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## INFORMING CURRICULUM DEVELOPMENT IN HEALTH SCIENCES

A DELPHI METHOD INQUIRY

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### INTRODUCTION

The education of future medical professionals has to ensure that their knowledge and skills are relevant to the health care needs of their future patients, in a context of continuous change of society, science, technology and environment. A rapid tour of the horizon will identify a few examples of evolving health care needs, which should inform the curricula of medical schools. To start with, the disease profile of populations evolves as their income and lifestyle change and their life expectancy increases. Another example would be the latest pandemic of HIV/AIDS, which requires appropriate medical skills and a rethinking of the management of many diseases for those living with the virus. Further, patients' increasing awareness of their rights has to be paralleled by doctors' awareness of the complex ethical issues which sometimes arise from the practice of the profession. In addition, the progress of science opens new knowledge domains, such as genomics – the study of the structure and function of genes – which reshape the understanding of disease. The accumulation of data from extensive research in all fields of medicine makes it possible, for the first time in the history of the profession, to practise evidence-based medicine, informed by the systematic analysis of the results of numerous studies on the same disease and thus to move away from treatments based merely on case series or expert opinions. A further example, by no means the last, is the renewed interest in complementary and alternative medicine in the search to expand the therapeutic panoply against disease.

Against this background, the medical education methods also undergo change: for example, instead of attending lectures and tutorials only, students increasingly participate in problem-based learning or may have Internet-delivered e-learning programs. Alongside this, medical schools have to acknowledge the evolving educational needs of the students, as their demographics show more diversity in ethnic and cultural backgrounds. To end this selective list of examples of change which have to reverberate in the planning of medical studies curricula, continuous medical education deserves mentioning: for the medical profession, life-long learning has become the

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norm and medical schools need to involve themselves in planning and delivering programmes targeting practising professionals.

A major task of curriculum planners in health sciences, just as in other learning fields, is to identify changes as those illustrated above, even to predict them to a certain extent and then maintain the relevance of the training of future doctors, by an appropriate selection of educational experiences offered. This chapter proposes to analyse the curriculum development theory in medical education in order to identify the mechanisms for ensuring the adequacy of the training of students for their future practice. In this context, the use of the Delphi method of inquiry will be described in more detail. This includes the author's research.

The process of curriculum development in medical education is informed by the need to attain a certain level of competence which, historically, has been monitored by an administrative authority and which is defined by clear domains of knowledge and skills to be acquired by the future doctor. Then the content of the curriculum, its teaching methods and its assessment system are all aimed at handing on this knowledge and skills to the student. Such terms of reference dictate a strong adherence to scientific curriculum development principles; this will also appear from the analysis that follows.

There are four elements that need to be addressed in the process of curriculum design: content, teaching and learning strategies, assessment processes and curriculum evaluation processes (Prideaux 2003). Most modern thinking in this field revolves around these components. Dent and Harden (2009), for example, propose 10 steps toward curriculum development: assessing the need to be covered by the programme, defining the student outcomes, selecting the content, organising the content, delineating the educational strategies, selecting the teaching methods, assessing the student progress and the efficacy of the teaching programme, communicating the curriculum to all stakeholders, including students, organising the educational environment and managing the curriculum. Fish and Coles (2005:104) similarly structure their description of the medical curriculum development around an initial comprehensive assessment: clarifying the aims of the curriculum, the values of the profession and the nature of practice – “a survey of the field”. Thereafter follows the defining of content, of educational strategies and assessment methods, and ending with implementing and managing the curriculum on the ground.

A comprehensive model of medical curriculum development was created by a group of specialists at the Johns Hopkins University Faculty Development Program for Clinician-Educators (Kern, Thomas, Howard & Bass 1998; Kern, Thomas & Hughes 2009). They envisaged a rational curriculum design approach in six steps. Resulting from a sustained process of training faculty in curriculum development and assessment skills, continued for more than two decades, their approach has gained a substantial international popularity. The analysis that follows focuses mainly on the framework proposed by the Johns Hopkins group. While being similar in structure to the models of curriculum design mentioned above, the approach proposed by Kern and collaborators has the

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advantage of having been tested in practice over a longer time and in different cultural environments (Amin & Eng 2003). The Johns Hopkins group has recently updated its approach, based on the review of the experience accumulated over the last 10 years (Kern *et al* 2009).

