

# Trends and the future of postgraduate medical education

R M Harden

*Emerg Med J* 2006;23:798–802. doi: 10.1136/emj.2005.033738

Where is the present flurry of activity in medical education leading and what sort of future is envisaged? This paper looks at trends in postgraduate medical education. Four themes and two trends for each theme have been identified. The themes are: the postgraduate medical curriculum, the application of learning technologies, assessment of competence, and professionalism in medical education. The trends are: outcome based education and a unitary approach to medical education; the use of simulators and e-learning; competency and performance based assessment, and portfolios and self assessment; and training the trainer and best evidence medical education. Any limitations in implementing change will likely result from a lack of imagination in those planning postgraduate medical education and their ability to bring about the necessary changes. To avoid a growing gap developing between what is possible educationally and what is delivered, it is clear that we need a new paradigm for postgraduate medical education.

capabilities. Patil<sup>1</sup> summarises the features of postgraduate training today as including

- a progressive syllabus that has both formal and informal elements,
- a recognised trainer and training unit,
- proactive supervision,
- a balance of clinical duties and educational activities,
- protected time for education, and
- defined exit outcomes.

In an article entitled “Evolution or revolution and the future of medical education: replacing the oak tree”, Harden<sup>2</sup> asks where the present flurry of activity in medical education is leading. What sort of future is envisaged? He describes the pressure for change in medical education and the tensions that have arisen from the need to combine seeming opposites – a study of breadth and depth, a mastery of core while retaining an element of choice, an emphasis on education for capability while preserving a firm scientific basis for the practice of medicine, the introduction of new themes into the training programme such as professionalism while not neglecting traditional topics, and an emphasis on inter-professionalism while at the same time recognising the important contribution of each of the professions.

## TRENDS IN POSTGRADUATE MEDICAL EDUCATION

This paper looks at trends in postgraduate medical education. Deciding what is a trend is not an easy task. The personal views and prejudices of the author have heavily influenced the themes noted in this paper. We have been guided, however, by the issues which have attracted the attention of workers in the field as identified, for example, by the 100 or so papers relating to postgraduate education presented at the AMEE 2004 meeting in Edinburgh in September 2004. In one such paper, Kilroy<sup>3</sup> identified three pointers relating to training in emergency medicine as follows:

- time pressure on training relating to the European Working Time Directive with a reduction of the working week to 40 hours,
- quality issues relating to the effective selection and training of educational supervisors, and
- the need to identify and develop robust performance and outcome measures.

**Abbreviations:** BEME, best evidence medical education; IVIMEDS, International Virtual Medical School; OSCE, Objective Structured Clinical Examination; RLOs, reusable learning objects

Change is the law of life, and “those who look only to the past or the present are certain to miss the future” suggested John F Kennedy in an address in Frankfurt, Germany in 1963. As with many things in life, medical education is not static. However, to change our approach to teaching and learning is not easy for we must leave behind part of ourselves and our personal past experiences as trainees and trainers. It is important that loyalty to the past does not cloud our minds or prevent us from sharing in the joy and satisfaction with what will be possible in the years ahead, if we allow it to happen. The comfort of inertia is not an option, for we need to face up to the annoyance or excitement, if we see it as such, of action.

But this is not a new story. Sir William Osler commenting in 1913 on medical training noted “We have outrun an educational system framed in simpler days and for simpler conditions. The pressure comes hard enough upon the teacher but far harder upon the taught, who suffer in a hundred different ways”. Changes since then have embraced the need for more formal postgraduate and specialist vocational training programmes. In the 1930s the average physician entered independent practice after 1–2 years’ training. Today a minimum of 8 years’ postgraduate training following completion of basic medical education is a requirement for doctors to develop the necessary competencies and

Correspondence to:  
Ronald M Harden,  
IVIMEDS, Tay Park House,  
484 Perth Road, Dundee,  
DD2 1LR, Scotland, UK;  
r.m.harden@cundee.ac.uk

Accepted for publication  
3 January 2006

As acknowledged by Abrahamson,<sup>4</sup> however, “predicting the future is neither a science nor an art: predicting the future is a sport and as in all other sports activities the players are subject to spectators’ criticism and second-guessing”.

Four themes have been identified around which we will look at the trends in postgraduate medical education; two trends have been identified regarding each theme. The themes are

- the postgraduate medical curriculum,
- the application of learning technologies,
- assessment of competence, and
- professionalism in medical education.

