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Case studies in outcome-based education

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Abstract

Outcome-based education is one of the most significant global developments in medical education in recent years. This paper presents four case studies of outcome-based education from medical schools in different parts of the world; Scotland; USA; Pakistan; and Singapore. The outcome-based curricula have either been in place for some time, are evolving or are at the planning proposal stage. The outcomes, change process and implementation of the outcome-based approach are described. Variation in the extent to which each medical school has implemented outcome-based education is discussed and key points for successful implementation are highlighted. This paper is based on the pre-conference symposium "outcome-based curricula: global perspectives" presented by the authors at the 4th Asia Pacific Medical Education Conference (APMEC) in Singapore, 8–11 February, 2007.

Introduction

"An outcome is a culminating demonstration of learning: it is what the student should be able to do at the end of the course" (Spady 1993). Many medical schools have identified outcomes for their curricula (Pales et al. 2004; Peninsula Medical School 2007). Outcome-based education (OBE), however, is somewhat different. "It is important to distinguish between outcome setting, which is what Australian state education systems typically do, and OBE, which is essentially the invention of William Spady" (Blyth 2002). "Outcome based" insists Spady (1993) "does not mean curriculum based with outcomes sprinkled on top. It is a transformational way of doing business in education." OBE is an approach to education in which decisions about the curriculum are driven by the learning outcomes that students should display at the end of the course. These decisions include curriculum content, educational strategies, student selection and assessment. "In OBE," suggest Harden et al. (1999), "product defines process. OBE can be summed up as results-oriented thinking and is the opposite of input-based education where the emphasis is on the educational process and we are happy to accept whatever is the result."

In this paper, four medical schools in disparate parts of the world – Scotland, USA, Pakistan and Singapore – each present a case study of their curriculum. Each school is at a different stage of implementation of OBE. The case studies are presented to provide medical educators with an international perspective of the direction of medical education reform; examples of different levels of conversion to OBE; and of the change process required to identify outcomes and move towards implementation of OBE.

Practice points

- The adoption of curriculum outcomes and OBE are different.
- In OBE decisions about the curriculum are driven by the outcomes.
- Consultation, staff development, staff buy in, and a willingness to act on feedback are essential for the adoption of OBE.
- New teaching and learning methods and the use of newer, non-traditional exams are required.
- Realignment of the medical school infrastructure and committee structure is necessary but challenging.
- Considerable staff effort in curriculum planning and additional financial resource are required for success.
- Leadership, medical education expertise, tenacity and persistence are essential.

Case study 1: Dundee medical school

The University of Dundee medical school in Scotland, UK moved to outcome-based education in 1997 (Harden et al. 1999). The outcomes are identified in Table 1.

The outcomes provide the framework for the students' learning from day 1 at medical school until graduation and beyond in postgraduate and continuing medical education.

Curriculum design

The five year educational programme is in three phases with approximately 150 students per year, mostly admitted direct

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Table 1. The outcomes identified for the Dundee medical school curriculum.

What the doctor does *Doing the right thing*	How the doctor approaches his/her practice *Doing the thing right*	The doctor as a professional *The right person doing it*
Clinical skills	With understanding of basic and clinical sciences and underlying principles and concepts	With an understanding of the role of the doctor and other health professionals in the health service
Practical procedures	With appropriate attitudes, ethical stance and responsibilities	With an aptitude for personal development
Patient investigation	With appropriate decision making, clinical judgement and critical thinking	
Patient management		
Health promotion and disease prevention		
Communication		
Handling and retrieval of information		

from secondary education although each year group includes a small number of graduates. The curriculum has both core and optional components (Harden & Davis 1995), but the outcomes provide the framework for student learning in both components. The content for the core curriculum was identified by groups of clinical and non-clinical teachers through a series of planning grids with the outcomes forming the column headings in the grids. The rows' headings were key cases selected from approximately 100 patient presentations (tasks) (Harden et al. 1996; Harden et al. 2000), such as chest pain, deafness or altered bowel habit. The content was then allocated to the appropriate phase of the curriculum, depending on whether it deals with normal (phase 1) or abnormal (phase 2) structure, function and behaviour or clinical practice (phase 3). Student learning about the outcomes increases from day 1 as they progress through the curriculum. Their outcome-based learning increases in scope, both breadth and difficulty; utility, with increasing applicability to clinical practice; and proficiency, with students increasing their accomplishment (Davis & Ponnamperuma 2006).