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The Johns Hopkins model draws on previous work by curriculum specialists such as Ralph Tyler (1949) and Hilda Taba (1962). Reviewing their contribution to curriculum development theory, Print (1993:64-66) describes their proposed rational model in curriculum design which would start with defining objectives and continue to selecting learning experiences that may help in attaining those objectives, then to organising these experiences and concluding with evaluation in order to find whether the learning objectives were attained. A cyclical curriculum planning process was envisaged by DK Wheeler (1967) and furthered by Nicholls and Nicholls (1978) some years later. The steps proposed by Wheeler were largely similar to those delineated by Taba and Tyler, but this time in a cyclical arrangement that highlighted the idea of interdependence between the steps and of curriculum evolution as the cycle repeats itself. Print (1993:70-72) describes how Audrey and Howard Nicholls introduced an important preliminary step in curriculum design: situation analysis, which is an initial (or, due to cyclicity, periodical) tour of the horizon of all factors that determine the choice of curricular objectives.

Kern and colleagues, who were responsible for developing the Johns Hopkins model, acknowledge that their inspiration came from such works. The model they proposed comprises six steps: problem identification and general needs assessment, targeted needs assessment, formulation of goals and objectives, choice of educational strategies, implementation, and evaluation and feedback (Kern *et al* 2009). Its structure remains cyclical, however “these steps do not always follow one another in sequence, but do constitute a dynamic, interactive, and systematic process” (Thomas & Kern 2004:599). The content of each step is detailed below.

The problem identification and general needs assessment constitutes the most important step, as its findings would inform the whole subsequent planning of the curriculum. It consists of identification, followed by a comprehensive critical analysis, of the health care problem that will be addressed by the curriculum. It requires substantial research to analyse what is currently being done by practitioners, educators, patients and society in general i.e., the current approach, and what should be done ideally by practitioners, educators, patients and society to address the health care problem, thus constituting the ideal approach. The general needs assessment is usually stated as the knowledge, attitude and performance dearth that the curriculum will address (Kern *et al* 2009:6). The methodology they propose for implementing this step is summarised in Table 15.1.

**PART THREE • METHODS FOR INTERROGATING, REVISIONING AND IMPLEMENTING CURRICULUM CHANGE****TABLE 15.1** Methods for obtaining the necessary information for a situation analysis  
(Kern *et al* 2009:17)

Review of available information	<ul style="list-style-type: none"> <li>▪ Evidence-based reviews of educational and clinical topics</li> <li>▪ Published original studies</li> <li>▪ Clinical practice guidelines</li> <li>▪ Published recommendations or expected competencies</li> <li>▪ Documents submitted to educational clearinghouses</li> <li>▪ Curriculum documents from other institutions</li> <li>▪ Patient education materials, prepared by foundations or professional organisations</li> <li>▪ Patient support organisations</li> <li>▪ Public health statistics</li> <li>▪ Clinical registry data</li> <li>▪ Administrative claims data</li> </ul>
Use of consultants / experts	<ul style="list-style-type: none"> <li>▪ Informal consultations</li> <li>▪ Formal consultations</li> <li>▪ Meetings of experts</li> </ul>
Collection of new information	<ul style="list-style-type: none"> <li>▪ Surveys of patients, practitioners or experts</li> <li>▪ Focus groups</li> <li>▪ Nominal group technique</li> <li>▪ Group judgement methods (e.g. <i>Delphi method</i>)</li> <li>▪ Daily diaries by patients and practitioners</li> <li>▪ Observation of tasks performed by practitioners</li> <li>▪ Time and motion studies</li> <li>▪ Critical incident reviews</li> <li>▪ Study of ideal performance cases or role model practitioners</li> </ul>

