Tuning research competences for Bologna three cycles in medicine – report of a MEDINE2 European consensus survey

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Abstract

Medical curricula, like healthcare systems and medical practice, have a strong cultural component and vary considerably between countries. Increasing mobility of medical graduates across Europe, and increasing pressure to ensure they are all fit for practice, however, have highlighted an urgent need to establish common ground in learning outcomes of medical education at all stages of training. A research-based approach was developed by the Tuning project, and used by the MEDINE Thematic Network to gain consensus on core learning outcomes / competences for primary medical degrees (www.tuning-medicine.com). But at that time no consensus was identified for learning outcomes relating to research. As part of MEDINE2, a Tuning survey was performed to identify consensus on core learning outcomes in research for all three Bologna cycles (Bachelor, Master, and Doctor). Responses from 417 stakeholders, representing 29 European and 13 non-European countries, revealed a high degree of consensus regarding core competences in research for each stage of medical training. The findings strongly suggest that learning outcomes related both to 'using research' and 'doing research' should be core components of medical curricula in Europe. The challenge now, however, is to find ways to achieve these competences within the context of already crowded medical curricula.

Introduction

Research has been the driving force of many stunning advances in medicine over the last 100 years, and research is likely to substantially contribute to future development in the field. Such statements are not likely to elicit much controversy – either from the medical academic community or from the public at large. Many medical curricula are internationally renowned for fostering an understanding of scientific method and for offering excellent research opportunities to students. However, there is relatively poor understanding of how such opportunities can be provided within already crowded curricula, and there are cultural and contextual variations in the curricular time and emphasis devoted to this.

The Bologna Process now requires all European Higher Education institutions to adopt a three-cycle system of Bachelor, Master and Doctor degrees each lasting approximately three years.(1) Although some aspects of this remain controversial, it is generally accepted that the Master of Medicine equates to the primary medical degree (sometimes referred to as MD or MBBS), the Doctor of Medicine to a higher degree (Ph.D. or professional doctorate), and that postgraduate specialty training is above the Master of Medicine but different to the Doctor of Medicine as it is situated outside the Higher Education context and often has no research component.(2, 3) Increasingly the content to be learned at each stage is being defined in terms of the intended learning outcomes of the curriculum, or the competences which graduates will possess on successful completion.(3)

The primary purpose of an undergraduate medical curriculum (Bologna first and second cycles) is to train doctors that are fit for practice, and consequently clinical competence often

assumes primacy over other competing factors. Curricular time is precious, and as "clinical competence" takes on an ever-wider meaning, inevitably additional required learning outcomes in communication, cultural understanding, behavioural, attitudinal, leadership, management, teaching, and many other areas are deemed essential. This increases the risk that learning outcomes pertaining to research may not be prioritised.

Many arguments have been advanced to support the position that all medical students should learn about research, ranging from developing competences which support core clinical activities like critical reasoning and applying evidence-based medicine in patient care, to preparing and enabling students to enter into real research activities should they so choose. Research competences can be broadly categorised into one of three groups: 'generic' competences, those related to 'using research', and those related to 'doing research'.(4) 'Generic' competences, such as the ability to synthesise findings, and to draw conclusions from findings, are important in many areas of medical practice, including research. 'Using research' competences, such as the ability to define and carry out an appropriate literature search, and to critically appraise research evidence, are typically also considered important for most areas of medical practice. Acquiring competences relating to 'doing research', however, such as the ability to formulate a research question as a hypothesis and to analyse research data, remain more controversial.(5, 6) Modern curricula have attempted to accommodate students who gravitate towards research activities with a structure of core and optional components, and there is an emergent evidence base relating to this.(7-9)

The time available to obtain a meaningful research experience can be short. Whilst medical graduates may further develop their research competences by undertaking third cycle (Ph.D. or Doctorate) degrees, many academics are concerned about inspiring and enabling research

in the first two cycles of undergraduate medical education. This would seem a pertinent concern in an era where there has been significant investment in career pathways both within Europe and elsewhere to promote recruitment of medical physician-scientists.(10, 11) How can we interest medical graduates in research and ensure they are sufficiently competent to advance to undertake a Doctoral degree if the foundation is not laid in the first two cycles?

