

## Developing an outcome-focused core curriculum

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**BACKGROUND** Many UK medical schools have modified their curricula to meet the requirements of the General Medical Council and other external agencies. In particular, efforts have been focused on increasing integration and reducing factual overload through the definition of a core curriculum. Various approaches to curriculum change have been adopted in an attempt to meet such demands.

**PURPOSE** This paper describes a curriculum development process, which commences with a clear vision, adopts an outcome-based approach and identifies clear statements of learning outcomes. The process led to the development of an outcome-focused core curriculum structured around clinical problems, which is available to all students and staff.

**CONCLUSION** A model of curriculum development has evolved which is relatively simple in concept, and appears to be easy to comprehend by students, teaching staff and visitors from other institutions. It provides a practical framework for managing the difficult problems of integration and factual overload. It should be of general interest and applicability to other schools with health professional programmes looking for a realistic and acceptable way of defining a core curriculum.

**KEYWORDS** education, medical, undergraduate/\*methods/\*standards; curriculum/\*methods.standards; England.

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## INTRODUCTION

Like many medical schools, Sheffield has been making major efforts to modify its curriculum. It has done so to meet the requirements of external regulatory agencies and to implement international best practice in curriculum development. The medical school conducted a two-stage curriculum review process – a short-term ‘refinement’ of the established curriculum as an interim reform measure and a longer-term ‘revision’ aimed at producing a more comprehensive response to perceived deficiencies in the curriculum. Particular concerns that had been identified were a lack of both horizontal and vertical integration and factual overload. These were not problems unique to Sheffield. Factual overload has been a consistent criticism directed at medical schools by the General Medical Council (GMC) and government enquiries for at least a century.<sup>1–6</sup> Universities were finally catalysed to respond to this issue by the publication in 1993 of the GMC’s highly influential *Tomorrow’s Doctors*.<sup>7</sup> A key concept promoted by this publication was the notion of a core curriculum, which arose from the ‘core plus options’ approach proposed in a King’s Fund study and outlined in a *Lancet* editorial in 1991.<sup>8,9</sup> How the core part of the curriculum should be defined to reduce factual overload was the key question raised in the editorial.

While there remains no national agreement on the content of a core curriculum, there does seem to be consensus that this should be based on the knowledge, skills and professional attributes required of a pre-registration house officer (PRHO), a junior doctor about to start work in a National Health Service (NHS) hospital. This outcome-focused approach reflects a growing interest among the international medical educational community in outcome-based education.<sup>10</sup>

## Overview

### What is already known

Across the world, many medical schools are revising their curricula. One model is the outcome-focused approach: defining what the graduating doctor must know, be able to perform and the appropriate attitudes and behaviours.

### What this study adds

This paper provides a description of a curriculum revision process in a UK medical school. A clear and widely agreed vision led to the identification of outcome objectives and the development of a core curriculum based on clinical problems.

### Suggestions for further research

Future studies will demonstrate whether students do acquire the knowledge, skills and attitudes and behaviours at the end of their undergraduate studies using this curriculum approach.

A recent review of outcome-based education concluded that an effective educational programme cannot be delivered without making its learning outcomes explicit.<sup>11</sup> This point has been emphasised by the GMC in the latest edition of *Tomorrow's Doctors*.<sup>12</sup> There have also been several influential sets of outcome objectives for undergraduate education published in the international literature.<sup>13–15</sup> Of particular note in the UK has been the production of common learning outcomes agreed by the 5 Scottish medical schools based on a model developed at the University of Dundee.<sup>16</sup>

While these documents provide statements of expected learning outcomes, not all have provided a framework for curriculum development. Two published examples where this has occurred are those from Brown University in the USA and from the University of Dundee.<sup>14–16</sup> The Brown model arranges the outcomes under 9 abilities and imposes upon these a multidimensional matrix. The Dundee approach has a 3-circle model incorpor-

ating 12 outcomes. In Sheffield we have sought to develop a simpler model, which would relate to a curriculum structure that was emerging from the work of the school's curriculum review team (CRT).

