Problem-based learning in sports medicine: the way forward or a backward step?

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Self-directed problem-based learning vs traditional didactic courses

As sports and exercise medicine (SEM) develops as a postgraduate specialty, training curricula are increasingly becoming sophisticated and developing along the principles of current educational theory. We have a problem, however, that at the present time the majority of sports physicians are graduates of “traditional” didactic medical courses, whereas the future generation of trainees will come from a more progressive learning environment with self-directed “problem-based learning” (PBL) principles in their undergraduate courses. The usefulness of this approach in postgraduate SEM education remains both problematic and unproven.

TRADITIONAL LEARNING MODELS

Medical schools as we know them began in the early Renaissance period in southern Europe and were under the jurisdiction of the Roman Catholic Church. In later centuries, medicine was taught by a lengthy apprenticeship system with various medical colleges arising in order to provide primitive training (eg, anatomical dissection) and a form of licensure.

Sir William Osler (1849–1919) was a Canadian-born physician who is largely responsible for many of the things that we take for granted in medicine today: university-based medical education, a strong underpinning of basic science for clinicians and an emphasis on bedside learning. Perhaps his greatest contribution to medicine was to insist that students learned from seeing and talking to patients, and this approach led to the establishment of the medical residency programme within hospitals. He himself liked to say, “*He who studies medicine without books sails an uncharted sea, whereas he who studies medicine without patients does not go to sea at all.*”¹

Osler’s textbook, *The Principles and Practice of Medicine*,² became the standard text of internal medicine following its publication in 1892 and the basis of most medical education. He stressed that the derivation of the word *diagnosis* comes

from the Greek words *dia*, which means “by”, and *gnosis* which means “knowledge”, and maintained that the function of a physician was to be able to identify disease within an individual patient. Osler believed that the best textbook was the patient himself and analysis of anatomy, physiology and pathology were the keys.³

Up until the last 20 years, anatomy was one of the pillars of medical education with most universities devoting 600+ hours to anatomy teaching within the first 2 years of the undergraduate programme. In the problem-based learning (PBL) medical curricula, anatomy as a discrete subject has disappeared and anatomical principles are taught within system-based PBL units. Cadaveric dissection of the whole body has similarly vanished, being replaced by dissection of selected anatomical regions (based on the anatomical sites of common medical procedures) being preferred.

PROBLEM-BASED LEARNING

PBL in medical education originated at McMaster University in Canada in the mid 1960s. Other medical schools in The Netherlands, Australia and the US adapted and developed this McMaster model of PBL and now it is in widespread use across the world, not only in undergraduate medical education but in business, law, accounting, engineering and even in school education programmes.⁴

PBL was developed by modelling the process of how we actually learn each day during our working lives. Patients pose a diagnostic dilemma, which results in either a “patient unmet need” where the diagnosis is missed or a “doctor’s educational need” where reference is made to learn from the signs presented.⁵ This stimulates the clinician to read around the subject once recognised deficiencies are identified. No-one gives practicing doctors a curriculum, lecture notes or suggested reading for each patient, but we acquire the knowledge and skills that allow us to practice

competently from the repeated application of these principles. It is our patients who provide the stimulus for life-long learning provided we recognise the need to maintain learning.

PBL poses these diagnostic dilemmas to students in the form of case-based problems, giving the student the opportunity to acquire knowledge but also a method of applying it and developing a diagnostic sieve to implement the newly found knowledge. This represents a more useful form of learning than merely memorising and regurgitating facts for a multiple choice exam.

It can be seen that this approach does not necessarily require an underpinning of didactically taught basic science (as per the traditional model) but rather the student gains basic science information relevant to each particular problem through this self-directed learning.

WHEN IS PBL NOT PBL?

“McMaster” PBL excludes interpretations of the concept that are not multi-disciplinary, small group-based or student-centred, because the heart of “pure” PBL has been lost. This requires an understanding by academics setting the curriculum to “lose control” of the syllabus in order to maintain the core of self-learning, and as such this freedom of learning is often not implemented.

More commonly, the pure McMaster approach has been adapted by using a tutor to remain in control or guide learning (often known as “scaffolding”⁶), but packaging the curriculum into PBL-style cases and small group discussion. Interestingly, this adaptation was not found to be as successful as the McMaster approach, yet the compromise tends to sit more comfortably within the existing university environment.⁷

There is evidence supporting PBL but, disappointingly, no evidence that PBL results in improvement in problem-solving skills.^{8,9} Information taught in this way is retained longer than conventionally learnt facts but, significantly, learning may be less extensive.

Does the ability to apply PBL effectively require the traditional core education of didactic learning that is then refined in a postgraduate setting to allow the problem-based approach? If so, we are failing a generation of young doctors in not giving them the lexicon from which to delve and merely developing knowledge in areas in which they are stimulated. One could argue though that this is no different to the student “firm” attachment with a particularly dynamic consultant who encourages learning in his or her field of interest and creates the uneven playing field that is life. There

will always be those whose breadth of knowledge and enthusiasm (the two hallmarks of a good teacher according to Osler) exceeds others, and it is down to curriculum setters to determine the competencies required and set examinations that must test this "core knowledge". If this system is in place then the freedom of PBL should nurture a thinking generation who are better trained in the diagnostic sieve.