A study undertaken for the academic year 2005/06 as part of the EU-funded MEDINE Thematic network (12) surveyed EU medical faculties and universities.(13) It identified a wide disparity among countries and institutions in the content and structures for covering research competences (first and second cycle), with writing and defending a thesis being a formal second cycle (primary medical degree) requirement in around half the programs. Two neighbouring countries, Belgium and the Netherlands, offer a good example of this diversity. Medical schools in the Netherlands require all students to undertake a research project during the second cycle of at least 4-6 months (full time) duration, whilst in Belgium such a project is optional, and then it lasts frequently only 4 weeks. The structural gap widened even more when looking at third cycle (Doctor) and professional education requirements of EU countries.(14) A further study undertaken by the MEDINE Thematic Network sought to gain consensus on core learning outcomes for primary medical degrees across Europe, using an established 'Tuning' methodology.(3, 15) No consensus was identified for learning outcomes relating to research.

Thus it was already known that there was considerable structural variation in EU-Europe with regard to whether and how much research training should be part of the medical curriculum.(13) However, it was not known to what extent agreement on research-related learning outcomes existed. The current study aimed to identify consensus on which, if any,

research competences all graduates of a medical curriculum should have achieved on successful completion of a Bachelor, Master, and Doctor of Medicine degree in Europe. This study constitutes a major output from Work Package 7 ('Integration of the Research Component in European Medical Education') of the MEDINE2 Erasmus Thematic Network for Medical Education in Europe 2009-2013, coordinated by the University of Edinburgh and supported by funding from the Life Long Learning Programme of the European Commission.(16)

Methods

The methodology employed in the original Tuning (Medicine) project was adopted as far as possible, although further work was required to develop a draft set of competences / learning outcomes in research as the existing ones were thought to have been insufficiently discriminating to identify any degree of consensus.(17) The study therefore consisted of:

1. Review by the project group of existing frameworks of research competences, including those of senior researchers, and learning outcomes in medicine in Europe and further afield. (3, 18-25)

2. Development of draft framework of research competences in medicine by the project group in a one-day work-package meeting in Madrid in Sept. 2010. This provisional framework was sequentially refined through feedback obtained following presentations and during informal consultations. An online discussion among the project group was then used to formulate 31 competences.

3. Based on discussions with all authors of the manuscript, each competence was assigned to one of the three categories: ‘generic’, ‘using research’, and ‘doing research’, and allocated a unique identifier (C1-C31, Table 1). Respondents were unaware of this classification.

4. This list of 31 research competences was developed into a detailed questionnaire in English using an online survey instrument, (26) ordered by their unique identifiers C1-C31. As in the original Tuning (Medicine) study, academics, students, graduates and employers were asked to indicate how important they thought it was for graduates to have achieved each competence by the end of each of the three Bologna cycles.(3) A 4-point Likert scale (Not Important / Important / Very Important / Essential) was used (Figure 1). Demographic data were also recorded.

5. The online questionnaire was implemented with Survey Monkey and available online from June 2011 until May 2012. The survey was accessible via the project home page and was publicised using various networks with the aim of acquiring mainly respondents from EU-countries.

6. Demographic data were collated, and learning outcomes were ranked in order of perceived importance. For data analysis and interpretation only, responses were dichotomized into ‘not important’ versus ‘important’; ‘important’ now being the sum of Important + Very Important + Essential. Differences between teachers and students were explored with Chi-square tests. In order to test the degree of agreement for each individual item, the Leik measure of ordinal consensus was calculated for each item and group of items.(27) This uses the frequency with which each option is endorsed to assess how much consensus there is for the ranking of each

item. Higher numbers always imply a greater degree of consensus. As a general guide, values below 0.20 are poor, values between 0.21 and 0.40 are fair, values between 0.41 and 0.60 are moderate, values between 0.61 and 0.80 are substantial and values above 0.80 are good.

7. All data and analyses were evaluated and interpreted in a project group workshop. The results were presented, discussed, and approved by the entire MEDINE2 Thematic Network at the final Annual General Meeting in September 2012 in Edinburgh. The final report and framework of intended learning outcomes / graduate competences will be presented to the European Commission in late 2013.

