HOW WILL WE GET THERE?

Evaluation: the engine that drives us forward — or back

Henry Mandin, MD

In looking at the title I was assigned, “The engine that drives us forward — or back.” I thought I would try to show that the Medical Council Qualifying Examination (MCQE) will not drive us back, although there is this potential in examinations. Dr. Dale Dauphinee (executive director of the Medical Council of Canada) and I started discussing this talk in January 1999, when the Medical Council’s newly revised objectives were first completed. These objectives were intended to serve a dual purpose: first, to guide candidates seeking licensure and the test committees writing questions and, second, to guide medical schools in establishing objectives for their own programs.

The well-known GEPEP report of 1986 made various recommendations to promote change in schools of medicine; but a decade later, the Association of American Medical Colleges, was concerned that little change had in fact occurred. Two barriers to change were identified, 1 relating to the National Board of Medical Examiners, and it was recommended that “serious consideration should be given to the Liaison Committee of Medical Examiners (LCME) prohibiting the use of licensure exam scores for students’ advancement in the curriculum.” These actions reflected the view that examining bodies could effect change but also that examinations are a 2-edged sword. A task force with the initials ACMETRI, short for “Assessment of change in medical education; the road to implementation” was established. This task force recommended the Medical Schools Objectives Project (MSOP) and this body published its first report in Academic Medicine, January 1999. Its goal was “to provide a guide to medical schools in establishing objectives for their own programs.” At this time (January 1999) we had completed the final draft of the Medical Council’s Objectives for the Qualifying Examination, which are intended to guide candidates seeking licensure. As you will see, there are both similarities and differences between the objectives of an examination body and of the medical schools. Differences are particularly apparent in the conceptual guidelines that are used by medical schools when they look at curricular change and the guidelines we used in developing the 2nd edition of objectives for the Medical Council (Table 1).

Now these are the conceptual guidelines that we followed at the Medical Council. When you are thinking about change, the first thing you do is to review your own curriculum, and you probably review other curricula as well. Those of you who have undergone any sort of curricular change will recognize similarities in the process. Y ou identify the product that you want to produce, the graduating physician, and appropriately there will be emphasis

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<th>Table 1: Conceptual guidelines for the 2nd edition of the Medical Council of Canada’s Objectives for the Qualifying Examination</th>
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<td>Review existing objectives</td>
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<td>Emphasize professional attitudes</td>
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<td>Develop a basic philosophy</td>
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<td>Establish a scientific base for clinical practice</td>
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<td>Assign priority to problem solving</td>
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<td>Deduce learning objectives from desirable terminal behaviour</td>
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on the professional attitudes of the graduating students. If there is any item that does not get enough emphasis in this process, it is developing a philosophical basis for the curriculum. Whether or not you agree with the McMaster University curriculum, as an example, I think you will all agree that it is based on a consistent philosophy of education, whereas some curricula, particularly if you compare 2 or 3 different models, force you to wonder whether there is an underlying philosophy.

In developing the objectives for the Medical Council, we did attempt to develop a basic philosophy. One point we felt very strongly about (and this was prior to this meeting being called) was to establish a scientific basis for clinical practice. We believed that this was essential, and certainly most medical schools regard this item similarly. They also assign priority to problem solving. Deducing learning objectives from desirable terminal behaviour may or not occur, and it is very important for any set of objectives or curricula to establish methods of maintenance — keeping it up to date — and evaluation.

I do not wish to discuss each of these guidelines, but to focus on just 2: (1) developing the basic philosophy and (2) establishing a scientific base for clinical practice.

In developing a basic philosophy there are differences between the approaches of examining bodies and medical schools based on their goals. “Licensure requires that examination content express the profession’s relations with the external world of human activity; in place of cognitive theory, the central focus of validation should be professional theory.” At the Medical Council we take this very seriously, and this is, in fact, how we started with the main focus on professional theory. However, I shall attempt to convince you that this has been developed in concert with cognitive theory, taking account of the principles laid out by Dr. Geoffrey Norman (Table 2).