## THE CURRICULUM

Trends in the postgraduate medical education curriculum are the move to an outcome based educational model and recognition of the need for greater integration between the different phases of medical education.

### Outcome based education

Much attention in the past has focused on the process of education with detailed discussions and assumptions about the methodology. Training has been defined in terms of time spent in training and in different clinical posts or attachments. It has been assumed that learning occurs naturally as part of routine clinical work. There has been no organised educational programme with clear objectives. The involvement by senior doctors has been unstructured and haphazard and minimum attention has been paid to the educational needs of the trainee.<sup>5</sup>

A key trend in postgraduate medical education is a move to a model in which the emphasis has changed to focus on the product and the expected learning outcomes. In outcome based education, the learning outcomes are clearly specified and decisions about the content of training and how it is organised, the educational strategies to be adopted, the teaching methods, the assessment procedures, and the educational environment are made in the context of the stated learning outcomes.<sup>6</sup> There are major pressures to implement an outcome based model and to adopt an approach in which the learning outcomes for postgraduate training are clearly identified, made explicit, and communicated to those concerned, including all stakeholders. These educational outcomes should be the overriding factor in decisions concerning the postgraduate curriculum and training programme.

The Accreditation Council for Graduate Medical Education (ACGME) in the USA has identified six learning outcomes for postgraduate medical education: patient care, medical knowledge, interpersonal and communication skills, professionalism, practice based learning and improvement, and system based practice. These outcomes have been related to training in emergency medicine.<sup>7-11</sup> In these publications, the knowledge, skills, and attitudes that the trainee is expected to attain in each of the six competencies are described in more detail. An alternative framework is the three circle model developed initially in the context of undergraduate medical education but now being applied in postgraduate education.<sup>12</sup> This intuitive model highlights how the learning outcomes are related one to another in clinical practice. In the inner circle are the seven technical competencies, that is, what the doctor should be able to do or “doing the right thing”. How the doctor approaches each of these technical skills is described in the three learning outcomes in the middle circle, for example, with appropriate attitudes and decision taking and an understanding of basic principles, again “doing the thing right”. The

doctor’s own personal and professional development is addressed in two outcomes in the outer circle, that is, “the right person doing it”.

Outcome based education as an educational approach in medical training is still in its infancy.<sup>13</sup> Whether the approach fulfils its early promise remains to be seen. The news to date, however, is encouraging and where it has been implemented, outcome based education has had a significant and beneficial impact. In the future, all postgraduate training will have clearly specified outcomes and decisions made about the delivery and implementation of a training programme will be influenced by the learning outcomes.

The learning outcomes may be embedded in a visual representation or map of the curriculum.<sup>14</sup> The postgraduate curriculum is a sophisticated blend of educational strategies, course content, learning outcomes, educational experiences, assessment, the educational environment, and the individual trainees’ learning style, personal timetable, and programme of work. A curriculum map helps both trainer and trainees by displaying these key elements of the curriculum and the relationships between them. In this way the curriculum is more transparent to all stakeholders. The use of a curriculum map is a key educational strategy in the International Virtual Medical School (IVIMEDS).<sup>15</sup>

### A unitary approach to medical education

A major obstacle to the efficient and effective planning and delivery of a training programme in emergency medicine or, for that matter, in any speciality, has been a silo mentality in which the different phases or stages of education are considered in isolation with different organisations responsible for their implementation, regulation, and funding. Traditionally the training of a doctor has been the responsibility of a number of different bodies and agencies, with different funding streams. There has been little collaborative planning by the autonomous professional colleges or boards responsible for postgraduate medical education and those responsible for the undergraduate phase. This has led to ambiguities about responsibility for training.<sup>16</sup>

A commission on medical education in the USA<sup>17</sup> noted in 1932, more than 70 years ago, that “the educational sequence from pre-medical education to retirement from practice should be looked upon broadly as a single problem, not a succession of isolated and unrelated experiences” and suggested that “artificial segregation of the basic medical course, the internship, the training of the specialist, or the continuation education of the general practitioner is very likely to create serious gaps in the education of physicians which should be avoided”.