The next step in accumulating the necessary information for designing the curriculum is the targeted needs assessment. Here, the specific needs of the students attending the medical education institution are scrutinised, as well as the specific needs of the institution itself, in connection with the subject of study in which the curriculum is developed. Amin and Eng (2003:60), describing their experience with the Johns Hopkins model, indicate a number of student characteristics that may need to be evaluated: their level of competence when entering the programme; their ability to undertake self-directed and group study; their individual goals and priorities, including reasons for enrolling; their attitude towards the subject studied and their assumptions and expectations from the programme. Written questionnaires might be useful in this step.

On the basis of this comprehensive analysis, the goals and objectives of the course can be formulated. Kern *et al* (2009) argue that they should cover three areas: knowledge, skills and attitudes. This step is crucial for the selection of the most effective learning methods, as well as for the adequate choice of assessment methods. The choice of

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teaching strategies must be aligned with the objectives, as stated above. The methods employed must be diverse, as required by the matters to be taught, knowing also that the ways students learn differ according to their personality. On the other hand, in choosing the methods, planners need to take into account the available material and human resources (Amin & Eng 2003). The potential to alienate teachers who do not cope with curricular changes is real, and it was advocated that they should be involved early in the development of new curricula and that they should receive training in the required new teaching methods (Lanphear & Cardiff 1987).

Students learn with examinations in mind and therefore the assessment methods should be carefully planned, on the basis of the objectives of the course. The assessment should address essential knowledge, skills and behaviours which will be required for practice by the future graduates. It should be planned at the beginning of the course, not at the end, and the learners need to be informed of the ways in which this assessment will be conducted.

Finally, the evaluation of the curriculum has to be planned for. This should be an ongoing process and not be left for the last days of the course. The evaluation may be done not only by the learners or faculty involved, but it may involve faculty from related disciplines (Burke 2002). An anticipatory evaluation, before the course actually starts, may be organised, involving students and faculty who did not participate in the development of the curriculum (Hollander, Leese & Irby 2002).

The principal merit of this approach, besides defining the internal architecture of the process of medical curriculum design, is the recognition of a general needs assessment, as well as of a targeted needs assessment, as the basis for structuring the programme. The curriculum is not seen as a rigid entity; on the contrary, it needs to evolve, to adapt in order to continue to fulfil its role. This evolution requires feedback. The sixth step in the Johns Hopkins model, the evaluation of the curriculum, brings feedback on the internal functioning of the system, i.e. how well it works to help the learners to achieve the desired objectives, how well the lecturers are coping, the adequacy of resources, and other aspects. The first step, the needs assessment, repeated at regular intervals (as prescribed by the cyclic character of the curriculum design), ensures that the programme remains attuned to the requirements of the society at large and of the accrediting and licensing organisations, as well as to the requirements of the practitioners in the field and, most importantly, to the needs of the patients. It is this first step that constitutes the focus of the rest of this chapter.

**OVERVIEW OF THE TOOLS USED IN A NEEDS ASSESSMENT**

Table 15.1 lists the various methods which might, according to Kern and collaborators, be used when performing a needs analysis. They stress that the review of the available information and the consultation of experts are, in fact, the usual methods and that they would, in most instances, be sufficient to perform a valid general needs assessment exercise. Done in this way, the analysis should not require excessive time

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or resources. It would entail going through the literature, reviewing the curricula of other similar institutions and other published curricula, consulting the standards set by the regulatory authorities or meeting with experts in the particular field where the curriculum is positioned. Kern and collaborators are of the opinion that direct consultation with the stakeholders (practitioners, educators, patients and society representatives) is necessary only when the resources mentioned above do not offer sufficient data to ensure a comprehensive grasp of the general needs. However, my research (Stefan 2009) indicates that the value of such direct inquiry should not be underestimated, as it has the potential to detect the real needs of the beneficiaries of the curriculum, i.e. practitioners and their patients, as presented by themselves. It may be necessary to perform such analysis initially and at regular intervals, as a guarantee that the curriculum is and remains effective.