Using this “clinical presentation” (CP) model because it is respectful of the physician’s primary task, we say that each health need is viewed as a CP, and furthermore that all of these CPs, viewed as a totality, ensure that the entire domain of medicine is comprehensively covered. We believe this because of an assumption made some time ago that the responses of the human body to an infinite number of situations or injuries is finite and stable. One reason we are confident that our assumption is valid is that many institutions that generate similar inventories, generate virtually identical lists. In 1973 at the University of Calgary we had to produce our first clerkship. The curriculum committee at that time decided that this should be a very innovative curriculum, and I think that the “Do it yourself clerkship” we produced fits that mould. This curriculum remained in place until 1979; it was published in 1978 by the Kellogg Center for Continuing Medical Education as a pamphlet entitled Medical Education Since 1960: Marching to a Different Drummer.* This curriculum was based on CPs. In 1979, there was a personnel change, and the innovative curriculum was scrapped and replaced by a very regular, rotation and discipline-dependent curriculum. The original innovative curriculum lay dormant until 1988 when the first draft of the first edition of the Medical Council’s objectives was available (this was published in 1992). When these 2 documents (the original “Do it yourself clerkship” and the 1988 MCC objectives) were compared, the 2 inventories based on CPs were virtually identical. Given the passage of 15 years between generation of these documents, we decided that the lists were indeed stable; the 2 lists were combined, circulated around our faculty in Calgary for 2 years, and in 1994 we started a new curriculum based on some 120 presentations.*

When, in 1998, the University of Florida, Gainesville, decided to use the same approach, it independently generated a virtually identical list. In 1999 a listing went to all of the test committees of the Medical Council, and with only 2 or 3 minor changes the same inventory remains. The University of Manchester described its new curriculum in 1999, referring instead to “indexed clinical situations” but, Table 2: Developing a basic philosophy: professional theory. The clinical presentation (CP) model

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<td>Respectful of physician’s primary task, the health needs of individuals and society</td>
<td>CP: the human responses to an infinite number of situations are finite and stable (e.g., hematuria, headache and hypertension).</td>
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<tr>
<td>Each health need viewed as a CP.</td>
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again, this was a virtually identical list. Similarly for
the University of Glasgow. And it is interesting that
Sweeney refers to the “cardinal manifestations of
disease” in Harrison’s *Textbook of Medicine* for a
similar purpose. These differ from our CPs only in
that the latter are not confined to disease but consid-
er other situations in which professional competence
is required.

In the chapter by Sweeney to there are 2 sentences
with which I cannot wholly agree. He writes: “The
temptation to cover everything must be avoided; if
there are no gaps, the curriculum is overloaded.” I
think it depends upon how you look on it. In any 1 of
the CPs you could have a dozen diagnostic condi-
tions or 120 diagnostic conditions. But if you were to
look at common things or prototypes, I believe it is
absolutely possible to define a comprehensive cur-
riculum by dividing the whole domain of medicine
into smaller areas, and I think the number is 125 ± 5
(depending upon whether you are a lumper or a splinter)
without overburdening the students. The reason I
believe that it is important to be comprehensive and
not to leave too many gaps (holes in the Swiss
cheese) comes from cognitive psychology. The cog-
nitive psychologists tell us that clinical expertise is
domain specific and does not generalize across
domains; put differently, a gap will remain a gap.
Regehr and Norman state that “true understanding of
a domain is defined not simply by the quantity of
information that a person possesses, but by the extent
to which this information is organized into a coher-
ent, mutually supportive network of concepts and
examples.”

Now what do we mean by a network? First of all let me assure you that I have no direct
pipeline into what goes on in your brain, or in my
brain, but this is a guess at how a network or scheme
may look. The reason I say it is a guess is the impos-
sibility of knowing how memory is organized. When
we initially started the curriculum in Calgary, we had
no idea that there was some sort of organization to
knowledge. However, when we asked our faculty to
write objectives for the various CPs, there emerged
quite spontaneously a very organized structure.
Objectives were not written in a helter-skelter man-
ner. The organization for 1 such presentation is
shown in Fig. 1.

**Fig. 1: Organization for the clinical presentation of hypertension.**
Attached to the CP were certain fairly generic skills, such as utilization of evidence-based medicine, and a variety of professional attributes such as communication skills, cultural sensitivity and ethical behaviour. But in addition, in order to deal with this domain, the author organized it into “chunks” or “small worlds”; “chunks” is the word that Geoffrey Norman uses and “small worlds” is the phrase Vimla Patel uses, but it is the same idea, and these chunks, small worlds or categorizations are often based on basic science concepts. Sometimes these will be anatomical, sometimes physiological or sometimes biochemical, and then they would go into still smaller worlds until finally they got down to causal conditions or diagnoses, and then within these they could define clinical objectives or clinical findings and basic science concepts, which would bring them all together. The actual example in this figure is the scheme we use in our curriculum for hypertension.

