Competencies for a Canadian orthopaedic surgery core curriculum

V. M. R. Wadey, P. Dev, R. Buckley, D. Walker, D. Hedden

From the University of Toronto, Toronto, Canada

We have developed a list of 281 competencies deemed to be of importance in the training of orthopaedic surgeons. A stratified, randomised selection of non-university orthopaedic surgeons rated each individual item on a scale 1 to 4 of increasing importance. Summary statistics across all respondents were given. The mean scores and SDs were computed. Secondary analyses were computed in general orthopaedics, paediatrics, trauma and adult reconstruction. Of the 156 orthopaedic surgeons approached 131 (84%) responded to the questionnaire. They rated 240 of the 281 items greater than 3.0 suggesting that competence in these was necessary by completion of training.

Orthopaedic surgery in Canada is taught at 16 accredited academic institutions under the auspices of the Royal College of Physicians and Surgeons of Canada (RCPSC) and the Specialty Committee for Orthopaedic Surgery (SCOS). Ten educational domains may be included in the design of core curriculum competencies for orthopaedic surgery and may include the following: general content which every orthopaedic surgeon should know and understand, trauma, paediatrics and adult reconstruction of the hip and knee, the foot and ankle, the shoulder and elbow, the hand and wrist and the spine, oncology, tumours and miscellaneous-like conditions and content pertaining to research and evidence-based medicine. With the advent of the CanMED 2005 competencies new areas of knowledge are required of the orthopaedic resident. Details of these can be seen on the RCPSC website. We will restrict this study to the medical expert competency.

The design and development of a curriculum targeted to meet the needs of a learner are essential to any educational programme. Learning to use an evidence-based approach is recommended and encouraged when making clinical decisions which affect the care and safety of patients. Traditionally, orthopaedic residents learned directly from senior surgeons. On the successful completion of a residency programme candidates took a certification examination.

The aim of each residency-training programme in Canada is to produce an orthopaedic surgeon who may enter the community and manage patients with musculoskeletal conditions. The role of the Examination Committee for the Specialty Committee of Orthopaedic Surgery of the RCPSC is to ensure that candidates are effectively and accurately assessed in their ability to be safe and competent orthopaedic surgeons.

Educational literature suggests that learning is driven by evaluation. During the past decade there has been a debate between the Examination Committee and those who run the training programmes as to the content of the questions in the orthopaedic Fellowship Examination. It has been suggested that this Examination is becoming too subspecialised and that it is not pertinent to the needs of orthopaedic surgeons in centres which are not affiliated to a teaching programme. A national survey to assess the importance of appropriate competencies in the orthopaedic curriculum was carried out. We have examined these competencies under four subsections as follows: 1) the general content which all orthopaedic surgeons should know regardless of their subspecialty; 2) paediatrics; 3) trauma and 4) adult reconstruction.
The RCPSC-SCOS, the Examination Committee, the Canadian Orthopaedic Association and the Bone and Joint Decade Canada supported an educational initiative to develop and to validate an orthopaedic curriculum targeted to meet the needs of residency education in Canada. The RCPSC-SCOS and the two chief examiners of the Examination Committee requested that a national survey to assess the importance of competencies to be taught in the curriculum be determined by orthopaedic surgeons whose primary affiliation was to a health-care facility without a training programme. Since many graduates from residency programmes will undertake practice at such locations, these surgeons are able to provide input into an appropriate curriculum which is targeted to meet the educational needs of those practising in their environment. Orthopaedic surgeons in university centres tend to be subspecialists who may overestimate the importance of their particular interest in the practice of a general orthopaedic surgeon.

We therefore describe the development and validation of core curriculum competencies for the orthopaedic surgery residency training programme.

Methods
Development of the outcome measure. We developed a questionnaire consisting of three sections as follows: 1) the previously validated international core curriculum for musculoskeletal health;11 2) the specialty objective of the RCPSC specifically pertaining to orthopaedic surgery; and 3) a complete procedure list based on the codebooks throughout Canada. The questionnaire was then compared with the curricula of the various institutions across Canada to ensure that the content of the university programme was also included.

The questionnaire was assessed by ten Canadian orthopaedic surgery researchers/educators representing adult and paediatric orthopaedic surgery from within Canada and the United States. They included the two Chief Examiners representing the Examination Committee, Programme Directors representing the RCPSC-SCOS and educational leaders within the Canadian orthopaedic committee, including both the English and French speaking surgeons, some of whom were based in universities and others in general orthopaedic community practice within Canada, and one Canadian orthopaedic educator who was practising in the United States. In the light of their comments the questionnaire was modified and finally consisted of 281 items. It is available on request from the corresponding author.

