Strategic choices in curriculum design to facilitate knowledge and competency development
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Identifying essential clinical rotations for a competency-based curriculum

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Martha J Dekker
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Submitted
ABSTRACT

Introduction The current shift towards competency-based medical education implies that the focus of clerkships should be on competency development. Competency development has been suggested to require longer clerkship rotations. As a consequence of longer clerkships students may only rotate through a selection of disciplines in a competency-based curriculum. To safeguard the development all necessary competencies while only rotating through a selection of disciplines, we investigated the suitability of different disciplines for students to master 177 different competencies.

Methods Eight stakeholders in our medical curriculum, two medical students and six medical doctors from varying disciplines, were asked to judge the suitability of 13 different disciplines for students to master necessary competencies. They judged for each competency whether the discipline was ‘very suitable’(+), ‘suitable’(0) or ‘unsuitable’(-) as a learning context. The scores off the judges were combined to determine a final suitability score per competency per discipline.

Results All disciplines were perceived as suitable for attaining most of the competencies (80.8%-100% per discipline). All disciplines were 100% suitable to develop competencies concerning ‘using basic knowledge and science’ and reflection. Community and occupational medicine and family practice were very suitable for developing a substantial number of competencies.

Discussion Almost every competency can be learned at almost any discipline, which implies that rotating through only a selection of clerkships is feasible in regard to competency development. The outcomes concerning family practice and community and occupational medicine suggest that these disciplines can play a central role in students’ competency development during clerkships.
Chapter 3

INTRODUCTION

COMPETENCY-BASED MEDICAL education is increasingly being implemented in medical schools at the undergraduate level.1-4 So far, literature on competency-based medical education has mostly conveyed how to formulate competencies and create a comprehensive competency framework.1,5-11 Medical educators are confronted with the challenge of creating a curriculum that optimally facilitates the development and integration of competencies.12-14 In curriculum design, alignment between the educational goals and the programme is vital for students to learn effectively.15 When implementing undergraduate competency-based medical education this implies that the design of a clerkship programme has to revolve around competency development. Traditionally, clerkship programmes are discipline-based, focusing on rotating through as many disciplines as possible, while in competency-based curricula the focus is on the development of competencies, which requires longer rotations.16 This raises the question of how a shift from discipline-based to competency-based clerkships will affect the way a clerkship programme should be designed.

The clinical phase is vital for undergraduate medical education,17 probably even more so for competency-based medical education. During this phase, students develop and practise relevant competencies in a clinical context.18 Furthermore, they learn to integrate competencies by applying them simultaneously and complementarily in practice.

A shift in the purpose of clerkships towards competency development has important consequences for the clinical phase. Longer clerkship rotations are suggested to benefit students’ competency development.16 Each competency in a framework represents a complex interplay of knowledge, skills and professional behaviour.19,20 Mastering complex abilities requires more time than acquiring separate skills or knowledge.21 Furthermore, the development of complex abilities requires considerable cognitive resources. Each transition to another department and environment can lead to increased cognitive load.21,22 Too much cognitive load from transitions may interfere with students’ competency development, especially during their early weeks.17,22 Therefore, it is questionable whether short, one to two-week clerkships which are often part of discipline-based clerkship programmes are suitable for competency development.16 Another argument for longer rotations is that one of the aims of competency-based medical education is to teach students to function as professionals in a societal context.1,20,23 Theories on professional identity suggest that professional development in students requires considerable time spent in the same team or department.16,24

At the basis of a competency-based curriculum stands a comprehensive framework of well-defined competencies which describes the curriculum’s end-goals.23 Therefore, shifting towards competency-based clerkships means that the purpose of clerkships shifts from mastering discipline-specific knowledge and skills to mastering a predefined set of
competencies. Consequently, students should have the opportunity to practise most or all competencies during clerkships. However, given the limited time available in the clinical phase, introducing longer rotations will limit the number of disciplines that students can rotate through. In addition, the number of students who can rotate through a discipline at a time is also limited, making it even harder for all students to rotate through a small selection of disciplines. Therefore, longer clerkships can only be implemented if most or all competencies can be learned in many different disciplines. This leads to the question how to safeguard the opportunities for students to master all relevant competencies in practice while also offering students rotations sufficiently long for the development of these competencies. In the current study, we investigated how a group of stakeholders in medical education perceive the suitability of different disciplines for students to master a predefined set of 177 competencies.