This is a very common scheme, which any internist would recognize, and it is based on Ohm’s law. Everyone would not use this precise organizational structure, but we make it very plain to our students that it really doesn’t matter what structure they use, as long as there is a structure that is meaningful to them personally. But as a beginning they are provided with this idea of how they may want to structure hypertension, and we point out to them how Ohm’s law fits into the scheme: pressure equals flow multiplied by resistance.

Inherent in this relationship are a whole series of basic science concepts to do with cardiac output and stroke volume, myocardial contractility, vasoactive substances, and so on.

**Question from the audience:** Suppose I am a first year medical student; looking at this, without any basic science background, it appears that many basic science questions are being asked. Is that what you intend?

**Answer:** Not only do we intend to do it, but we suggest to faculty that basic science concepts to be learned by our students be identified from the scheme at the beginning of each CP. This scheme is what I referred to as “the big picture.” The basic science concepts identified are essential for comprehension. Once identified, learning opportunities are to be provided to our students so that they may learn what is needed to understand this particular domain, in this example hypertension.

I want to stress that the CPs reflect aspects of physician–patient encounters.

**Question from the audience:** Why is glaucoma not considered a CP whereas hypertension is? Both situations are concerned with increased pressure.

**Answer:** A person may go to a physician after having been to a mall and had their blood pressure checked and say that their pressure is elevated. On the other hand, it is doubtful they will say, “I have glaucoma,” but they might say, “I have problems with my vision” or “pain in my eye.” So the definition of these presentations is based in physician–patient encounters.

We have tried to define these presentations as reactions of the human body to some situation or injury and to reduce these to a minimum. For example, there are thousands of different causes of inflammation, but inflammation has only 5 presentations: pain, redness, swelling, heat and loss of function. Each of these could be 1 of the presentations.

So the definition of 1 of these schemes is a mental categorization of knowledge that includes a particular organized way of understanding and responding to a complex situation. This is simply what we do to comprehend it, to remember it and to store it, and therefore these schemes are useful both for the storage of information in memory and for retrieval, so it is also useful as a search strategy. Schmidt and colleagues and Bordage and Zacks have suggested that within our minds we have a variety of knowledge structures such as that shown in Fig. 2.

First, although there is an implication here that these steps are sequential, that is not the case. Various medical domains exist in our memories at the same time in any 1 of the stages identified in this figure. Some domains in which we are relatively ignorant are represented in our memory as reduced knowledge or unconnected knowledge, whereas other domains in which we are more expert will exist in one of the other formats, such as elaborated causal networks. Such a network would include clinical findings and taxonomy and sciences basic to medicine all linked together to understand a problem, and then, through use, as Norman suggested, these become compiled and abridged and easier to recall, eventually becoming what he describes as illness scripts or incidence.
scripts, which means you can actually remember a case representing the CP. Nevertheless, I believe it is true for any one of us here, in the fields in which we are expert, we have in our mind at this very moment some knowledge that is at 1 stage of organization, and some knowledge in a different stage, and so on. Even when we are experts, we are not expert in everything, we are expert in a very narrow domain, and in the other areas we can be at any stage of lesser sophistication. These schemes are very useful because they direct our perception, link the concepts we build and permit our energies to be used selectively. Without some sort of framework we cannot even begin to learn so that it is important to have these organizational structures right up front. We had a great debate in our faculty as to whether we should make schemes explicit or let the students discover them on their own. Eventually the decision was made to make them explicit simply because they do direct attention. This is similar to the use of broad concepts that Sweeney (loc cit) refers to as providing a scaffolding for assimilation, therefore making learning possible and allowing comprehension and elaboration. According to the cognitive psychologists, 1 available mode of learning is assimilation, which simply means adding detail to the scaffolding. When we find a new fact that doesn’t quite fit in with the scheme we have in our mind, we have to remodel it a little, but when new information is absolutely incompatible with our “mind-map,” we have to destroy it. This can be extremely hard to do and that is why, when I look out over my audience, I see a lot of disbelief because some of the things I am saying don’t fit in with your (editor’s italics) schemes. So for you to believe what I have to say, you have to destroy something which you have believed for most of a lifetime and this is very, very difficult. But when our students learn a new field, they have to develop and adopt new schemes. If you provide these, they are very receptive. On the other hand, if you don’t provide some structure, if you allow them to make up their own schemes, trying to change them later may be extremely difficult, and this is another reason why we think it is useful to pro-

![Fig. 2: Knowledge structure and strategy for problem solving.](image-url)
provide some sort of structure when students are learning of a new field.