## THE SHEFFIELD MODEL

The first important task of any systematic curriculum review is to develop a clear vision.<sup>17,18</sup> Achieving this involves extensive consultation with teachers, students and health service stakeholders as well as educational experts. Such initial work is considered essential to achieve widespread ownership of the curriculum and support for the changes the review will inevitably recommend. This was particularly important in Sheffield, where one of the key starting points was the perceived need to increase integration. Potentially, this provided major challenges and threats to the departmental structures that underpinned its conventional curriculum. The Vision Statement took nearly a year to develop before it was agreed at a public meeting and approved by the Curriculum Committee. This Statement was then made publicly available to all on the school's website (<http://www.shelf.ac.uk/~dme/curriculum/vision.htm>). Key points included in the Statement were that the curriculum would be both 'outcome-focused' and 'highly integrated'. After much debate among teachers and students, it was agreed that the general instructional approach to achieve these goals would not be through the implementation of a fully problem-based learning (PBL) curriculum. Instead a more flexible hybrid approach would be used consisting of 'a spine of problem, case and patient-based *integrated learning activities* complemented by a range of other teaching and learning activities'.

Having developed a clear vision and a general framework for the curriculum, attention turned to defining and structuring the learning outcomes to be coherent with the curriculum plan. The main feature of this plan was that vertical and horizontal integration would be achieved by organising the content of the core curriculum under only 2 vertical themes, clinical competence and underpinning medical sciences ([http://www.shelf.ac.uk/~dme/curriculum/curriculum\\_map\\_2003.pdf](http://www.shelf.ac.uk/~dme/curriculum/curriculum_map_2003.pdf)). This was a strategic decision to encourage integration from the earliest phase of the course. These 2 themes would be bound together by the spine of integrated learning activities (ILAs) and complemented by the vertically integrated student selected components (SSCs).

## THE OUTCOME OBJECTIVES

A working party of the CRT conducted a literature review and internet search to identify published information from medical schools which had adopted an outcome-based approach. Where appropriate, supplementary documentation was sought. Of particular value were materials from The Scottish Doctor project, Brown University and the Universities of Birmingham (UK), British Columbia, California Los Angeles (UCLA) and Newcastle (UK).<sup>14,16,19-21</sup> An analysis was conducted to identify key features and to ensure comprehensive coverage of the domains of knowledge, skills and professional attributes. These were cross-referenced to *Tomorrow's Doctors*<sup>7</sup> and to the Quality Assurance Agency in Higher Education's subject benchmark statements for medicine.<sup>12,17,22</sup>

A framework was devised which structured the outcome objectives for the Sheffield curriculum under headings representing the 2 themes of the core curriculum ('clinical competencies' and 'underpinning medical sciences'), and under the heading 'generic graduate skills'. These reflected the 2 main aims of the Vision Statement to produce graduates 'able to fulfil their role as a junior doctor in the NHS' and also to produce graduates 'possessing the generic skills expected of students attending a research-led university'.

The outcome objectives for clinical competence are shown in Fig. 1. Each of these outcome objectives was expanded to a further level of detail (<http://www.shf.ac.uk/~dme/curriculum/outcomes.htm>). For medical sciences, the objectives were subdivided into 'basic medical sciences', 'clinical sciences', 'behavioural sciences' and 'population health sciences' (Fig. 1). The core content of each of these was to be evaluated against the same aim of producing a competent PRHO. The achievement of the generic graduate skills is considered to be of equal importance to those for clinical competence and medical sciences. Their achievement is the particular focus of the SSC part of the curriculum. The outcome objectives for generic graduate skills are available on the School's website <http://www.shf.ac.uk/~dme/curriculum/generic.htm>.

The outcome objectives were refined further in response to feedback. They were approved by the Curriculum Committee, made available on the medical school's curriculum website and on the students' managed learning environment known as Minerva.<sup>23</sup> However, at this stage of development, the outcome

objective statements were expressed in general terms and did not define the specific content of the core curriculum. Furthermore, they did not address directly the question all students want answered – what do they need to know and be able to do to pass the course?