Writing in 1973 about the future of medical education, Medearis and Kinney<sup>18</sup> argued convincingly that “medical education must be decompartmentalised and redesigned as a true continuum extending from secondary school through college, medical school, hospital training and postgraduate medical education”. Little progress, however, has been made over the last 30 years in achieving this objective. Nonetheless, for educational, logistical, and economic reasons, and facilitated by the new learning technologies, this will change. We will see a continuum in the future physician’s education beginning when the student makes his or her decision to study medicine and ending with his or her retirement. The various stages in the educational programme will be integrated with the student and trainee advancing from one stage to the next and the exit learning outcomes of one phase being the entry requirements for the next. The Society for Academic Emergency Medicine has produced a model for an integrated undergraduate and postgraduate education curriculum in the field of emergency medicine.<sup>19</sup>

## LEARNING TECHNOLOGIES

The rapidly expanding use of new learning technologies is a second major area where we will see significant changes in postgraduate medical education. Two aspects can be highlighted.

### The use of simulators

The use of flight simulators in the aircraft industry is now highly developed and their use widely accepted. Indeed the technology has got to the stage when the first time a pilot may fly a new aircraft is with passengers on board, having been fully trained on a simulator. The use of simulators in medicine is not new. One of the early simulators introduced in the 1970s, "Harvey" the cardiology patient simulator, has proven to be an effective tool to teach and assess bedside cardiovascular skills in both undergraduate and postgraduate training programmes. Until recently, however, simulators have been regarded as somewhat of a curiosity and as peripheral to mainstream medical training programmes. Rapid advances in technology and increasing demands in clinical training are leading to a revolution in how we teach clinical skills and the manual skills necessary to perform invasive procedures and surgical interventions.<sup>20</sup> Models that provide a high level of visual fidelity and the use of sophisticated haptic devices that simulate the touch and feel of a procedure or examination are being increasingly used. The use of high fidelity simulation training for teams in emergency medicine has been described.<sup>21</sup>

A recent best evidence medical education (BEME) systematic review on the features and uses of hi-fidelity medical education simulations that lead to effective learning was completed by Issenberg and co-workers.<sup>22</sup> It concluded that hi-fidelity medical simulations are educationally effective and that simulation based education complements medical education in patient care settings. In simulation, learning is facilitated through the provision of

- effective feedback,
- repetitive practice,
- a range of difficulty,
- multiple learning strategies,
- clinical variation,
- a controlled learning environment, and
- individualised learning.

Virtual reality simulation represents a paradigm shift in postgraduate training<sup>23</sup> and in the future, virtual reality technology will play a major role in medical education and will provide the majority of simulation based training.<sup>20</sup>

### E-learning

Rapid developments have taken place in e-learning.<sup>24</sup> The Commission on Technology and Adult Learning in the USA<sup>25</sup> suggested that "Recent technological advances have laid the foundation for a learning revolution that will clearly take place in the years ahead". The European Commission noted in 2003<sup>26</sup> that "The spread of the internet and new information and communication technologies (ICT) has transformed the way people communicate, the way industries operate, the way governments interact with their citizens, and, significantly, the way people learn". Harden<sup>27</sup> highlighted some of the myths associated with e-learning and concluded that

- e-learning is not just a passing fad,
- it is not only about knowledge transfer,
- on-line learning can be effective and efficient,
- students need not learn in isolation but can be part of an on-line community,

- teachers and trainers have important but different roles, and
- technology may be queen but pedagogy is king.

E-learning may offer particular advantages in emergency and disaster medicine<sup>28-29</sup>; Kabrhel and colleagues described the creation of an on-line collection of emergency medicine literature as an aid to doctors in training in the speciality.<sup>30</sup>

E-learning brings with it new approaches to content development appropriate for postgraduate medical education.<sup>31</sup> Emerging trends include an instructional design based on reusable learning objects (RLOs) and the semantic web. RLOs are small chunks of learning resources, ranging from a single diagram or illustration to a sequence or aggregation of such resources. To create a course, RLOs can be linked or aggregated together in the same way as children's building blocks can be assembled to create a structure such as a castle. As with the building blocks, the same RLOs can be reused to create other courses. This approach to instructional design has been adopted in IVIMEDS, a collaboration of medical schools worldwide.<sup>15</sup>

The semantic web is a vision for the future development of the internet where web based materials, including e-learning resources, can be automatically linked together or associated in some way as a result of their context. This context is provided not only by the content of the resource itself, but also by data that describe that content, so called metadata. Davies<sup>31</sup> describes how semantic web technologies will allow more intelligent searching of the web and will allow trainees to more effectively retrieve and share relevant information from the web. It will also facilitate online collaborative learning between trainees who are geographically and culturally separate.