Now I must return to the affairs of the Medical Council of Canada. I have defended the use of a comprehensive set of objectives, which at the Medical Council divides medicine into 127 domains, and my defence indicates the attention we have paid to cognitive theory. We have organized each domain along the line of a scheme with the causal conditions identified. So far all we have identified as objectives at the Medical Council are the clinical objectives, but we are very interested, and are going to try to seek your support and the support of every school across Canada, to have basic science concepts attached to each of these 127 domains. We think this would be extremely useful for the comprehension and utilization of these basic science domains in diagnosis and management.

**Question from the audience:** Are you including anything as fundamental as physics here?

**Answer:** I am not even beginning to attempt to identify the discipline. All I would say is that whatever it takes to aid the comprehension of these 127 domains is relevant. If it is physics, so be it.

I will speculate that the methods students use to problem solve depends on the degree to which these domains are developed in their minds. If the knowledge is unconnected or acquired simply by rote memorization, “search and scan” or hypothetical deductive reasoning is going to be their fallback position, the approach all of us use in a domain we are not familiar with. When I have to deal with a neurology problem or a dermatology problem, that is where I am at. On the other hand when I deal with a nephrol-

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**Fig. 3:** Example of the scientific base objectives for clinical practice.
ogy problem, most of the time I simply recognize the problem and don’t have to do any thinking at all. But for medical students who are not yet experienced, everything is new, and this is the type of enquiry we should aim for, an organized enquiry based on logic that is implicit in the basic sciences. This is why I think it is useful and important to establish a scientific base for clinical practice, and Fig. 3, dealing with acute renal failure, serves as an example.

I think there are 2 things that should run consistently through our programs. For the first, I shall quote directly from McMaster philosophy as expounded by Sackett and colleagues,12 “We do have to practice evidence-based medicine which is the explicit, conscientious and judicious use of current best-evidence in making decisions about patient care.” But for the second, we cannot forget that we must practise medicine in a manner that reflects the theoretical underpinning of clinical diagnosis and management, and this includes its scientific basis. I think these 2 are equally essential.

At the Medical Council we have completed the clinical objectives. What we would like to do now is another pilot project. If we look at these clinical objectives and then discuss them with various people and faculties across the country, we should be able, for example with anatomy and histology, to decide what is required to understand the domain (Fig. 3) in terms of the anatomy and histology of the kidney, the cortex, the medulla, the collecting system and so on; equally, the physiology and the pharmacology are essential to understand this domain and its pathology, immunology and genetics.

The way we are thinking that we could do this is by utilizing the method we have developed to establish maintenance and evaluation methods (Table 3).

When we finished the objectives in January 1999, I contacted every single medical school in Canada and asked them if they would be willing to adopt 10 CPs and review them initially for the edition that is coming out in a couple of months, but in addition, subsequently review 5 of them per year so that every 2 years automatically these are updated. To my surprise and amazement, every single medical school across Canada has agreed. In fact, in January 1999 I sent each medical school 10 CPs. The vast majority were returned to me with comments, editorial suggestions and with a whole series of helpful hints, which were immediately incorporated into the edition which is coming out.13 Once the new edition is out in October, the review and update will be started at a rate of 5 domains per year. At the same time we are going to try to integrate legal, ethical and organizational objectives with the appropriate clinical presentation, and as a pilot project we would like to suggest that as we go through each of the 5 domains each year, we would develop the basic concepts and eventually write objectives. Once this is done, and prior to going to print, the Medical Council will submit this material to a focus group, so that when the 3rd edition comes out in 2001 or 2002 we would like to have what we will call CLEOS (clinical, legal, ethics, organizational and scientific objectives) for each of these 127 presentations.

This is the initiative that is presently under way. Your interest and comments would be very helpful.

References


4. Mandin H, Watanabe M. The “do-it-yourself” clinical clerkship at the University of Calgary. In: Hunt AD,