## DEFINING THE CONTENT OF THE CORE CURRICULUM

Several possible methods of defining the detailed content of the core curriculum have been identified previously.<sup>9</sup> Of these, an analysis of the material needed to manage common clinical problems and critical incidents has been suggested as the best approach. This position was consistent with an outcome-based approach. The identification of clinical problems likely to be faced by a PRHO and defining the competencies and knowledge required to deal with them seemed intuitively logical and was readily supported by all parties involved in the review process.

The first task was to develop an agreed list of presenting clinical problems. Lists of such problems were acquired from published sources and directly from medical schools with problem-based curricula. These included the Universities of Adelaide, Calgary, Manchester and Southampton. The problems were entered into a database and scanned for commonality. Those which appeared in 2 or more lists were included in the initial Sheffield list of problems. Consensus was then sought by sending this list to a sample of clinical teachers who were asked to rate the priority of each problem. They were also asked to add additional problems if they felt this was necessary. Those problems rated as of high or moderate priority were retained. (Fig. 2).

The second and most time-consuming task was to construct a blueprint for each problem using the outcome objectives as the framework (Fig. 3). Multi-disciplinary groups of clinicians and medical scientists worked together to complete blueprints in workshop sessions. Additional expert input was obtained by sending blueprints and instructions to targeted individuals. This was conducted to ensure integration and comprehensive coverage of both clinical competencies and associated underpinning sciences. In most instances at least 4 clinicians contributed to each blueprint, and all had contributions from basic medical scientists, population health scientists and behavioural scientists. The full range of specialist and generalist clinicians involved in adult

GENERIC GRADUATE SKILLS				
CLINICAL COMPETENCES				
Clinical Skills	Interpersonal Skills	Professional Behaviours	Practical Skills	
<p>Contributes to cure of illness, recovery from sickness and the easing of suffering and discomfort in encounters with patients [CS1]</p> <p>Participates in health promotion and in prevention of disease and disability in encounters with patients [CS2]</p> <p>Gathers relevant patient history information systematically either from patient or third party [CS3]</p> <p>Conducts complete mental state examination or selects appropriate components in a systematic and directed fashion [CS4]</p> <p>Conducts complete physical examination or selects appropriate components in a systematic and directed fashion [CS5]</p> <p>Makes accurate assessment of patient's problems &amp; formulates differential diagnosis [CS6]</p> <p>Selects &amp; initiates appropriate investigations [CS7]</p> <p>Interprets and evaluates data from history, physical examination and other findings to formulate diagnosis [CS8]</p> <p>Formulates and implements management plan and monitors its effectiveness [CS9]</p>	<p>Can establish, build and maintain proper partnerships with patients, their family / friends / carers [IS1]</p> <p>Communicates effectively [IS2]</p> <p>Works effectively as a member of a multidisciplinary team [IS3]</p> <p>Deals sensitively with patients, their family / friends / carers [IS4]</p> <p>Identifies potential danger for self and others and takes appropriate action to limit impact [IS5]</p>	<p>Adopts a questioning approach to own work and that of others [PB1]</p> <p>Works within limits of own knowledge and experience [PB2]</p> <p>Maintains patient confidentiality [PB3]</p> <p>Is responsive to changes in health care, policy and current science [PB4]</p> <p>Maintains an ethical approach [PB5]</p> <p>Complies with legal responsibilities and requirements and guidelines of regulatory bodies and the NHS [PB6]</p> <p>Demonstrates respect for the role and function of all those involved in patient care [PB7]</p> <p>Demonstrates a patient-centred approach [PB8]</p> <p>Recognises and takes advantage of opportunities to teach [PB9]</p> <p>Fulfills professional responsibilities in work and in contexts outside work [PB10]</p>	<p>Ensures optimum patient comfort and privacy [PS1]</p> <p>Prepares patient for, explains &amp; conducts technical and practical procedures effectively [PS2]</p> <p>Ensures patient consent is obtained in all aspects of investigation, treatment and management [PS3]</p> <p>Can access relevant information and record information accurately [PS4]</p> <p>Makes thorough and accurate observations, measurements and calculations [PS5]</p> <p>Recognises, identifies and can describe abnormalities and symptoms [PS6]</p> <p>Demonstrates effective decision making [PS7]</p> <p>Manages life-threatening conditions [PS8]</p>	
MEDICAL SCIENCES				
Basic Medical Sciences		Clinical Sciences	Population Health Sciences	Behavioural Sciences

Figure 1 The Sheffield Core Curriculum - outcome objectives for undergraduate medicine.

