



## Education

# Problem-based learning for surgical trainees

Jonathan D Beard, Joy Robinson, Jonathan Smout

North Trent Higher Surgical Training Scheme, Sheffield, UK

**Problem-based learning (PBL) represents an educational technique that many medical schools have adopted for their undergraduate curricula. This article discusses the application of PBL for surgical trainees.**

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Postgraduate education for surgical trainees has become better defined and more structured in recent years. The Royal College of Surgeons of England introduced the STEP Distance-Learning Course in 1996 and recently launched a new edition that includes Internet and satellite broadcast television media.<sup>1</sup> The educational principle behind conventional surgical teaching assumes that trainees require a core of knowledge before dealing with clinical problems. Problem-based learning (PBL) turns this principle on its head.

### Problem-based learning – definition and origins

The essence of PBL is that a small group of students decide for themselves what to study after discussing some trigger material, such as a written problem. After an intervening period of self-study, they meet to share, compare, and relate what they have found.<sup>2</sup> The McMaster Medical School in Hamilton, Ontario, Canada, introduced the first PBL undergraduate curriculum in 1969.<sup>3</sup> Howard Barrows who instigated the PBL curriculum at McMaster has outlined four important advantages of PBL that help students develop the skills and attitudes relevant to the practice of medicine and lifelong learning.<sup>4</sup> These are:

- *Structuring of knowledge for use in clinical context*

Education seems most effective when it is undertaken in the context of future tasks and results in better retention of knowledge.

- *The development of an effective clinical reasoning process*

The problem solving skills involved in the clinical reasoning process need shaping and perfecting through repeated practice and feedback to become effective and efficient.

- *The development of effective self-directed learning skills*

Skills of self-assessment and self-directed learning allow the student to become sensitive to personal learning needs and to locate and to use appropriate information resources.

- *Increased motivation for learning*

Motivation enhances student learning. The perceived relevance of work with medical problems and the challenge of solving problems provide strong motivation for learning.

Proof has accumulated that PBL can result in better motivation and self-directed learning skills, which seem

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**Correspondence to:** Mr Jonathan D Beard, The Sheffield Vascular Institute, The Northern General Hospital, Herries Road, Sheffield S5 7AU, UK. Tel: +44 114 271 5534; Fax: +44 114 271 4747; E-mail: Jonathan.Beard@northngh-tr.trent.nhs.uk

important for life-long learning. However, the evidence for improved clinical reasoning and long-term retention of knowledge remains scanty.<sup>3,5</sup>

### **Application of problem-based learning at a postgraduate level**

There exists a wealth of literature regarding PBL for undergraduate curricula, but little concerning its application at a postgraduate level.<sup>6</sup> Harden has advocated task-based learning (TBL), where the learning is built around the task.<sup>7</sup> In TBL, the focus for the learners is not a paper simulation but an actual task addressed by healthcare professionals. The task acts as the focus for learning not the sole objective of the students' learning. Grant and Marooned have described service-based learning (SBL) as a strategy for the training of senior house officers.<sup>8</sup> Trainees identify topics, arising from their clinical work, that they would like to learn more about. Additional learning opportunities are provided with study time allocated. TBL and SBL appear to represent models of practical postgraduate problem-based learning. However, these models have not been translated into practical postgraduate educational programmes, particularly in surgical training.

Schwartz described a PBL curriculum for a General Surgery Residency Programme in 1997.<sup>9</sup> All general surgery residents at the University of Kentucky Chandler Medical Center participated in this PBL curriculum. He designed the curriculum around problems in four domains: gastrointestinal/endocrine, oncology, trauma/critical care and vascular. The problems were chosen to constitute a formal curriculum of both the basic science and clinical objectives necessary for the broad education of general surgery. Each case took 1 month to complete (1.5 h/week) and each domain consisted of roughly 10 cases. The groups covered approximately 3 cases from each domain per year, the curriculum taking 3 years to complete. Fourteen faculty members served as tutor, each tutoring for 3 or 4 cases per year. More than 80% of the residents judged the tutorials to be above average or outstanding in comparison to standard resident teaching methods, such as conferences and ward rounds.

### **A problem-based learning tutorial for basic surgical trainees**

The University of Sheffield Medical School is introducing PBL into the undergraduate curriculum, and vascular surgery has become one of the pilot specialties. We were involved with the design and provision of this programme. The tutorials were based on the Manchester curriculum, which contains eight steps.<sup>10</sup>

#### *First tutorial*

- Read the case and clarify unfamiliar terms
- Define the problem(s)
- Brainstorm possible solutions
- Discuss solutions and arrange them into a tentative explanation of the case
- List questions to be answered and resources to be used, including clinical experience

#### *Private study (1 week)*

- Study privately and gain clinical experience from the tutorial

#### *Second tutorial*

- Discuss answers to questions and cite resources used
- Discuss related clinical experience

Following our experience with undergraduate PBL, we designed a PBL tutorial for the Sheffield basic surgical training scheme, based upon acute leg ischaemia. We chose acute ischaemia because it fulfils the criteria described by Chong *et al.*<sup>11</sup> with regard to the selection of problems for curriculum design: (i) significant adverse effects on outcome; (ii) the existence of beneficial interventions; (iii) significant benefit if quality is improved; and (iv) feasibility of monitoring quality of care.

Less than half of the attending SHO's had prior knowledge of PBL, but all found the tutorials a useful experience. The reasons given for this included sharing and contributing of information, discussing real-life problems which often seem ambiguous and the opportunity to review the evidence base. All preferred PBL to the conventional Friday teaching sessions and indicated that they would like it applied to the rest of the curriculum. However, they indicated a preference for a hybrid model of PBL tutorials, bedside teaching and didactic lectures.

### **Discussion**

Introducing PBL into the undergraduate curriculum requires a cultural change for both students and tutors. The experience of Schwartz and others suggests that PBL cannot easily be introduced at a postgraduate level until the culture has been established at an undergraduate level.<sup>5,9</sup> This was not our experience, but we were fortunate in having tutors with previous experience of PBL, who understood the need to act as a facilitator rather than an expert who knows all the answers.<sup>12</sup> This seems a challenge for many consultants who feel more comfortable with their conventional role as information providers.

We found the preparation for a PBL tutorial greatly exceeded that of a conventional tutorial or lecture. Furthermore, PBL requires attendance at two consecutive tutorials by both the tutor and the trainees. This causes problems for those with on-call commitments. More bleep-free teaching time will be required for all participants for any continuity to occur. The tutors will also need rewarding for the extra effort involved. This could include at least one protected teaching session for those consultants committed to the teaching programme, or extra sessional payments.<sup>13</sup>

We feel that postgraduate surgical education programmes could usefully include PBL tutorial as a means of improving motivation and self-directed learning. Weekly tutorials could be integrated with more conventional teaching methods on a monthly cycle. A new problem could be covered each month, *i.e.* approximately 20 cases over a 2-year training rotation. The cases would be chosen to emphasise the learning objectives required by the MRCS curriculum and integrated with the STEP course wherever possible.

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