Sample question. Each of the 281 questions was structured in a fashion similar to the sample in Figure 1. The respondents rated each item on an integer scale of increasing level of importance. The choices of response for each question were as follows: 0, unable to assess; 1, not important; 2, probably not important; 3, probably important; and 4, important.

Randomisation and cross-sectional survey. From the RCPSC list of active orthopaedic surgeons practising in 2004, 156 were chosen all of whom were non-university affiliated. A stratified, randomised selection was completed which ensured appropriate representation from the Atlantic Provinces and Quebec, central Canada (Ontario) and western Canada (Manitoba, Saskatchewan, Alberta, British Columbia and the three territories). These distributions were based on the number of orthopaedic surgeons within these regions. An interview schedule was arranged and conducted in both official languages. A cross-sectional survey was completed.

Statistical analysis. The data were analysed descriptively and quantitatively. Summary statistics across all respondents were computed as were the mean scores and SDs. We wished to draw conclusions from the questionnaire about the four categories, namely, general competencies, paediatric orthopaedics, orthopaedic trauma and adult reconstruction.

Results
Demographics. A total of 131 of 156 orthopaedic surgeons participated in our study giving an overall response rate of 84%. The rate for each of the regions was similar. Of these, 111 (85%) classified themselves as generalists and 20 (15%) as specialists. Their mean age was 48.7 years (30 to 79) and their mean time in practice was for 16.8 years (0.8 to 50.5). Men made up (118 of 131) 90% of the surgeons. The details of their experiences acquired during Fellowship are summarised in Table I.

The analysis addressed all 281 items. The ranked mean scores and SDs were obtained and listed in ascending order of importance for the entire curriculum. Histograms indicated the distribution of items for each of the four groups of items based on the mean rank score provided by the respondents (Fig. 2).

Orthopaedic core curriculum including all 281 items. Analysis of all the 281 items identified 240 which were considered to be probably important or important to dem-
onstrate knowledge in or be able to perform with proficiency upon completion of residency training. Only 41 (14.6%) of the 281 items received a mean rank of between 2.00 and 2.48. These involved complex procedures in adult reconstruction, arthrodesis of the lumbar, thoracic and cervical spine, osteotomies in children, the ability to identify developmental milestones in children and the performance of emergency angiograms.

General principles in orthopaedic knowledge. General orthopaedic knowledge requires competencies associated with common musculoskeletal conditions including a list of basic procedures which all orthopaedic surgeons should be able to perform regardless of subspecialty. There were 103 items pertaining to musculoskeletal conditions which consisted of a large component of a previously validated core curriculum for musculoskeletal health. Of these 103, 89 received a mean rank score of not less than 3.5 and 102 had a mean rank score of not less than 3.0, indicating their importance for all orthopaedic residents upon completion of training.

Paediatric orthopaedics. There were 48 competencies pertaining to paediatric orthopaedic surgery of which 42 were given mean scores of at least 3.0, suggesting that they should be known by completion of training, and 25 mean scores of at least 3.8, indicating a high level of importance.

Orthopaedic trauma. There were 128 items, of which 109 were given mean scores of at least 3.5 and 123 of at least 3.0 (SD < 0.9) indicating that virtually all were deemed to be important upon completion of residency.

Adult reconstruction. This section consisted of 170 items pertaining to all aspects of adult reconstruction including the spine, hip and knee, foot and ankle, hand and wrist, tumour and miscellaneous, sports medicine and shoulder and elbow. These groupings were chosen to reflect the contact of specific rotations in training programmes. A mean rank score of not less than 3.0 was recorded in 137 items (80%) indicating that knowledge of these was needed by the end of the residency. Greater importance was attached to 91 items (53%) (score 3.5) suggesting these those were of greater significance (SD < 0.08).

Discussion

There was substantial agreement among the orthopaedic surgeons whose primary affiliation was not to a university regarding competencies to be included in a core curriculum for orthopaedic surgery. The general content of the proposed core curriculum covered the requirements for the diagnosis and initial management of common problems associated with the musculoskeletal system. The contents consisted of the initial items outlined by Woolf, Walsh and Akesson in their Bone and Joint Decade Undergraduate Curriculum Group which assembled 29 representatives from the developed nations. They produced a set of recommendations for a core curriculum which could gain worldwide acceptance.

This was validated in Canada at the post-graduate level and the product made up the first cluster of questions in the proposed Canadian orthopaedic core curriculum.

