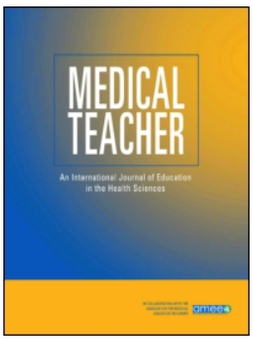

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The need for longitudinal clinical reasoning teaching and assessment: Results of an international survey

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ABSTRACT

Background: Clinical reasoning is a key ability essential for practising health professionals. However, little is known about the current global adoption of clinical reasoning teaching and assessment.

Purpose: We aimed to provide insights into how clinical reasoning is deliberately taught and assessed in curricula worldwide and to identify needs and perceived barriers for teaching clinical reasoning to students and educators.

Methods: A questionnaire was devised by an international expert group and distributed in a large international medical education community. Data were collected in 2018 and analysed using descriptive statistics. We identified themes in free-text responses using content analysis.

Results: Three hundred and thirteen responses from 76 countries were collected. Most respondents were from Europe (34%). While the presence of a longitudinal clinical reasoning curriculum was only reported by 28%, 85% stated that such a curriculum was needed. The lack of awareness of the need to explicitly teach clinical reasoning was the most commonly identified barrier. For assessment, the greatest need identified was for more workplace-based assessment.

Conclusions: Global respondents indicate the need to implement explicit longitudinal clinical reasoning curricula. Our findings suggest that efforts should be put into improving faculty development, including evidence-based materials on how to teach and assess clinical reasoning.

KEYWORDS
Clinical reasoning education; survey; curriculum planning; workplace-based assessment; faculty development

Introduction

There is little doubt that clinical reasoning is fundamental to the practice of health professions (Norman 2005; Higgs et al. 2019). For example, deficits in clinical reasoning correlate with medical errors and suboptimal care of patients (Graber et al. 2005; Norman and Eva 2010). A lack of clinical reasoning abilities is a primary cause of cognitive errors and threats to patient safety. These deficits cause unnecessary suffering for patients and increase the costs of healthcare. According to the World Health Organization (WHO), European data consistently show that medical errors and healthcare related adverse events occur in 8–12% of hospitalisations (WHO Regional Office for Europe 2019).

The definition of clinical reasoning varies across medical education experts (Young et al. 2018) and different health professions such as medicine (Goldszmidt et al. 2013), nursing (Holder 2018), or physical therapy (Christensen et al. 2017). Generally speaking, clinical reasoning is understood as 'the thinking and decision-making processes associated with clinical practice' (Higgs et al. 2019). Clinical reasoning includes tasks such as data gathering, interpreting, and synthesising information as well as generating hypotheses and diagnoses, developing management plans, avoiding cognitive errors and ensuring patient safety (Goldszmidt et al. 2013).

The concept of clinical reasoning as a generic algorithmic skill that may be taught independently of the clinical

Practice points

- This study presents the current status of clinical reasoning curricular implementation from an international perspective.
- There is a gap between the implementation of longitudinal clinical reasoning curricula and the expressed need for such a curriculum.
- Bedside teaching, problem-based learning and virtual patients are the preferred methods to teach clinical reasoning.
- More investment is needed in implementation of workplace-based assessment methods in clinical reasoning.
- There is a need for clinical reasoning teacher training courses.

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Supplemental data for this article can be accessed here.

context was abandoned a long time ago (Schuwirth 2002; Norman 2005) and we know now that it requires among other things a sound base of discipline-specific knowledge believed to be organised in illness scripts, awareness of multiple strategies and flexibility in strategy use as prerequisites (Charlin et al. 2007; Norman et al. 2017).

Varying recommendations were published in recent years on how to support learning of clinical reasoning (Bowen 2006; Rencic 2011; Audétat et al. 2017) and tools for carrying out its assessment (Daniel et al. 2019). Differences in reported learning outcomes across medical schools suggest that the way that clinical reasoning is taught likely plays a role. At the same time, we are far from definite conclusions regarding which methods that work best for teaching clinical reasoning (Williams et al. 2011) and it is likely that different methods are optimal for different situations (Daniel et al. 2019). Research has also suggested several developmental stages of clinical reasoning abilities with some suggested aligned teaching methods (Schmidt and Mamede 2015; Pinnock et al. 2019). Our knowledge about the current adoption of clinical reasoning teaching strategies in health professions education curricula and the connected perceived barriers encountered by teachers in introducing these methods is very limited.