Results

Demographics

There were 417 responses to the survey, though some respondents skipped questions. Seven respondents came from Africa, Asia or Australia, 19 from USA, and the others came from Europe, including 55 from Austria, 35 Finland, 20 Germany, 19 The Netherlands, 39 Spain, 11 UK, and 33 from Turkey. While 68 respondents did not specify their country, 111 came from 29 different countries or regions in Europe. Two thirds of respondents were academic involved in delivering undergraduate medical education (including 88 who considered themselves responsible for a medical curriculum in 23 different European countries), and 28% of respondents were medical students.

Consensus on learning outcomes

Detailed results of the survey are presented in Table 1. For each of the thirty-one competences the percentage of respondents indicating a specific item as 'not important' at the end of all three cycles is given. The responses are ranked according to the outcome at the end of the 2nd cycle (primary medical degree). For example, C31 was considered 'not important' by 0.8% and thus considered 'important' by the remaining 99.2%. The Leik measure of consensus and the category to which each competence was assigned are also listed in Table 1.

The degree of consensus varied across cycles. Some items began with a high degree of consensus in cycle 1 which declined significantly by cycle 3, or vice-versa. For example, when asked to rank the importance of C8 (Apply ethical principles and analysis to research, seeking ethical approval where appropriate), there was only moderate consensus on the importance of this for the first cycle, but by the third cycle the consensus was on the borderline between substantial and good. On the other hand, when asked to rank the importance of C24 (Supervise research students), the consensus was initially good - they agreed that it was 'not important' - but by the third cycle the consensus had declined to only moderate. It is of interest to note how uniformly respondents have answered in each cycle. In general the consensus tended to vary between substantial and good. Some small variations between subgroups were also identified and are described below.

Bachelor of Medicine (Bologna First Cycle)

At the end of first cycle, only four items were considered 'not important' by less than 15% of respondents, of which three were 'generic' competences: C11 (Maintain confidentiality and protect data), C30 (Write and speak in English), and C31 (Use computers effectively). Only one item related to 'using research' was considered 'important' at this stage by more than 90% of respondents: C2 (Define and carry out an appropriate literature search). There was a

statistically significant difference in the importance students assigned to five items: C13, C22, C23, C27, and C29 compared to teachers.

Primary medical degree (Bologna Second Cycle)

For 10 competences, less than 5% of respondents considered them 'not important' to be obtained at the end of the second cycle. For a further 9 competences, 5-15% considered them 'not important' (Table 1). Seven of these top-19 competences were classified as 'generic', four as 'using research', and eight as 'doing research'. We also tested whether the % respondents saying an item is 'important' or 'not important', at the end of the 2nd cycle, is different for teachers versus students. For most items there was no difference, but for five items there was (C13, C24, C27, C28, and C29). In all of these cases students felt the item to be statistically significant more important than teachers did. Remarkably C13 (Carry out research on medical practice), was considered 'not important' by 14.5% of teachers, but only by 6.1% of students, suggesting that students may view research as more central to their professional life than their academic teachers.

Doctor of Medicine (Bologna Third Cycle)

For the end of the third cycle, 27 items were considered 'not important' by less than 5%, and thus relevant by more than 95%, of respondents. The remaining 4 items: C6 (Carry out laboratory procedures), C25 (Supervise laboratory technicians), C24 (Supervise research students), and C27 (Lead a research team) were regarded by many as being necessary competences with only 5-15% assigning a low importance to them. Two items: C17 (Propose and carry out the next step in a research project) and C20 (Write a scientific paper suitable for publication) showed a sizable increase in their perceived importance between the end of the 2nd and 3rd cycle. The only significant difference ($p=0.011$) between teachers and students was

found for C27 (Lead a research team): 18% versus 7% respectively considered this 'not important' for the end of the third cycle, possibly indicating that teachers assign relatively more significance to this skill.