**METHODS**

**Context**

The current study took place as part of the development of a competency-based medical undergraduate curriculum at the University Medical Center Groningen (UMCG). Its competency framework was inspired by an early version of the CanMEDS framework and the Dutch general objectives for undergraduate medical education at the time. The framework consists of seven areas of competence: communication, clinical problem-solving, using basic knowledge and science, patient investigation, patient management, social and community contexts of healthcare, and reflection. Each area of competence was subdivided into applicable competencies, of which a total of 177 were specifically meant to be developed during clerkships (Table 1). Only four competencies in the area of ‘using basic knowledge and science’ were to be developed during the clinical phase because most competencies concerning this area were developed during a separate half-year scientific elective during which students write a thesis.

**Procedure and analysis**

Eight stakeholders in medical education were invited to participate in the study. The group consisted of two medical students near the end of their clerkships and six medical doctors with extensive experience in education. They were two gynaecologists, an internist, a neurologist,
Table 1. Definitions of the seven areas of competence in the competency-based active learning curriculum at the UMCG in Groningen.

<table>
<thead>
<tr>
<th>Area of competence</th>
<th>Definition</th>
<th>Number of competencies</th>
<th>Example competency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication</td>
<td>The medical practitioner is competent to communicate effectively and efficiently in matters of patient management and professional attitude within the patient-care context and cooperation with other care providers.</td>
<td>29</td>
<td>The student is able to communicate relevant patient information orally and in writing.</td>
</tr>
<tr>
<td>Clinical problem-solving</td>
<td>The practitioner is competent to identify a problem and undertake adequate steps to solve it. He integrates this competency with any other competency and applies it in medical decision-making processes, which he can justify.</td>
<td>26</td>
<td>The student is able to revaluate and integrate information from patient problems, anamnesis, physical examination and further medical tests.</td>
</tr>
<tr>
<td>Using basic knowledge and science</td>
<td>The medical practitioner is competent to approach scientific information critically and form his opinion independently. Consequently, he adequately translates this information into medical policy.</td>
<td>4</td>
<td>The student is able to keep up with and select the relevant literature.</td>
</tr>
<tr>
<td>Patient investigation</td>
<td>The practitioner is competent to independently record the patient-oriented history, physical examination and additional diagnostics as well as interventions that are part of a treatment.</td>
<td>28</td>
<td>The student is able to assess a patient’s functioning in different aspects of his or her life.</td>
</tr>
<tr>
<td>Patient management</td>
<td>The medical practitioner is competent to manage the most common health problems of individual patients in relation to their living conditions and society. He is competent to name the goal of a treatment, list the potential treatments, reason the choice of treatment, monitor its effect and, if necessary, adjust it after consultation with third parties.</td>
<td>24</td>
<td>The student is able to refer a patient to the right person or service in primary or secondary care and determine the urgency.</td>
</tr>
<tr>
<td>Social and community contexts of healthcare</td>
<td>The medical practitioner is competent to place the patient’s individual problem (the complaint) in its social context and adjust to this. He is aware of the factors that affect health and illness and their consequences, both individually and collectively.</td>
<td>24</td>
<td>The student is able to explain the nature of a disease and its consequences for different aspects of the patients life.</td>
</tr>
<tr>
<td>Reflection</td>
<td>The medical practitioner is competent to reflect on his personal and professional contacts with patients and colleagues, on his work and on medical principles in a cultural context. On the basis of these reflections he will develop both as a professional and as an individual in the course of his career.</td>
<td>42</td>
<td>The student is able to identify his/her own blind spots and professional deficiencies in order to remove them.</td>
</tr>
</tbody>
</table>
a specialist in community and occupational medicine, and a general practitioner. The participants were asked to fill out a table with the 177 competencies listed against twelve disciplines on the other axis – 2124 cells in total. The disciplines were internal medicine, surgery, emergency medicine, paediatrics, obstetrics and gynaecology, psychiatry, neurology, revalidation, ‘otolaryngology, ophthalmology and dermatology’, family practice, nursing home medicine and community and occupational medicine. Otolaryngology, ophthalmology and dermatology were combined in the current study because of their similarities in the experience they offer (mostly outpatient care). However, each of these disciplines offers its own clerkship rotation.

Participants were asked to judge for each competency whether the discipline was ‘very suitable’(+), ‘suitable’(0) or ‘unsuitable’(-) as a learning context. Afterwards, the positive and negative scores from all participants were combined, resulting in a score for each cell. When at least half the participants had judged a clerkship very suitable or unsuitable for a specific competency, the cell was scored as such. When at least two positives and two negatives were present in one cell it was scored as conflicting.