### Delphi as a method of curriculum inquiry

Drawing on the Johns Hopkins model discussed above, I would argue that the adequacy of the medical curriculum, in the face of evolving patients' and practitioners' needs, is maintained by the cyclicity of assessing the general needs and the targeted needs. Such assessment consists mainly of gathering information from various written sources. It also includes monitoring the activities of learners, patients, practitioners or experts and eliciting the opinions of these groups (see Table 15.1). Several methods for opinion gathering are suggested by Kern *et al* in the table mentioned: meetings of experts, surveys, focus groups, meetings where the nominal group technique is applied in order to establish a hierarchy of shared opinions, and the Delphi method.

When using any of these methods for opinion gathering, the curriculum developer should be aware of the specific advantages, disadvantages and pitfalls of each of them. Expert meetings should be monitored for patterns of interactions between participants such as 'follow the leader' behaviours or reluctance to abandon previously stated opinions in order not to lose status within the group. Such group dynamics may yield an unbalanced opinion, where the more vocal or authoritative members effectively silence the opinions of the other participants (Forsyth 2010).

Focus group discussions are structured as interviews held simultaneously with a small number of participants (Varkevisser, Pathamanathan & Brownlee 2003). The method allows capturing multiple opinions simultaneously on the same matter and thus achieving awareness of the various facets of the issue being studied; also, the interaction between members may be stimulating and contribute to generating ideas. However, this method also has disadvantages: due to the multiple participants, focus group discussions require a large investment of time. The geographical distribution of the locations of various experts can make it difficult to assemble them for the purpose of discussions. The dynamics of a group as discussed above, i.e. the influence of dominant individuals, peer pressure to conform, as well as noise, add to the difficulty of conducting successful discussions.

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Surveys by questionnaire – self-administered – are not expensive; by providing anonymity they may elicit more honest responses; the possible bias, sometimes induced by rephrasing the question during interviews, is eliminated. However, questions may be misunderstood and it is easy for the subjects to neglect responding. A low response rate to a questionnaire survey introduces a bias which cannot be compensated for, as the responses of those who chose not to participate cannot be known or guessed (Varkevisser *et al* 2003).

In the nominal group technique, participants are invited to write their thoughts on the issue under discussion, individually. Thereafter the group would discuss in order to achieve full understanding of the ideas they wrote down and rate them for relevance to the solution sought. This technique encourages unrestrained individual contribution, in an attempt to minimise peer influence. However, it requires a trained group coordinator and the assembling of a group of individuals at a given venue and time (Stewart, Shamdassani & Rook 2007).

The Delphi method eliminates many of the disadvantages of the methods mentioned above. Delphi is a technique for eliciting suitable information for decision making, based on the opinions of a group of experts. It is based on a structured process for collecting and synthesising knowledge from the participants by means of a series of questionnaires accompanied by controlled opinion feedback (Adler & Ziglio 1996). Olaf Helmer and Norman Dalkey developed the method at the RAND Corporation in California, USA in the 1950s, originally as a means of forecasting events in the military domain. Its name was inspired by the oracle at the temple of Apollo in Delphi, where, in the times of ancient Greece, people would arrive from distant places to seek answers about their future.

The underlying philosophical concept of the Delphi method is that, in fields of knowledge which have not yet developed to the point of having scientific laws, the opinion of the experts is admissible in order to circumscribe the reality (the philosophical underpinning of the method is described extensively in Linstone and Turoff 2002). Our understanding of reality is seen as a spectrum of degrees of accuracy. At one end of it is the knowledge: this is thoroughly supported by solid evidence, usually obtained by the scientific method. At the other end, little or no available evidence leaves the ground open for speculation. The segment of spectrum situated between the extremes is the realm of wisdom, or insight, or informed judgment. This is where Delphi may be used in order to optimise the information that can be extracted from such wisdom (Dalkey 1969, cited in Adler & Ziglio 1996:6).