Discussion and Conclusions

The survey results reveal a surprising amount of consensus between stakeholders about core competences relating to research for each of the three Bologna cycles. Particularly interesting is that the ability to do research was considered at least as important as being able to use research especially at the end of the second cycle. Students appear to be somewhat more in favour of having to develop research competences than their teachers. This may partly be explained by the immediacy of seeking postgraduate training places and the recognition that research competences and output will enhance the opportunities available to them.(28) There is increasing evidence that students actively seek research opportunities for this purpose.(8, 29)

The competence C6 (Carry out laboratory procedures) was considered less important for second and third cycle degrees than many other competences, including C13 (Carry out research on medical practice). Clearly undergraduates are, and seek to be research active in the first and second cycle also in non-laboratory settings. This may require a transition in emphasis in some medical curricula.(30) Facilitating and supporting non-laboratory medical research can also present additional inherent challenges for supervision and governance.(31)

The findings of participant surveys are always subject to interpretation, but there are several markers of academic rigour in the current research. For one, participants were asked to identify themselves and to supply their email address, which more than 85% did. The data also allow plausibility checks. The quintessential qualification for an independent researcher: C17 (Propose and carry out the next step in a research project), was considered less important for the second cycle outcome list, but only 1.8% considered it 'not important' for the third cycle. However C27 (Lead a research team) was considered by 14% as 'not important' at the third cycle and thus was not considered a consensus outcome. Consistency like this supports the reliability of these findings.

Given the huge diversity of the structure of third cycle programs within Europe,(12) the survey data which pertain to intended learning outcomes / graduate competences, show an impressive degree of consensus. Consequently, the diversity is the consequence of different traditions as well as contextual, institutional, and national priorities, rather than any fundamental disagreement. Whilst this work will not lead to a European blue-print for 3rd cycle Medical Education research programs in the near future, it does suggest that there is significant consensus in relation to outcomes to be achieved. This could be a basis for intensifying mobility programs at this level, since in all likelihood similar learning outcomes will be attained. It must be noted that there are also other initiatives, which attempt standardization in this area.(2)

What are the take-home messages for programs leading to a primary medical degree? These findings strongly support the view that teaching research competences (to do research) should be part of all medical curricula in Europe. Most colleagues will agree that the 19 consensus competences for primary medical degrees identified in this survey should indeed be

considered when planning an outcome-based medical curriculum. Those in the 'generic' and 'using research' categories are actually already part of many curricula,(13) but there are still differences of opinion with regard to how some of these can be achieved, whether through 'doing research' or by other means. It has not been clear to what extent stakeholders consider that 'doing research' should be part of the European medical curriculum. The results of the survey indicate, however, that there is considerable support for increasing the research-orientation of medical curricula.

The survey asked respondents to consider the 3rd cycle (Ph.D.) curricula, but not postgraduate speciality training. The opportunities for medical graduates to pursue research at a postgraduate level vary by location and speciality and are not limited to the university environment, which puts additional demands on the research qualifications for 2nd cycle graduates. Many postgraduate clinical training programmes producing hospital-based specialists require trainees to gain research experience, but some do not. Increasingly research in the form of clinical audit is a basic requirement of competence assurance, as is the case in Ireland.(32) In the USA professional medical training in many instances also requires research training. The Accreditation Council for Graduate Medical Education (ACGME), which is responsible for the Accreditation of post-MD medical training programs within the United States, lists as a common program requirement: "The curriculum must advance residents' knowledge of the basic principles of research, including how research is conducted, evaluated, explained to patients, and applied to patient care".(33)

The question "what educational models cultivate the educated practitioner?" has recently been revisited by Coles.(34) Building on the work of Stenhouse,(35) three possible educational models: "product", "process", and "research" are examined in some detail. While medical

curricula must include all approaches to some extent, Coles argues that the research approach is the most appropriate in many instances, since it engages learners in researching their clinical practice.(34) This would suggest that there is a real advantage to learning even 'generic' competences through a research approach. Taken together with the findings of this survey, this strongly supports the view that students should obtain research competences by actually doing research as part of all medical curricula in Europe.

Essentials

- It is becoming increasingly important to define and gain consensus on core competences for medical training across Europe.
- The previous Tuning Project (Medicine) achieved consensus on core competences for many areas of the primary medical (undergraduate) degree across Europe, except for those related to research, which remained controversial.
- The practice of modern medicine depends on the application of evidence from medical research, and future medical research is required for ongoing development in the field, however opportunities to learn about research in European undergraduate medical curricula vary enormously.
- This study defined a set of detailed competences related to research, and then using an online stakeholder survey achieved broad consensus on core competences for the Bachelor, Master and Doctor of Medicine across Europe.
- Competences related to doing research, as well as using research, were considered by most to be important for the primary medical degree – strongly supporting the inclusion of some research experience in all European undergraduate medical curricula.

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Declaration of interest:

The authors report no declaration of interest.

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