THE SOLUTION: OSLERIAN-BASED PBL?

In adapting the PBL model to serve postgraduate sports medicine, a move away from the pure "McMaster" model is required. We should remember Osler's ideals of a detailed understanding of the basic anatomy and the functional pathology of the area in question, in order to separate the underlying diagnoses and educate oneself as to why a given condition occurs in a particular patient. To a great degree, graduates of traditional medical schools have a better underpinning of core knowledge in this regard, although their ability to search for new and up-to-date information in a self-directed fashion is limited.

There seems to be a need for a return to formal anatomical (and pathophysiological) teaching as part of the basic requirements for a SEM practitioner, and consideration of this fact should be made at the time of entry into postgraduate SEM training. The completeness of anatomical instruction as a minimum should include formal lectures as well as whole body dissection (plus additional study from plastinated specimens and CD-ROM based learning as needed). It would be simplest to ensure that prospective trainees have documented their anatomical training (possibly to 600 hours as per the traditional medical school approach), which could be either completed as an undergraduate or as part of postgraduate training. Failure to consider this key element of core SEM skills may mean that we admit a cohort of SEM trainees who are ill-equipped to understand the basic elements of SEM practice.

One consequence of the failure of anatomical and physiological knowledge

is the poor use of healthcare resources and lack of understanding of their limitation of investigational techniques. Instead of the traditional diagnostic algorithm with history and examination as cornerstones of the diagnostic challenge, the tendency to rely on investigational studies as the initial diagnostic step (eg, an MR scan to check for an anterior cruciate ligament rupture) is inappropriate; however, in the absence of a detailed patho-anatomical understanding of the human body, this may be the only cognitive resource available to the PBL-trained sports physician.

Based on Osler's approach, we propose a four-step compartmentalisation of the diagnostic process that should be taught, emphasising history and examination and limiting investigation to the final step as follows:

1. Define and align: To ask discriminatory questions to provide a basis for examination and aligning those facts with the clinician's knowledge to begin to narrow the diagnostic possibilities.
2. Listen and localise: To fine-tune the direction of the examination by specific closed question technique.
3. Palpate and re-create: To examine with specific purpose a movement or test, not to just do such a test for completeness, but to rule out or include specific pathology.
4. Alleviate and investigate: To attempt to direct further investigation if diagnostically required or to attempt to relieve a possible diagnosis as means of confirming it.

Rather than a simple reliance on modern educational trends, we believe that for the better understanding of sports physicians in the diagnostic and rehabilitation process, a return to Oslerian principles is crucial. Winkelman¹⁰ demonstrates that merely following an educational trend is not a solution, and the evidence is not there to break with traditional teaching. The steady decline of anatomy teaching¹¹⁻¹³ in the UK, US and Australian medical schools may result in the PBL-trained

sports physician trainees of the future being relatively under-prepared for clinical practice. Some professional colleges have already voiced their concerns¹⁴ and now may be time for the curriculum planners of the specialty to voice theirs.

Br J Sports Med 2007;**41**:623-624.
doi: 10.1136/bjsm.2007.042333

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Accepted 16 August 2007

Competing interests: None declared.

REFERENCES

- 1 Osler W. *Aequanimitas*. New York: McGraw Hill, 1906.
- 2 Osler W. *The principles and practice of medicine*. New York: Appleton, 1892.
- 3 Porter R. *The greatest benefit to mankind. A medical history of humanity from antiquity to the present*. London: Harper Collins, 1997.
- 4 Knowles M. *The modern practice of adult education*. Cambridge: Prentice Hall, 1980.
- 5 Gammon M. PUNs and PUEs, DENs and SANs. *Br J Gen Pract* 2001;**51**:676.
- 6 Stewart T, MacIntyre W, Galea V, et al. Enhancing problem-based learning designs with a single e-learning scaffolding tool. *Interactive Learning Environments* 2007;**15**:77-91.
- 7 Boud D, Feletti G, eds. *The challenge of problem-based learning*. 2nd edn. London: Kogan Page Limited, 1997.
- 8 Colliver JA. Effectiveness of problem-based learning curricula: research and theory. *Acad Med* 2000;**75**:259-66.
- 9 Norman GR SH. The psychological basis of problem-based learning: a review of the evidence. *Acad Med* 1992;**67**:557-65.
- 10 Winkelman A. Anatomical dissection as a teaching method in medical school: a review of the evidence. *Med Educ* 2007;**41**:15-22.
- 11 Cottam W. Adequacy of medical school gross anatomy education as perceived by certain postgraduate residency programs and anatomy course directors. *Clin Anat* 1999;**12**:55-65.
- 12 Dyer GS, Thorndike ME. Quidne mortui vivos docent? The evolving purpose of human dissection in medical education. *Acad Med* 2000;**75**:969-79.
- 13 Jones RL. *Humanity's mirror: 150 years of anatomy teaching in Melbourne*. Melbourne, Australia: Haddington Press, 2007:249-51.
- 14 Patel KM, Moxham BJ. Attitudes of professional anatomists to curricular change. *Clin Anat* 2006;**19**:132-41.