In order to attain such purpose, the Delphi method uses three specific components: (1) mailed or e-mailed questionnaires, thus ensuring the anonymity of the panellists; (2) controlled feedback, and (3) statistical response.

**PART THREE • METHODS FOR INTERROGATING, REVISIONING AND IMPLEMENTING CURRICULUM CHANGE****Description of the Delphi method**

A Delphi inquiry on a given subject begins with establishing a team to undertake and monitor the procedure (Illinois Institute of Technology 2008). The team then selects, among the experts in the area being investigated, a number of participants whose opinion will be sought. After securing the participation of the experts, the Delphi team develops a questionnaire exploring various aspects of the subject of the inquiry. The questionnaire is then tested for adequate wording, in order to eliminate ambiguities and vagueness. The questionnaire is then sent to the participants, by mail or e-mail.

The responses received are analysed for concordance between experts. The Delphi team will already have established what percentage of concordance between experts will be considered as consensus (50%, 75% or more). A number of answers will have attained the set percentage of concordance, meaning that the experts have reached consensus on those items. A second questionnaire is now prepared, including only those questions where there was no consensus among the participants, together with a statistical feedback, indicating the various answers given by the experts to every question and the number (or percentage) of participants who gave each answer. All experts receive the second questionnaire, while being informed that, should they now have a different opinion on the matters under inquiry, they can give a different reply than their previous one. On analysing the answers from this second round, further consensus will be seen, as some of the experts will have changed their own replies to coincide with those of the majority. A third questionnaire is set up, following the same procedure as for the second one. More items will now register consensus. The process may be repeated as many times as desired or until either complete consensus or stability in the answers (i.e. no more change of opinion) is attained. The team can now prepare their final report on the results of the Delphi inquiry.

The proper selection of participants requires a clear definition of who is an expert for the purpose of the survey. Here, the most important attribute is not the academic proficiency (which indeed may be required for specific applications) but rather knowledge of and practical involvement with the issues under investigation. An inadequate selection of the panel will lead to meaningless answers.

Delbecq, Van de Ven and Gustavson (1975:88) define three groups of people who are well qualified to be subjects of Delphi:

1. the top management decision makers who will utilise the outcome of the Delphi study;
2. the professional staff members together with their support team; and
3. the respondents to the Delphi questionnaire whose judgments are being sought.

The size of the panel does have an influence on the results. If, for instance, it consists of a homogeneous group of experts, 10 to 15 participants would be enough. However, if various reference groups are involved, the panel must be much larger. Dalkey (1972, cited in Linstone & Turoff 2002:224-230) has shown that the size of the group



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influences the accuracy of the results up to a certain point. Beyond that point, however, there is very little to gain, in terms of result precision, from widening the group

The ultimate aim of a Delphi exercise is that of obtaining a collective answer to the question asked, with facilitated consensus. Should answers indicate divergence in opinions, the authors should explain their views and these explanations should be analysed. Both consensus and dissension are valuable and should be explored with regard to their reasons and to their significance towards the solution sought. The method has been applied in almost 1 000 studies worldwide, involving panels of various sizes, for evaluating phenomena (and especially predicting their course) in the industrial, military, economic and social fields (Gupta & Clarke 1996; Landeta 2006). Its use in medical education is explored in the section that follows.

### Aspects of using the Delphi method in the design of medical curricula

The Delphi method has been chosen by numerous teams of researchers worldwide for surveying expert opinions in the process of designing medical studies curricula. It was used, for example, for determining the content of core undergraduate psychiatry (Wilson, Eagles, Platt & McKenzie 2007); to identify the priorities to be met by a family medicine training programme (Kanashiro, Hollaar, Wright, Nammavongmixay & Roff 2007); to obtain the students' perspectives on a radiology curriculum (Subramaniam, Beckley, Chan, Chou & Scally 2006); for involving patients in curriculum development (Alahlafi & Burge 2005) and in many other studies. The method was found to be suitable for determining the outcomes (Clayton, Perera & Burge 2006), the contents (Carley, Shacklady, Driscoll, Kilroy & Davis 2006; Kilroy & Driscoll 2006) and the methods of teaching (Fallon & Trevitt 2006) for various medical programmes.