E-learning will be, almost certainly, one of the most important developments in the delivery of postgraduate medical education. It is not simply a method which uses information communications technology to deliver a more effective and streamlined system, it is also a tool for potentially transforming postgraduate medical education. "Trying to predict the future of e-learning", however, suggested Karen Mantyla,<sup>32</sup> "is like trying to guess which colours and shapes will appear at the other end of the kaleidoscope. The colour combinations and shapes are wonderful to see, yet they blend and change at the twist of the dial". Although one cannot at the moment be precise about the form e-learning will take, it is inevitable that future cohorts of postgraduate trainees will be educated in a context where a significant time is spent on line.

## ASSESSMENT

There has been a long tradition in postgraduate medical education of specialist examinations which lead to the award of membership of a college or certification by a board. Assessment in the future will play an important role in postgraduate education but it will be very different from the formal written, oral, and clinical examinations which have been characteristic of postgraduate education in the past.

### Competency and performance based assessment

The past decade has seen greater emphasis placed on a more performance based assessment approach. The assessment procedures in a postgraduate education programme should provide reliable evidence that trainees have achieved the required minimum accepted standard in each of the specified learning outcomes. Have they the necessary clinical skills? Have they mastered the required practical procedures? Have they the necessary communication and information handling skills? Have they the appropriate clinical judgement and decision making skills? Do they exhibit appropriate attitudes

and professionalism? Can they work effectively and efficiently alongside other team members in the delivery of health care?

The Objective Structured Clinical Examination (OSCE), introduced initially in the context of undergraduate education,<sup>33</sup> is now widely used in postgraduate medical education. In the OSCE a wide sample of competencies from history taking and physical examination of patients to communication skills, interpretation of laboratory investigations, and practical procedures are tested in controlled situations using a checklist or rating scale. We will see in the future more performance based assessment including more innovative and greater use of the OSCE. Trainees will be assessed as members of a multiprofessional team tackling together a series of practical clinical scenarios. Use will be made of unconventional settings such as a simulated accident staged in a hospital garage, or a virtual reality simulator. The use of simulation for emergency medicine resident assessment has been described.<sup>34</sup>

### Portfolios and self assessment

The search for new assessment tools has been a reaction against existing methods of assessment which often have adverse effects on the learner or trainee, the teacher or trainer, and the curriculum as a whole. There is a move to authentic performance based assessment which encourages trainees to take responsibility for their own learning. Portfolio assessment has been introduced with this purpose in mind.<sup>35</sup> A portfolio which contains work collected over a period of time is a collection of evidence prepared by the trainee to demonstrate that learning has taken place. It documents not only the trainee's educational experiences but also how these have contributed to the trainee's mastery of the required learning outcomes. O'Sullivan and co-workers demonstrated that portfolios are well suited to the assessment of competence of doctors in training.<sup>36</sup> Portfolio assessment offers a number of advantages<sup>35</sup> in that

- it counteracts the limitations of a reductionist approach to assessment,
- it facilitates the assessment of integrated and complex activities,
- it supports an outcome based approach to education, and
- it actively involves the trainee and engages the trainee in the process of self assessment.

In the future, opportunities for self assessment will be a key feature of the postgraduate learning environment and trainees will be able to chart their own progression to the achievement of the exit learning outcomes. An electronic portfolio prepared by trainees as a record of their educational activities will contribute to their formal assessment.

### PROFESSIONALISM

The past decade has seen increasing recognition of medical education as a field of knowledge and expertise, and a legitimate area for research.

### Training the trainer

It is now recognised that individuals with specific responsibilities for education and training must have opportunities to develop the necessary and sometimes more specialised skills of medical education. A wide range of face-to-face and distance learning courses are now available leading to certificates, diplomas, or master degrees in medical education. It is recognised also that all doctors should have some competence as teachers and skills in teaching<sup>37</sup> will increasingly be included in the undergraduate and postgraduate curriculum. All doctors with particular responsibility for

training will need to demonstrate evidence that they have acquired the necessary additional skills.

Courses in teaching will focus on content areas that go beyond the improvement of specific teaching skills, adopt diverse education formats, and use staff development programmes and activities to promote organisational change.<sup>38</sup> A framework for developing excellence as a clinical educator has been developed based on the three circle outcome model.<sup>37</sup>

### Best evidence medical education

Associated with a new professionalism in medical education is a recognition of the need to move from opinion based to evidence based education.<sup>39</sup> BEME is the implementation by teachers in their practice, of methods and approaches to education based on the best evidence available. It recognises that different types of evidence may be used to support decisions about the choice of methods of teaching and learning, of approaches to assessment, of decisions about the curriculum, and about other issues in medical education.