The paediatric section identified important competencies as follows: procedures relating to trauma, the diagnosis and management of infection, the assessment and management of hip conditions and the ability to apply casts for fractures, dislocations and spasticity. The performance of osteotomies...
and the understanding of the developmental milestones in children were not considered to be important. Orthopaedic surgeons whose primary affiliation is not to a university do require competencies for managing paediatric conditions which should be an integral part of a core curriculum.

The World Health Organisation has predicted that by the year 2020 motor-vehicle accidents will be the second leading cause of premature deaths worldwide. Orthopaedic surgeons will need to be able to manage this burden of injury. Our study indicated the competencies which need to be included in a core curriculum for trauma.

The category of adult reconstruction identified only 33 of 170 competencies which received a mean score of between 2.0 and 2.9, suggesting that knowledge of these items was not of particular importance for residents to know by the completion of training. These complex procedures were more likely to be undertaken in specialist centres. The burden of illness resulting from musculoskeletal conditions is well understood. The World Health Organisation has predicted that by 2020, 40% of the world’s population will be afflicted with arthritis, and educators will need to prepare future surgeons to meet this increase in burden of illness in all spheres of orthopaedic surgery.

Various procedures which had been previously performed by orthopaedic surgeons were identified as not being of importance for proficiency upon completion of training. It is important that factors in education produce strategies, probably by fellowship programmes, by which these procedures will be learned and practised in appropriate centres to meet these projected health demands.

The strengths of our study included the use of a previously validated international core curriculum for musculoskeletal health, with direct one-on-one interviews either by telephone or in person with participating surgeons, randomisation of orthopaedic surgeons carried out separately in three different regions of Canada, a full review of the content by senior education and research leaders in Canada before carrying out the study and full endorsement by the RCPSC-SCOS, the Canadian Orthopaedic Association and the Bone & Joint Decade Canada.

The limitations included the existence of a positive response bias within the questionnaire, the grouping together of several similar competencies in some of the questions, a limited scale grading of the level of importance and the wording of the questions which asked each respondent to indicate the importance of either content or procedures. This implied that we are asking opinions rather than determining what surgeons were actually doing. The end-results would be more convincing if they showed what orthopaedic surgeons were doing clinically. Also, within the groups of items which received the exact mean rank score, we were unable to identify which items within the cluster were more important than others. The validity of our study may be increased if it were to be repeated among the tertiary-care orthopaedic surgeons who teach the competencies of the curriculum.

Future considerations. Although our study has identified competencies deemed to be important for satisfactory performance on completion of residency, the ability to learn these with proficiency may pose different problems for residency training programmes. Traditionally, the Halstedian method of ‘see one, do one and teach one’ has been the method of choice for the teaching of residents in surgery. This method increases time in the operating room, the use of equipment and of human resources. Residents may not have the opportunity to learn a particular surgical procedure unless a patient is scheduled for it at a teaching hospital. They may attend the operation but may not be given the opportunity to actually perform it. There is also a lack of objective measures against which residents are evaluated. In the current climate of pressure on waiting lists and clinical time residency education may be being compromised in our attempt to deal with increased volumes of work. Surgeons may prefer to have surgical assistants other than residents in their operating rooms and clinics.

With the increased numbers and complexity of procedures and the explosion of knowledge in orthopaedics it will continue to be challenging to know what is best to teach. The time spent in residency is precious and must be used to its maximum advantage. With the addition of additional competencies being taught and evaluated and with the decreased number of hours which residents are allowed to work, we must be certain that every educational moment is used to the best possible advantage. This will take a major change in the way we think about orthopaedic education and will require much more organisation of the programme. Competency-based learning may be on the forefront of such training programmes.

Our study has shown with reliable statistical evidence validated core competencies for orthopaedic surgery. The objectives of orthopaedic curricula should focus on emergent and common problems with the final examination reflecting these objectives. If this goal is not achieved, a strategic plan facilitating the acquisition of an optimal clinical experience for each resident may need to be developed and implemented into training programmes. This may be in the form of continued direct hands-on experience in the operating room which may be structured differently. Alternatively, the development of surgical or virtual competencies laboratories or competency-based educational experiences may be implemented into training programmes. Either way, it will be essential for the academic programmes within Canada to be unified in their approach to educating future orthopaedic surgeons in order to combat the present and projected burden of illness resulting from musculoskeletal conditions. Learning activities are directed by evaluation of the curriculum and this may need to be defined.
V. M. R. Wadey acknowledges the support of the Royal College of Physicians and Surgeons of Canada for providing the opportunity for this study to be completed as the 2004 Medical Educational Travelling Fellow.

No benefits in any form have been received or will be received from a commercial party related directly or indirectly to the subject of this article.

References