All studies consisted essentially of a list of items such as outcomes, skills, course topics or teaching methods, which was submitted for rating of importance (this meaning mainly usefulness for medical practice) to a panel of experts. The list might have been formulated by the authors, obtained from other curricular documents or drawn up by a group of experts specifically tasked to design it. Sometimes the list was based on interviews or free text questionnaires answered by the same panels of experts who would be asked to do the ratings. The responses to such instruments were analysed by means of the coding method, where fragments of the analysed text are allocated 'tags' – named codes – which encapsulate the contents of the fragment; these codes are later grouped together according to their meaning and thus the main ideas of the text are identified (Auerbach & Silverstein 2003:43; Creswell 2009:188). The results obtained were sometimes combined with other sources from literature in order to compile the list of curricular components whose rating was sought.

As outlined above, the expertise of a panel member was generally not related to the academic status but to the experience regarding the subject under study. For instance, a student can be an expert whose opinion on the impact of a number of teaching methods may be sought, on the basis of the student's experience of the effects of

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such methods (Mifflin, Campbell & Price 1999). Nevertheless, in curriculum-related matters, most studies generally sought the opinions of professional authorities in the respective domains.

It is important to note here that the Delphi survey result did not constitute, in any of the mentioned studies, the curriculum, not even the syllabus, but was used to ensure the relevance of the training programme for the future professional practice of the group of targeted learners.

### Advantages of using the Delphi method

The main advantage of the method is that of circumventing the common biases which often arise from group interactions such as the influence of dominant individuals, group pressure for conformity, and noise (i.e. loss of focus and drifting from the issues studied, whether due or not to individuals or sub-groups trying to push their own agendas) (Dalkey 1972, cited in Hsu & Sandford 2007). This is achieved by suppressing direct contact between the panellists, giving anonymous feedback with the iterations and ensuring confidentiality. A second advantage, one that is equally important, is that of fostering consensus among the panellists, which increases the validity of the results. Further benefits are related to reduced time constraints for the participants as the respondents can choose the proper moment to work on the questionnaire. In addition, considering and reconsidering the same issues, in the light of the offered feedback, constitute a stimulus for in-depth thinking. The controlled feedback and anonymity enable panellists to revise their opinions without publicly admitting to doing so, and this encourages them to take a personal viewpoint rather than a more cautious public position (Gupta & Clarke 1996). Furthermore, the method gives the possibility of addressing experts in largely distant geographical locations, by means of e-mail.

### Disadvantages of using the Delphi method

The Delphi method was created to facilitate the prediction of change (hence the same name as that of the famous oracle), yet its usage in forecasting was strongly criticised, as many felt that predicting the future is an act of high importance and should not be entrusted to a technique that has no connection with the scientific method or with mathematical formulas. However, in curriculum inquiry Delphi is not an 'oracle'. Other criticisms have highlighted the vulnerability of the method to "conceptual and methodological inadequacies, potential for sloppy execution, crudely designed questionnaires, poor choice of experts, unreliable result analysis, limited value of feedback and consensus, and instability of responses among consecutive Delphi rounds" (Gupta 1996, cited in Hanafin 2004:40). The answer to these critics is that poor implementation of a technique should not be seen as a disadvantage of the technique itself, as Adler and Ziglio (1996:13) point out:

There is no reason why the Delphi method should be less methodologically robust than techniques such as interviewing, case study analysis or behavioral simulations, which are now widely accepted as tools for policy analysis and the generation of ideas and scenarios.