The BEME collaboration ([www.bemecollaboration.org](http://www.bemecollaboration.org)) is committed to creating a culture where evidence based teaching is valued and to facilitating access to available evidence in medical education. As part of the initiative, a number of international groups are currently completing systematic reviews of available evidence on selected topics. Six reviews will be published over the next year. The first one addresses the effective use of hi-fidelity simulators and was published as BEME guide No. 4 and as a review in *Medical Teacher*.<sup>22</sup>

The future will see increasing emphasis on research in medical education, on systematic reviews, and on the application of the results of the research to teaching practice.

### CONCLUSIONS

There is a need for a strategic vision of the future for postgraduate medical education. This paper addresses four themes: the curriculum, new learning technologies, assessment, and professionalism in medical education. The limitations in implementing a vision for postgraduate medical education are likely not to be technical or pedagogical or even logistical, but are more likely to be the result of a lack of imagination by those concerned with planning postgraduate medical education and their ability to bring about the necessary changes. We run the risk of seeing a growing gap between what is possible educationally and what is delivered. It is clear that we need a new paradigm for postgraduate medical education. In delivering this, all stakeholders including the readers of this paper have a contribution to make and must accept a measure of responsibility for what happens in the future. Marinker<sup>40</sup> in the book *Clinical Futures* encourages "our attempt to peer into the mists of the day after tomorrow" and quotes from WH Auden's poem "Leap before you look".<sup>41</sup>

"The sense of danger must not disappear:

The way is certainly both short and steep,

However gradual it looks from here;

Look if you like, but you will have to leap."

### REFERENCES

- 1 **Patil NG.** The postgraduate curriculum. In: Dent JA, Harden RM, eds. *A practical guide for medical teachers*. Edinburgh: Elsevier Churchill Livingstone, 2005;31.
- 2 **Harden RM.** Evolution or revolution and the future of medical education: replacing the oak tree. *Med Teach* 2000;22(5):435-42.
- 3 **Kilroy DA.** "Not like it is on TV": clinical supervision in the accident and emergency department. In: *AMEE Programme and Abstracts, 2004*. Dundee: AMEE, 2004:4.111.
- 4 **Abrahamson S.** *Essays on medical education*. Lanham, MD: University Press of America, 1996.