1. Anaemia	48. Leg pain/swelling
2. Bleeding	49. Cough/sputum
3. Breast lump	50. Cyanosis
4. Dying patient	51. Haemoptysis
5. Enlarged spleen	52. Low blood pressure
6. Fever	53. Murmur
7. Lump in neck	54. Oedema
8. Lymphadenopathy	55. Palpitations/abnormal heart rhythm
9. Pain	56. Raised blood pressure
10. Back/neck pain	57. Shortness of breath
11. Joint pain/swelling	58. Stridor
12. (Not in current use)	59. Wheeze
13. Lacerations	60. Abdominal distention
14. Trauma/injuries	61. Abdominal mass
15. Abnormal/unsteady gait	62. Abdominal pain (acute/chronic)
16. Confusion/delirium	63. Anorectal pain
17. Loss of consciousness /coma	64. Change in bowel habit
18. Dizziness/vertigo	65. Constipation
19. Facial pain	66. Diarrhoea
20. Fall/collapse	67. Dysphagia
21. Headache	68. Enlarged liver
22. Movement disorder/tremor	69. Haematemesis
23. Numbness/paraesthesia/tingling	70. Jaundice
24. Seizure	71. Rectal bleeding, melaena
25. Visual disturbance/impairment	72. Vomiting, anorexia, nausea
26. Weakness	73. Abnormal vaginal bleeding
27. Red eye	74. Dysuria
28. Addictive behaviour	75. Groin lump
29. Aggression/violence	76. Haematuria
30. Anxiety	77. Hirsutism
31. Self harm	78. Infertility/sexual dysfunction
32. Depression	79. Menstrual disturbance
33. Deterioration of intellect	80. Pelvic pain
34. Hallucinations	81. Physical malformation/abnormal stature
35. Learning difficulty	82. Pregnancy
36. Sleep disturbance	83. Testicular pain
37. Burns	84. Testicular/scrotal swelling
38. Itch	85. Urinary frequency/nocturia
39. Hair loss	86. Urinary incontinence
40. Skin rash/eruptions	87. Urinary retention
41. Skin ulcers	88. Vaginal discharge
42. Change in hearing	89. Weight gain
43. Ear pain	90. Weight loss
44. Oral lesions	91. Abnormal blood sugar
45. Sore throat	92. Abnormal serum sodium
46. Cardiac arrest/sudden death	93. Raised serum calcium
47. Chest pain	94. Drug effect

Figure 2 Clinical problem list.

patient care undertook most of the work. In addition, a team of child health specialists reviewed all problem blueprints to ensure specific aspects relevant to children were incorporated. Each contributor was asked to enter on the blueprint the specific outcomes that must be achieved by students in relation to the particular problem being considered. The outcome objectives provided the checklist for this process and to facilitate this all outcomes were coded (Fig. 1). In addition to the competence outcomes, contributors were asked to identify, in broad terms, the underpinning medical science knowledge required to understand and manage patients with each problem. These statements were developed in more detail by multidisciplinary groups led by phase and module co-ordinators and are incorporated into study guides. Finally, they were asked to list the index clinical

conditions relating to the problem that the student should know about because they were common, or less common but dangerous, and those which, although uncommon, were illustrative of an important underlying principle.

As an example, the completed problem blueprint for seizures is shown in Fig. 4. An important feature to note is that not all competence objectives are represented. This is because contributors were asked to identify only those objectives specific to that particular problem. For instance, under 'practical skills' there is no representation under PS1 ('Ensures optimum patient comfort and privacy'). This is a skill which we would expect to be applied to all patients, irrespective of the problem. However, this would be given curriculum priority in problems where it is a

<b>PROBLEM</b>			
<b>OUTCOME OBJECTIVES: Key skills/behaviours relating to this problem</b>			
Clinical Skills	Interpersonal Skills	Professional Behaviours	Practical Skills
<b>UNDERPINNING SCIENCES: Key content relating to this problem</b>			
Basic Medical Sciences			
Clinical Sciences			
Behavioural Sciences			
Population Health Sciences			
<b>INDEX CONDITIONS: Conditions to be considered relating to this problem</b>			
Common or less common but dangerous			
Uncommon but illustrative			

**Figure 3** Framework for problem blueprint.

very specific issue and component of care; for example the examination of a patient with pelvic pain. Under the problem 'seizures' there is an entry for PSS ('Manages life-threatening conditions') which is 'Able to manage a fitting patient' as this was thought to be a specific skill needed by a PRHO and thus one that should be covered by students when learning about the problem 'seizures'.