**RESULTS**

All disciplines were judged to be suitable for attaining most of the competencies, with percentages varying between 80.79% and 100%. All the disciplines were deemed suitable for developing 100% of the competencies concerning ‘using basic knowledge and science’ and reflection. The percentage of competencies each discipline was judged very suitable for varied between 0% and 18.46% (Table 2).

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Percentage competencies</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Very Suitable</td>
</tr>
<tr>
<td>Internal Medicine</td>
<td>5%</td>
</tr>
<tr>
<td>Surgery</td>
<td>5%</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>5%</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>1%</td>
</tr>
<tr>
<td>Obstetrics and Gynaecology</td>
<td>0%</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>3%</td>
</tr>
<tr>
<td>Neurology</td>
<td>0%</td>
</tr>
<tr>
<td>Revalidation medicine</td>
<td>1%</td>
</tr>
<tr>
<td>Otolaryngology, Ophthalmology and Dermatology</td>
<td>0%</td>
</tr>
<tr>
<td>Family practice</td>
<td>19%</td>
</tr>
<tr>
<td>Nursing home medicine</td>
<td>3%</td>
</tr>
<tr>
<td>Community and occupational medicine</td>
<td>10%</td>
</tr>
</tbody>
</table>
Community and occupational medicine was judged to be very suitable for the development of a substantial number of competencies (10.17%). This was mostly because community and occupational medicine was considered to be very suitable for mastering 50 percent of the competencies in ‘social and community contexts of healthcare’ (Table 3). The high suitability of family practice (18.46%) was because this discipline was regarded as very suitable for 45% of the competencies concerning ‘social and community contexts of healthcare’ and 41% of the competencies concerning patient management (Table 3). The percentage of competencies for which disciplines were judged unsuitable varied between 0% and 5.65% with neurology and surgery scoring lowest and community and occupational medicine highest. Community and occupational medicine was mainly judged to be unsuitable for developing 10% of the competencies concerning patient investigation (Table 3). Opinions about the suitability of a discipline for learning a specific competency were conflicting in 8 of 2124 cells (0.37%).

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Clinical problem-solving (% competencies)</th>
<th>Using basic knowledge and science (% competencies)</th>
<th>Patient investigation (% competencies)</th>
<th>Social and community contexts of healthcare (% competencies)</th>
<th>Reflection (% competencies)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal Medicine</td>
<td>3</td>
<td>97</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Emergency Medicine</td>
<td>3</td>
<td>97</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Paediatrics</td>
<td>3</td>
<td>97</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Psychiatry</td>
<td>14</td>
<td>83</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Neurology</td>
<td>0</td>
<td>100</td>
<td>0</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Revalidation medicine</td>
<td>0</td>
<td>93</td>
<td>7</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Otolaryngology, Ophthalmology, and Dermatology</td>
<td>24</td>
<td>72</td>
<td>3</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Family practice</td>
<td>0</td>
<td>86</td>
<td>14</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Nursing home medicine</td>
<td>0</td>
<td>86</td>
<td>14</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Community and occupational medicine</td>
<td>10</td>
<td>83</td>
<td>7</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3: Percentage of competencies per area of competence for which each discipline was deemed very suitable (VS), suitable (S) and unsuitable (U).
DISCUSSION

The key finding of the current study is that almost every competency can be learned at almost any discipline. This finding is important for those who intend to implement competency-based clerkships. The current shift in medical education towards the competency paradigm is an important impetus to increase the duration of clerkship rotations. Literature is clear on why clerkships should be longer, but as yet unclear on what selection of disciplines these longer rotations should be in. Curriculum designers are confronted with the difficulty of implementing longer clerkship rotations, while at the same time safeguarding the opportunity for students to develop all the competencies they need – often in circumstances where the number of medical students necessitate the use of as many departments of teaching hospitals as possible. The current study shows that most competencies can be practised and mastered during clerkships in almost any discipline.