Teaching, learning and student assessment

A range of teaching and learning methods is employed in the medical school and one of the advantages of the outcome-based approach is that it shifts the emphasis away from the educational process to the product of the curriculum. The assessment system must be capable of testing the students' achievement of all of the outcomes and various assessment tools are employed, such as multiple choice questions, extended matching items, objective structured clinical examinations and portfolio assessment. Individual exams are blueprinted (Crossley et al. 2002) on the outcomes and the course content. Standards in each exam are identified using a modification of the Angoff technique (Angoff 1971; Friedman Ben-David 2000). The final exam is a portfolio assessment, which provides a holistic approach to assessing the individual student's achievement of the appropriate standard in every outcome, through the selection of appropriate material for inclusion in the portfolio (Davis et al. 2001).

The change process

Faculty buy-in for the approach was obtained using committee meetings, presentations at staff development sessions and written material such as leaflets, brochures and newsletters. The amount of work involved in first-time planning of the curriculum was substantial, given the transformational nature of the change from the previous curriculum, but subsequent years involved only fine tuning and response to feedback. Medical school infrastructural change to support the curriculum was slow, however, and continues to be difficult to achieve.

Curriculum evaluation

Several approaches to curriculum evaluation were adopted (Davis & Harden 2003), and both external and internal evaluations have been positive, which encouraged continuation with the outcome-based approach. Measures of the educational environment (Roff & McAleer 2001) at the medical school increased following the introduction of outcome-based education, but the increase is likely multifactorial rather than exclusively related to the outcome-based approach. Dundee medical students had the highest level of confidence of all UK medical students that their medical school education prepared them well for their first postgraduate year (Goldacre et al. 2003). That has made all the effort worthwhile.

Case study 2: Mayo medical school

The Mayo Clinic is a not-for-profit academic health centre with integrated, comprehensive medical campuses in Rochester, Minnesota; Jacksonville, Florida; and Scottsdale, Arizona. It evolved from the first private, integrated group practice of medicine established in the late of 19th century by Dr. William W. Mayo and his two sons, Dr. Charles H. Mayo and Dr. William J. Mayo. The Mayo Graduate School of Medicine has supported the postgraduate training of residents and fellows for over 100 years. The Mayo Medical School (MMS) was established in 1972 and currently has 170 students enrolled in four year program.

Even though MMS is relatively new, rapid change in worldwide health care delivery practice has mandated the development of specific, assessable learning outcomes for medical curricula at MMS and at other institutions (Cortese & Smoldt 2006; Pawlina et al. 2006). Over the past two years, MMS has defined specific learning outcomes and initiated a major curriculum redesign to ensure that our graduates achieve critical outcomes—mastery of knowledge, cognitive skills and technical competency (Harden et al. 1999; McNeil et al. 2006). A major goal of this reform is to transform a course-based to a block-structured curriculum that integrates basic and clinical sciences, employing student centred learning modalities.

From theme committees to graduation outcomes

The redesign process was initiated by review of the MMS mission statement, which states that:

> Mayo Medical School will use the patient-centred focus and strengths of the Mayo Clinic to educate physicians to serve society by assuming leadership roles in medical practice, education, and research.