Individual problem blueprints were collated and edited by the chair of the curriculum review team (DN) and the director of teaching (NB). The end result of this process is that the University of Sheffield now has a defined and transparent core curriculum, which identifies the clinical competencies and knowledge required of its graduating students. Further refinement of the blueprints is in progress. The core curriculum is now available to staff and students by its incorporation in a web-enabled searchable database.<sup>23</sup> The database also contains the study guides for each component of the course and these are cross-referenced to the problem blueprints. The database is also the source of reference for all assessments.

## DISCUSSION

The systematic process of developing an outcome-based curriculum described in this paper is one of the few published examples in the literature. Central to the process was a clear vision for the overall intent and approach to the curriculum development, which was achieved as a result of widespread

consultation and consensus. From the beginning of the process this has promoted broad ownership, an essential predictor of successful curriculum change.<sup>24</sup>

The outcome-based approach has provided a rationale for identifying the content of the core curriculum by focusing on what it is that the student needs to know or to be able to do in relation to the clinical problems with which they will have to deal as a PRHO. Students have appreciated the clear statement of learning outcomes, the greater degree of relevance apparent in the curriculum and the closer match between specific learning objectives and the content of assessments. The transparency of the process and the accessibility of the core curriculum has been considerably enhanced by its transfer to a searchable online database, which is readily available to all students and staff.

The procedures we have followed provide a relatively simple model of curriculum development. The interest shown in the process and in the interactive outcome-focused core curriculum database by other institutions in the UK and in other countries leads us to believe that this is a model which may be of general interest and applicability. It is acknowledged that implementation is in its early stages and its ultimate success will have to be judged when at least a full cohort of students have completed the revised course. Nevertheless, the process of curriculum revision has been a success, an agreed model and plan is in place and student evaluations are already highly favourable. Of particular value has been the

PROBLEM 24

Seizure

**OUTCOME OBJECTIVES: Key skills/behaviours relating to this problem**

Clinical Skills	Interpersonal Skills	Professional Behaviours	Practical Skills
<p>CS02 Able to advise about risk reduction.</p> <p>CS03 Takes focussed history about nature of seizures from patient, witness/parent</p> <p>CS03 Obtains history in relation to possible underlying causes including cardiovascular and non-organic causes</p> <p>CS04 (See 35)</p> <p>CS05 Performs neurological examination</p> <p>CS05 Performs standing and lying BP</p> <p>CS07 Appropriate use of imaging, EEG, ECG and 24hr ECG.</p> <p>CS09 Understands use of anticonvulsants for acute control and long term management</p> <p>CS09 Understands issues relating to long term use of anticonvulsants (e.g. side effects, monitoring, cessation of treatment)</p> <p>CS09 Aware of non-pharmacological treatments (e.g. surgery)</p>	<p>IS01 Can give patient and/or parents appropriate advice regarding seizures (e.g. febrile, epilepsy)</p> <p>IS01 Understands specific needs of children with epilepsy (e.g. schooling)</p> <p>IS03 Liaises with specialists and epilepsy services.</p> <p>IS04 Able to discuss with patient/family epilepsy related issues (e.g. driving, employment, social consequences).</p>	<p>PB06 Understands legal issues relating to epilepsy and driving.</p>	<p>PS08 Able to manage a fitting patient.</p>

**UNDERPINNING SCIENCES: Key content relating to this problem**

Basic Medical Sciences	Basic understanding of electrical activity of brain
Clinical Sciences	Pathophysiology of main types of epilepsy. Understands mechanisms of actions, use and adverse affects of anticonvulsants.
Behavioural Sciences	Social and behavioural impact of epilepsy.
Population Health Sciences	

**INDEX CONDITIONS: Conditions to be considered relating to this problem**

Common or less common but dangerous	<p>Epilepsy</p> <p>Febrile convulsions</p> <p>Non organic seizures</p> <p>Seizures secondary to cerebral anoxia</p>
Uncommon but illustrative	

Figure 4 Completed blueprint.

high degree of transparency provided by the web-based outcome objectives and problem blueprints, which they are using to guide their study and preparation for assessments.