- 5 **Holm HA**. Postgraduate education. In: Norman GR, van der Vleuten CPM, Newble DI, eds. *International handbook of research in medical education*. Dordrecht: Kluwer, 2002:381–413.
- 6 **Harden RM**, Crosby JR, Davis MH. An introduction to outcome-based education. *Med Teach* 1999;**22**(1):7–14.
- 7 **Swing SR**. Assessing the ACGME general competencies: general considerations and assessment methods. *Acad Emerg Med* 2002;**9**(11):1278–88.
- 8 **Dyne PL**, Strauss RW, Rinnert S. Systems-based practice: the sixth core competency. *Acad Emerg Med* 2002;**9**(11):1270–7.
- 9 **Shayne P**, Heilpern K, Ander D, et al. Emory University Department of Emergency Medicine Education Committee. Protected clinical teaching time and a bedside clinical evaluation instrument in an emergency medicine training program. *Acad Emerg Med* 2002;**9**(11):1342–9.
- 10 **King RW**, Schiavone F, Counselman FL, et al. Patient care competency in emergency graduate medical education: results of a consensus group on patient care. *Acad Emerg Med* 2002;**9**(11):1227–35.
- 11 **Chapman DM**, Hayden S, Sanders AB, et al. Integrating the accreditation council for graduate medical education core competencies into the model of the clinical practice of emergency medicine. *Ann Emerg Med* 2004;**43**(6):756–69.
- 12 **Harden RM**, Crosby JR, Davis MH, et al. AMEE Education Guide No. 14: outcome-based education, part 5—from competency to meta-competency: a model for the specification of learning outcomes. *Med Teach* 1999;**21**(6):546–552.
- 13 **Harden RM**. Developments in outcome-based education. *Med Teach* 2002;**24**:117–20.
- 14 **Harden RM**. AMEE Guide No. 21: curriculum mapping, a tool for transparent and authentic teaching and learning. *Med Teach* 2000;**23**(2):123–37.
- 15 **Harden RM**, Hart IR. An international virtual medical school (IVIMEDS): the future for medical education. *Med Teach* 2002;**24**(3):261–7.
- 16 **Harden RM**. Early postgraduate education and the strategy of the dolphins. *Med Teach* 1999;**21**(4):365–9.
- 17 **Commission on Medical Education**. *Final report of the Commission on Medical Education*. New York: Office of the Director of Study, 1932.
- 18 **Medearis DN**, Kinney TD. On creating a true continuum of medical education. In: Anlyan WG, Austen WG, Beck JC, et al, eds. *The future of medical education*. Durham NC: Duke University Press, 1973:133.
- 19 **Shepherd S**, Zun L, Mitchell J, et al. A model preclinical, clinical and graduate educational curriculum in emergency medicine for medical students and rotating residents. *Ann Emerg Med* 1991;**20**(5):591.
- 20 **Issenberg SB**, Gordon MS, Gordon DL, et al. Simulation and new learning technologies. *Med Teach* 2001;**23**:16–23.
- 21 **Small SD**, Wuerz RC, Simon R, et al. Demonstration of high-fidelity simulation team training for emergency medicine. *Acad Emerg Med* 1999;**6**(4):312–23.
- 22 **Issenberg SB**, McGaghie WC, Petrusa ER, et al. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. *Med Teach* 2005;**27**(1):10–28.
- 23 **Gallagher AG**, Ritter EM, Champion H, et al. Virtual reality simulation for the operating room: proficiency-based training as a paradigm shift in surgical skills training. *Ann Surg* 2005;**241**(2):364–72.
- 24 **Davis MH**, Harden RM. E is for everything - e-learning? *Med Teach* 2001;**23**(5):441–4.
- 25 **Commission on Technology and Adult Learning**. *A vision of e-learning for America's workforce*. Alexandria, VA: ASRD/NGA, 2001.
- 26 **European Commission**. *Better e-learning for Europe*. Luxembourg: Office for Official Publications of the European Communities, 2003.
- 27 **Harden RM**. Myths and e-learning. *Med Teach* 2002;**24**(5):469–72.
- 28 **Della Corte F**, La Mura F, Petrino R. E-learning as educational tool in emergency and disaster medicine teaching. *Minerva Anestesiol* 2005;**71**(5):181–95.
- 29 **Haile-Mariam T**, Koffenberger W, McConnell HW, et al. Using distance-based technologies for emergency medicine training and education. *Emerg Med Clin North Am* 2005;**23**(1):217–29.
- 30 **Kabrhel C**, Liu S, Takayasu JK, et al. Creation of an online collection of emergency medicine literature. *Acad Emerg Med* 2005;**12**(2):173–5.
- 31 **Davies D**. E-learning. In: Dent JA, Harden RM, eds. *A practical guide for medical teachers*. Edinburgh: Elsevier Churchill Livingstone, 2005:221.
- 32 **Mantyla K**. *Blended e-learning*. Alexandria, VA: ASTD, 2001.
- 33 **Harden RM**, Gleeson FA. Assessment of clinical competence using an Objective Structured Clinical Examination (OSCE). *Med Educ* 1979;**13**:41–54.
- 34 **Bond WF**, Spillane L. The use of simulation for emergency medicine resident assessment. *Acad Emerg Med* 2002;**9**(11):1295–9.
- 35 **Friedman Ben David M**, Davis MH, Harden RM, et al. AMEE Medical Education Guide No. 24: portfolios as a method of student assessment. *Med Teach* 2001;**23**(6):535–51.
- 36 **O'Sullivan PS**, Reckase MD, McClain T, et al. Demonstration of portfolios to assess competency of residents. *Adv Health Sci Educ* 2004;**9**:309–23.
- 37 **Hesketh EA**, Bagnall G, Buckley EG, et al. A framework for developing excellence as a clinical educator. *Med Educ* 2001;**35**:555–64.
- 38 **Steinert Y**. Staff development. In: Dent JA, Harden RM, eds. *A practical guide for medical teachers*. Edinburgh: Elsevier Churchill Livingstone, 2005:390.
- 39 **Harden RM**, Grant J, Buckley EG, et al. BEME guide no. 1: best evidence medical education. *Med Teach* 1999;**21**:553–62.
- 40 **Marinker M**. Looking and leaping. In: Marinker M, Peckham M, eds. *Clinical futures*. London: BMJ Books, 1988:19.
- 41 **Auden WH**. Leap before you look. In: *Collected Shorter Poems, 1927–1957*. London: Faber & Faber, 1996:200.