An important implication of our findings is that – as far as competency development is concerned – the clinical phase can and probably should be designed in a less discipline-specific manner. Most competencies can be developed in almost any context. This outcome supports the current trend towards longitudinal attachments to one department or discipline. Longitudinal attachments would still offer the opportunity for students to develop all the necessary competencies while eliminating the current objections to the short rotational approach. Students would thus have time to engage with patients and the medical team, which should help them to develop as professionals.18,24

Family practice and community and occupational medicine seem to be the disciplines which are most suitable for students to develop competencies concerning social and community contexts of healthcare. These concern competencies such as ‘the student is able to explain the nature of a disease and its consequences for different aspects of the patients life’ and ‘the doctor has knowledge of and insight into the importance of prevention of chronic incapacity for work and maintenance of ability to work’. Indeed, it seems intuitive that family practice and community and occupational medicine are disciplines that offer unique opportunities for students to practice such competencies. This finding is especially salient because an important reason for the present focus on competency-based medical education is the call for societal accountability and healthcare that matches society’s needs.19,28,31 One of the aims of competency-based education is that students understand and are able to work with social and community contexts in healthcare. Therefore, we feel that family practice and community and occupational medicine play a key part in implementing a competency-based clerkship programme.

We found that competencies concerning the use of basic knowledge and science and reflection can be learned equally well in any of the disciplines. All disciplines were judged suitable for learning all the competencies in these areas of competence, which might stem from their nature. Currently, medical education and medicine are both firmly
grounded in evidence-based practice.\textsuperscript{32,33} Therefore, any department should offer opportunities to practice competencies related to the use of basic knowledge and science. Reflection mostly concerns the students analysing and managing their experiences in practice.\textsuperscript{34} We feel that any department can offer ample opportunities for such reflection.

We acknowledge that the outcomes of this procedure are not necessarily generalizable to the context of other medical schools or other countries. The data we present concern 177 specific competencies based on the Dutch blueprint and are based on the judgments of stakeholders from a single medical school. Replication of the current study in other contexts is required to determine its generalizability. We feel the procedure presented here serves as an example of how to select clerkships based on a competency framework. It utilises the expertise present in the organisation and a well-picked group of stakeholders can help curriculum developers to ascertain broad support throughout a medical school. Furthermore, we feel that the general findings discussed above add to a basic understanding of the relationship between learning outcomes and curriculum design.

Our findings emphasize one of the advantages of formulating curricular goals as competencies. Current literature on competency-based medical education suggests that competencies should not be formulated too elementarily, but should rather reflect actual practice.\textsuperscript{1,8,9,35} Such generality allows for learning outcomes to be adaptable to different contexts in practice.

An important limitation of our study is that it focuses solely on competencies. Though it may be its most important purpose, offering students sufficient opportunities for competency development is not the only purpose of a clerkship programme. It should also offer a broad variety of patient groups and clinical problems to prepare students for a variety of postgraduate curricula and the full scope of the profession of medical doctor. We did not use the results from our procedure blindly. After the current study, its results were discussed in the project group responsible for curriculum design. Disciplines were selected if they were judged very suitable for developing at least six competencies (3.39%). Because no discipline was found to be particularly unsuitable (<5.65%), this score was not considered relevant for selecting disciplines. Consequently, family practice, community and occupational medicine, internal medicine, surgery, emergency medicine, psychiatry and nursing home medicine were initially selected as mandatory clerkship rotations. Nursing home medicine was not made mandatory because of logistical limitations. After discussion, paediatrics and neurology were added as mandatory disciplines because of their specific patient group and specific clinical picture of diseases, respectively. We provide this example to emphasize the importance of weighing factors in a group discussion even where the results may seem clear.

A narrow focus on competencies in clerkship design also carries with it another risk. Even though students are able to develop broadly-defined competencies, critical knowledge and skills concerning specific disciplines may not be developed when rotating through a limited number of disciplines. Furthermore, clerkships also serve the purpose of
career orientation. As they rotate through different disciplines, students familiarize themselves with the different paths they can choose after graduation. As such, clerkships can also serve to help students make deliberate decisions about their future careers.\textsuperscript{36,37} This is especially important since not working in the right field can lead to lower job satisfaction.\textsuperscript{38} One can easily imagine how less diversity in disciplines can reduce the chances for students to obtain a detailed picture of the field of medicine. Consequently, we feel that even though most competencies can be mastered in any discipline, diversity in disciplines remains important.

In conclusion, in this study we demonstrated how a competency framework can be used to classify clerkships according to their suitability to fit in a competency framework. We found that most disciplines are suitable for developing most competencies. Consequently, students do not need to rotate through specific disciplines to be able to develop all the competencies they require. This means that curriculum designers can implement longer clerkship rotations without including all disciplines and, thus, without lengthening the curriculum or making any discipline compulsory. Current literature presents arguments to favour a competency based view on clerkship programmes over a discipline-based view. The current study shows that most disciplines are fit to serve as building blocks for a competency-based clerkship programme.
REFERENCES


