?
Pima Indians are at very high risk for developing diabetes. What are the possible genetic factors that contribute to that risk?	What are the environmental factors that might contribute to the high rate of diabetes among Pima Indians?
Erectile dysfunction is common in men who have diabetes. What is the mechanism?	What are the costs and side effects of treatments for erectile dysfunction?
Obesity is a risk factor for developing diabetes. What is the role of the fat cell in diabetes?	The prevalence of obesity is increasing. What programs are in place to prevent or mitigate this problem?