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Another disadvantage arises from the unclear distinction between who may be an expert or a layman with respect to the issues studied, and lack of sufficient evidence that the opinions of experts are more reliable than those of laymen (Gupta & Clarke 1996). Further disadvantages of the method are related to the requirement for the meticulous preparation of the questionnaires, which should be formulated without any ambiguity. Another critical area is the judicious choice of the participants: the criteria for selection have been mentioned above. A frequently mentioned further difficulty is the long time required to implement it, which typically is three months for a three-round Delphi survey. This is especially inconvenient when immediate answers are needed.

It is easy to assume that the content of the feedback would exert a major influence on that of the answers. A potential for moulding the opinions of the respondents exists here and, indeed, a number of experiments have shown that participants in Delphi would rate their subjects differently after receiving distorted feedback (Hanafin 2004; Hsu & Sandford 2007). However, expressing the feedback as a numerical measure of specific opinions leaves little place for distortion.

**Issues of reliability and validity**

As the Delphi method elicits and analyses only the opinions of the chosen experts, their degree of expertise or familiarity with the researched problem influences the validity of the results. Another issue related to the validity of the results is whether the convergence/consensus attained is indicative of the correct (or true) answer to the question. Dalkey (1969:18) has shown that, statistically, the convergence obtained by the method is in the direction of the true value. By using almanac-type questions within a Delphi questionnaire administered to graduate students at the University of California, Los Angeles, ("... who did not know the answers but had some relevant knowledge ...") he was able to ascertain that, for a high level of confidence in the answer given and a low dispersion of the answers (consensus), the results of the Delphi method were at a close range of the real answer.

The average error of the answers decreased with the increase in size of the group, with a reduction of approximately 50% for groups counting seven members. From there, the rate of decrease of the error diminished at a smaller rate; for instance, adding another 20 members to the group only reduced the error by an additional 10%. This finding justifies the relatively small size – 10 to 15 participants – of a panel of experts, as mentioned above. The degree of consensus was shown to increase with every iteration but the maximal increase occurred at the first iteration; with further rounds, the progress towards consensus was much slower. The accuracy of the answers increased, similarly to the degree of consensus, mainly with the first iteration, and afterwards it fluctuated.

It is difficult to test the reliability of the method. Gupta and Clarke (1996) indicate why: in order to determine that the answers reflect the true judgements of value of the panellists on the issues studied, a large number of repetitions of each test need to be administered, which is not consistent with the nature of the Delphi.

**PART THREE • METHODS FOR INTERROGATING, REVISIONING AND IMPLEMENTING CURRICULUM CHANGE****AN APPLICATION: DELPHI AS A METHOD OF INQUIRY INTO THE RELEVANCE OF AN UNDERGRADUATE HAEMATOLOGY CURRICULUM FOR GENERALIST PRACTICE**

The undergraduate curriculum in haematology at the Faculty of Health Sciences, Stellenbosch University is developed by sub-specialists in the discipline, with the contribution of a general practitioner, to ensure a valid connection with the field of practice of general medicine. Regular student feedback mostly raises issues of a technical nature, such as the format of computer tests and the timing of the course, and clashes with other student activities. Sometimes, however, the students questioned the usefulness of some of the matters presented for their future practice and the lecturers felt that they had too little evidence to support a credible answer. The research literature on undergraduate haematology curriculum is minimal: a single study (Broudy & Hickman 2007) surveyed the undergraduate programmes at medical schools in the USA and found a great diversity of content and teaching methods among them. By contrast, the postgraduate haematology training is oriented by model curricula, originating from the American Society of Haematology and the European Haematology Association.

This situation led the author to undertake an inquiry into the relevance of the haematology curriculum for generalist practice at the Faculty of Health Sciences, Stellenbosch University.

A general needs assessment was conducted using the Delphi method to survey the opinions of all stakeholders in the haematology training programme at the Faculty of Health and the findings were compared with the provisions of the existing curriculum. The significance of discrepancies thus found were analysed and proposals were made towards adjustments in the haematology curriculum (Stefan 2009).