The MMS mission statement provided a template for the development of specific graduate outcomes, which are

- outstanding scholarly clinician scientists and educators who place the needs of the patient first
- compassionate physicians who value diversity and work toward social responsibility
- effective leaders and members of interdisciplinary teams who improve the processes and outcomes of healthcare
- promoters of wellness in themselves, their patients, and communities
- creative thinkers who translate discovery into practice and advance medicine through innovation and education

These discussions led to the identification of critical themes which require a longitudinal presence throughout the curriculum. The critical themes include: (1) scientific foundations of medical practice; (2) clinical experiences; (3) leadership; (4) physician and society; and (5) pharmacology and principles of therapeutics. Five theme committees were organized and charged with responsibility for defining learning outcomes and ensuring that the themes are represented throughout the curriculum. Initially, 67 theme outcomes were identified. The five theme committees, however, were able to consolidate these into 26 distinct outcomes that could be mapped to the six exit outcomes proposed by the Accreditation Council for Graduate Medical Education (ACGME 1999). The six ACGME outcomes are medical knowledge, patient care, professionalism, interpersonal and communication skills, practice based learning and improvement, and systems based practice. The 26 learning outcomes mapped to the six ACGME outcomes were posted on MMS home page for review and comment from the faculty. The theme committees are currently using this list to determine the optimal time and didactic methods to achieve the outcomes. Their recommendations are given to the curriculum committee, which has oversight of the entire curriculum. There are also active discussions regarding assessment of students and the curriculum, to ensure that the outcomes are in fact being achieved. We believe that this committee structure will facilitate the implementation of changes that continue to be needed to optimize the integrated basic science and clinical training of medical students.

Mentorship program and selectives

The mentorship program is a key feature of our revised curriculum. Every Mayo medical student is assigned to a mentor prior to matriculation. The mentor facilitates student transition to medical school, provides opportunities for early clinical exposure, and provides resources needed for successful achievement of curricular objectives. This relationship allows students to model behaviours important for their future success as a physician, such as; leadership, professionalism, teamwork and humanism. The new curriculum includes 10 selectives, which are two-week periods of time during which students are free of any scheduled didactic activities. Students are able to use this time for clinical experiences, career exploration, service learning, or volunteer work.

Role of innovations in the medical curriculum

Innovation is central to the long term success of any curriculum. Generating innovations requires an understanding of the institutional culture (Dowton 2005). A focus on innovation was an important principle during the development of didactic blocks. For example, in the Human Structure block that included gross anatomy and radiology, both conceptual and procedural innovations were represented by incorporating diversified educational approaches with group-based activities and peer-teaching assignments. Technological innovations included the provision of daily feedback of student performance using audience response system technology. Integrating radiological images, obtained from scanning cadavers with high resolution CT scanner, into the traditional dissection laboratory created a better learning environment for understanding the application of anatomy in a clinical settings. In addition, anatomy educators integrated several professionalism initiatives including reflective exercises, peer and self-assessments, team and leadership development, and team-based consensus course evaluation into a traditional course structure (Bryan et al. 2005; Pawlina et al. 2006). We believe that our revised curriculum, which is based on specific, assessable outcomes, will facilitate integration of basic and clinical sciences, promote flexibility, and will embrace innovation that is essential for the continued viability of our educational structure.

Case study 3: Aga Khan university medical college

The Aga Khan University (AKU) was chartered in 1983 as Pakistan's first private university. It is not-for-profit, has campuses in Asia, Africa and Europe, and is committed to excellence in education, research and service. AKU medical college (AKU-MC) Karachi aims for international standards as well as relevance to national health needs. Therefore about

20% of the curriculum is dedicated to community health sciences (CHS). AKU-MC selects 100 students every year from 4000 applicants, by extensive outreach and needs blind admission policies.

Outcomes

By the end of the five year curriculum, students should be able to demonstrate achievement of AKU professional attributes/competencies (1986, revised 1988 and 2000). The curriculum has four major goals:

(1) to address problems of primary health care;
(2) to acquire clinical competence in primary care and hospital settings (under supervision);
(3) to gather, evaluate and generate new knowledge;
(4) to be prepared for further training in various clinical and non-clinical specialties.