*Contributors:* DN wrote the paper, led the curriculum review team (CRT) and was involved in all aspects of developing the core curriculum. PS assisted with the

literature review and developing the Outcome Objectives. NB contributed to the work of the CRT, co-edited the problem blueprints with DN, chairs the Curriculum Committee and is responsible for leading the implementation of the revised curriculum. ML led the working party which developed the outcome objectives.

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## REFERENCES

- General Medical Council (GMC). *Introduction to the Recommendations of the Council as to the Medical Curriculum*. London: GMC 1967.
- General Medical Council (GMC). *Recommendations as to Basic Medical Education*. London: GMC 1967.
- General Medical Council (GMC). GMC Annual Report for 1986. London: GMC 1987.
- Newman G. *Some Notes on Medical Education in England*. London: HMSO, 1918.
- Ministry of Health, Department of Health for Scotland. Report of the Interdepartmental Committee on Medical Schools (Goodenough Report). London: HMSO, 1944.
- Royal Commission on Medical Education. Report of the Royal Commission on Medical Education (Todd Report). London: HMSO, 1968.
- General Medical Council (GMC). *Tomorrow's Doctors. Recommendations on Undergraduate Medical Education*. London: GMC 1993.
- Towle A. *Critical Thinking: the Future of Undergraduate Medical Education*. London: Kings Fund Centre 1991.
- Editorial. The core curriculum: can it be defined? *Lancet*, 1991;**338**:1048–9.
- Prideaux D. The emperor's new clothes: from objectives to outcomes. *Med Educ* 2000;**34**:168–9.
- Harden RM. Developments in outcome-based education. *Med Teacher* 2002;**24**:117–20.
- General Medical Council (GMC). *Tomorrow's Doctors. Recommendations on Undergraduate Medical Education*. London: GMC 2002.
- Association of the American Medical Colleges (AAMC). Report 1: Learning objectives for medical student education. *Guidelines for Medical Schools*. Washington: AAMC 1998.
- Smith SR, Dollase R. AMEE guide 14. Outcome-based education. Part 2. Planning, implementing and evaluating a competency-based curriculum. *Med Teacher* 1999;**21**:15–22.
- Institute for International Medical Education. Global minimum essential requirements for medical education. *Med Teacher* 2002;**24**:125–9.
- Harden RM, Crosby JR, Davis MH, Friedman M. AMEE guide 14. Outcome-based education. Part 5. From competency to metacompetency: a model for the specification of learning outcomes. *Med Teacher* 1999;**21**:546–52.
- Fisher LA, Levene C. *Planning a Professional Curriculum*. Calgary: University of Calgary Press 1989.
- Harden RM, Sowden S, Dunn WR. ASME medical education booklet 18. Some educational strategies in curriculum development: the SPICES model. *Med Educ* 1984;**18**:284–97.
- Ross N, Davies D. AMEE guide 14. Outcome-based education. Part 2. Planning, implementing and evaluating a competency-based curriculum. *Med Teacher* 1999;**21**:15–22.
- Towle A. Personal communication. The University of British Columbia 2000.
- Spencer J. Personal communication. The University of Newcastle 2000.
- The Quality Assurance Agency for Higher Education. *Medicine*. Gloucester: The Quality Assurance Agency for Higher Education 2002.
- Roberts C, Lawson M, Newble D, Self A. Managing the learning environment in undergraduate medical education: the Sheffield approach. *Med Teacher* 2003;**25**:282–6.
- Gale R, Grant J. AMEE medical education guide 10. Managing change in a medical context: guidelines for action. *Med Teacher* 1997;**19**:239–49.

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