To this end, several panels of professionals were surveyed, each representing a category of stakeholders in the haematology programme: five adult medicine haematologists, 10 paediatric haematologists, four laboratory haematologists, 10 interns, 14 students and 20 general practitioners. An open-ended self-administered questionnaire was first used, in which the participants were invited: a) to list the knowledge and skills required in the management of haematological patients in their practice and b) to suggest topics for inclusion in – or exclusion from – the curriculum, based on their own experience. The answers were analysed using the coding method (see above) and by extracting the main themes.

On this basis, and including the items already existing in the haematology curriculum, a list of elements of knowledge and skills was drawn up and the participants in the study were invited to rate the importance of the topics on a Likert scale ranging from one to four: 1 – strongly disagree; 2 – disagree; 3 – agree; 4 – strongly agree. The rating had to be based on the usefulness of the topic for medical practice, according to the participant's opinion. The scale was chosen in such a way that an undecided 'middle' option was not possible.

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The answers were analysed in order to determine the consensus on the value of the items. This was defined as the event where a minimum of 80% of the participants ascribed the same rating to a given item. A new list was then drawn up, excluding those items on which consensus had already been attained; this list also showed the distribution of votes, in percentages, for each rating regarding every item. This new list thus informed the participants of the opinion of the other panellists. In the accompanying letter, the specialists surveyed were offered the option to review their position on the significance of the items listed and, if their opinion had changed, to re-rate them.

The new ratings were again analysed for consensus and the process was repeated one last time, following the same procedure as described above. These last answers were analysed along the same lines. The resulting rating was then used to formulate proposals for changing the contents of the curriculum.

**Results of the Delphi inquiry**

The analysis of the answers to the open-ended questionnaires revealed a few overarching concepts, among which the most important is the need to organise the material in the form of 'approaches' in order to facilitate the process of differential diagnosis, which is the most frequent task of a general practitioner at the patient-health care system interface. A number of outcomes were identified in the panellists' answers. Among these, the need to adequately detect and assess the 'red flag' signs for haematological cancers was proposed for consideration in the next curriculum.

The Delphi survey indicated a group of topics which, by almost unanimous consensus among all participants, were rated as most important for practice. At the opposite pole, a few topics were designated as devoid of utility. The remaining ones, rated as of moderate importance, could be further classified as diseases whose management falls within the area of competence of the general practitioner and pathology which usually would be referred to a specialist for management. The former require a more detailed presentation and a thorough understanding, whereas, in the latter, the emphasis should be on accurate diagnosis and timely referral. These findings were compared with the existing curriculum and the discrepancies were analysed, resulting in a set of proposals towards a framework for a new undergraduate haematology curriculum. While these proposals did not recommend major changes to the contents of the curriculum, or to the teaching methods, they revealed the need to present the information in the format of 'approaches' in order to better enable the students to work out a differential diagnosis. They also indicated the need for a shift in emphasis in favour of those topics frequently seen in practice, such as blood transfusion or haematological changes during the course of HIV infection, which at present has epidemic proportions, with less time spent on aspects that are not part of a generalist's practice, such as the details of chemotherapy for cancer. As the duration of the haematology-oncology block is very short, these proposals indicated valuable ways of optimising the teaching process.

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For the first time in the literature, as far as could be determined, the research described above presented knowledge and skills items for an undergraduate haematology course which were defined and rated for importance by consensus of the curriculum developers, specialists in the field and beneficiaries of the course, i.e. students, interns and general practitioners. A comprehensive consultation with the stakeholders in the curriculum was found to generate suggestions for the existing training programme that enhanced its relevance to generalist medical practice.

The Delphi method was found to be a suitable instrument for orchestrating the consultation, its main benefit being building consensus among the participants, and offering a tool to measure the perceived importance of each item in the curriculum for generalist practice. Further research is needed in the ways of using Delphi for curriculum development and review, aimed at refining the criteria for recruiting the panel of experts, the usefulness of combining interviews with the Delphi method, the optimal timing and modality for student feedback and the frequency of curriculum evaluation.

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