AKU-MC outcomes (Figure 1) are its professional attributes operational in a universe of its four curricular goals (AAMC 1998; IIME 2002; Smith & Dollase 1999; PMDC 1998).

Medical education is a continuum and the attributes are considered as interim outcomes, which graduates hopefully continue to refine and hone throughout future study and practice.

Process to achieve outcomes

AKU has a tradition of curricular review. After the last review (1999), a task force was established for planning a student-centred curriculum (April 2000 to September 2002). It identified that self-directed learning, practising evidence-based medicine, working in diverse teams, patient advocacy, effective communication, and student research were opportunistic at best. The task force identified strategies to meet unmet attributes, incorporating exit and enabling objectives (identified by basic scientists and cross-matched with those identified by clinicians for the AKU list of 127 common clinical presentations and health problems), and disseminated these widely to ensure that faculty and students knew which outcomes were to be achieved to what extent each year.

The AKU curriculum

The current integrated curriculum (Figure 2) is congruent with the SPICES model (Harden et al. 1984).

Basic sciences continue to year 5, clinical skills start in year 1, and CHS runs through. Electives are offered in four of the years and year 4 has a required research course. Problem-based learning was introduced as a learning modality to foster self-directed lifelong-learning, critical reasoning and team-work, moving from basic sciences to clinical problem-solving (years 1 through 4). Longitudinal themes were introduced so that students learn and demonstrate achievement of outcomes related to communication, ethics, behavioural sciences, evidence-based medicine, and research through years 1–5 with increasing complexity. Students learn through multiple methods: lectures, tutorials, practicals, community visits, student presentations, clinical and communication skills sessions, workshops, and by being active members of health teams. Assessment too is multimodal, with contextual integrated assessment of knowledge, assessment of clinical skills by Objective Structured Clinical Examinations and long and short cases, and assessment of behaviours during group work, community visits, and clerkships. Feedback is also provided.

Programme review

To maintain international standards, AKU recently invited a team from USA, Canada, Pakistan, and Malaysia for programme review, to be conducted according to liaison committee for medical education (LCME 2004) standards. Recommendations are awaited, when the cycle for improvement will re-start.

Resources needed

These include supportive and enlightened leadership; committed faculty qualified in medical education; adequate planning; faculty development; perseverance; and finances. Extensive faculty and student involvement and incorporating their feedback is the key to success.

Figure 1. The AKU-MC outcomes.

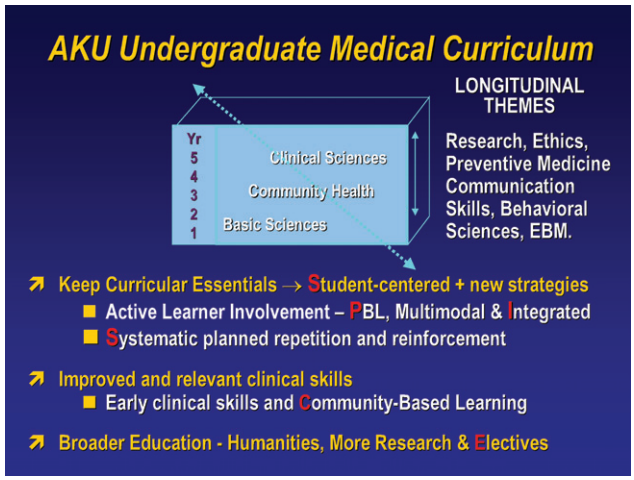

Figure 2. The AKU-MC integrated curriculum.

Case study 4: Yong Loo Lin school of medicine

Recently Yong Loo Lin School of Medicine celebrated 100 years of existence. The Times Higher Education and the Newsweek ranked the National University of Singapore (NUS) as one of the top global universities. The health care of the population is improving. The question then naturally arises why is there a need for curriculum review and why now? Major driving forces for curriculum review are changing demographics and health care needs; inculcating a high standard of professional, ethical and moral behaviour; Singapore's initiative to become the regional medical hub and its aspirations to develop excellence in biomedical research.

Proposed outcomes for the new curriculum

This is a preliminary proposal that is currently being reviewed by various stakeholders and has not been approved yet. The broad outcome of the proposed curriculum is to produce graduates who are competent as house officers and have the foundations to become competent specialist clinicians. They may also undergo further training to become clinician researchers, scientists and administrators.

This proposal reaffirms our belief in creating a solid foundation of basic sciences and providing students with high quality clinical experiences. The proposed curriculum is based on principles of student centred, self-directed and life-long learning, horizontal and vertical integration, planned repetition of content and skills with increasing complexity and valid and reliable assessment that supports student learning. The curriculum intends to provide greater clinical relevance and more meaningful patient contact.

Developing framework for the new curriculum

The proposal is to have five phases in curriculum. Phase I will start with a novel introductory module to provide students with a broad concept of health and disease. The remainder of phase I will be structured under body systems with emphasis on normal structure and function with clinical relevance and application. Phase II will focus on abnormal structure and function including genetics and genomics, cancer biology, and the body's defence. A heavier emphasis will be on quantitative skills and a systematic approach to inquiry and research methodology.

The proposal is to structure the clinical years into three phases: core clinical practice (phase III); advanced clinical practice (phase IV); and student internship program (phase V). Phase III will have three themes: medical sciences, surgical sciences, and public health. Clinical years will focus on a core list of patient and health care problems. Novel topics such as emerging unconventional threats, disaster mitigation, international health and problems facing the aging population will be incorporated. Four longitudinal tracks: (1) health ethics, law and professionalism; (2) medicine and society; (3) information literacy, critical thinking, evidence-based medicine, and research methodology; and (4) patient-based program will run in parallel and will be integrated with the biomedical sciences and clinical components.

Teaching and learning methods will be mixed with appropriate use of self-directed learning, small group tutorials, interactive sessions and didactic methods. Greater emphasis will be placed on information management and literacy that will go much beyond information gathering.

Assessment will be matched against the learning outcomes of each phase and will support student learning. Components of the longitudinal tracks will be assessed in each examination. Assessment will be 'progressive,' whereby components of earlier phases could be tested in later years. Examinations will include written and performance-based multi-station examination formats.

A proposed elective period will allow students to pursue clinical electives, do research, pursue community service, or gain insights into public health policy. Students will have multiple entry points to engage in more formal research activities such as PhD.

The curriculum will be available in an electronic version to improve accessibility, visibility, and transparency. It will be led by a school-level multi-disciplinary team consisting of all major stakeholders in education.

Discussion

Harden (2007) described four potential medical school responses to OBE: beavers, who work assiduously to successfully transform their curricula to OBE; failed beavers, whose efforts are unsuccessful; peacocks, who identify and display outcomes, but in reality have a traditional curriculum where no one is certain how or whether the students have achieved the outcomes; and ostriches, who have ignored the notion of OBE.

All four medical schools describing their curricula in this paper are attempting to be beavers. Some (Dundee and AKU) have already succeeded while the Mayo approach is evolving and the Yong Loo Lin OBE curriculum is in the planning stage. Knowledge about the approach, wide staff consultation and buy in are essential for success, all under pinned by a robust staff development programme. Successful transformation of the curriculum to OBE involves realignment of medical school infrastructural support and committee structures to support the new integrated curriculum design. The committees have to be prepared to expend considerable effort in the identification of course, phase, theme or year outcomes on the road to achievement of the terminal learning outcomes. New teaching and learning methods are required to ensure students reach the required standard in all the outcomes and student assessment techniques beyond traditional exams are needed to assess outcomes relating to attitudes and professionalism. Adequate planning time, leadership backed up by expertise in medical education, some financial resource, tenacity and persistence and a willingness to take feedback on board all seem to be important requirements for beavers in implementing OBE.

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