A recent US survey among internal medicine clerkship directors (Rencic et al. 2017) showed that 57% institutions lacked dedicated sessions on clinical reasoning instruction in their curricula with 67% respondents indicating that more time should be devoted to clinical reasoning teaching. The main barriers to clinical reasoning instruction cited by participants were lack of curricular time and insufficient faculty expertise in teaching clinical reasoning (Rencic et al. 2017). The European perspective is largely unknown and the literature displays a gap in the global perspective on the current state of clinical reasoning education.

Thus, building on the work of Rencic et al. (2017), we sought to provide an international perspective on how clinical reasoning is taught and assessed in curricula and to identify the perceived needs and barriers from the teacher's perspective.

Methods

Development of the survey instrument

For the purpose of this study, we designed a questionnaire using established survey best practices (Artino et al. 2014). The questions were based on the published literature (e.g. Eva 2005; Schmidt and Mamede 2015; Audétat et al. 2017) and our experiences in the topic of clinical reasoning (e.g. Huwendiek et al. 2015; Rencic et al. 2017; Edelbring et al. 2018; Hege et al. 2018). All items in the survey also underwent cognitive interviewing in health professions contexts in several countries. Based on this feedback, a revised version of the questionnaire was iteratively developed and re-reviewed by experts in the field, and additional changes were made. The final version of the questionnaire contained 15 close-ended questions and one open-ended question. The survey encompassed items asking about: presence and need of an explicit longitudinal curriculum; aspects of clinical reasoning required in the curriculum; preferred teaching and assessment methods; and the need for adoption and content of 'train-the-trainer' courses in clinical reasoning. Consistent with the literature, with inquiring about clinical reasoning we covered a wide range of topics ranging from collecting and interpreting patient information; developing diagnostic and treatment plans; and theories and strategies of clinical reasoning. The complete list of questions is presented in Supplementary Appendix 1. We implemented the questionnaire as a web survey using SurveyMonkey (SurveyMonkey Inc. 2019). The study was reviewed and approved by the ethical committee of Jagiellonian University Medical College.

Table 1. Respondents of the survey by region.

Region	% (*n*)
Europe	34% (107)
North and South America	26% (80)
Eastern Mediterranean Region	17% (53)
Western Pacific Region	14% (44)
South-East Asia	7% (21)
Africa	2% (7)

Data collection and analysis

As our aim was to reach a broad international community, we selected AMEE (The Association For Medical Education in Europe 2019) for distributing the survey. AMEE is one of the largest medical education organisations worldwide, with members in 90 countries on five continents and a strong community gathered around annual conferences (Segouin et al. 2007; The Association for Medical Education in Europe 2019). We estimate the size and structure of AMEE organisation to be around 2200 members based on a former study (Huwendiek et al. 2010).

An invitation to participate in the survey was sent via the AMEE e-mail newsletter on 4 October 2018, a follow-up request was sent on 30 October 2018. We closed data collection on 8 November 2018. We did not request nor store any personal information about the participants. Statistical analysis was conducted using the R platform (version 3.6.1) (R Core Team 2019). A thematic content analysis was performed of the open-ended question. This was performed by two researchers (AK, SE) who independently created initial coding frames, then reached a consensus on a joint coding frame which was used for collaborative coding of responses into themes. All differences were resolved by consensus reaching a complete agreement on the final themes.

Results

Sample

We have collected 313 responses from 76 countries (estimated response rate of 14%). The largest number of respondents were from Europe (34%, $n = 107$; Table 1), with the United Kingdom being represented most frequently (29%, $n = 31$ out of 107). Respondents from North and South America (26%, $n = 80$) mainly from the United States (39%, $n = 31$ out of 80) and Canada (28%, $n = 22$ out of 80) were the second largest group of respondents. From the WHO's Eastern Mediterranean Region came 17% ($n = 53$) respondents, with Pakistan being best represented (36%, $n = 19$ out of 53) and from Western Pacific Region (14%, $n = 44$). We received just a handful of responses from South-East Asia (7%, $n = 21$) and Africa (2%, $n = 7$).

Table 2. Which of the following aspects are taught and assessed with an explicit focus on clinical reasoning and how relevant do you rate these?

	Mean (SD)		
	Taught	Assessed	Relevant
Gathering, interpreting, and synthesising patient information ($n = 308$)	3.6 (0.7)	3.3 (0.8)	3.9 (0.4)
Generating differential diagnoses including defining and discriminating features ($n = 307$)	3.5 (0.7)	3.3 (0.8)	3.8 (0.5)
Developing a diagnostic plan ($n = 305$)	3.3 (0.8)	3.1 (0.8)	3.7 (0.6)
Developing a treatment plan ($n = 293$)	3.3 (0.8)	3.2 (0.8)	3.7 (0.6)
Errors in the clinical reasoning process and strategies to avoid them ($n = 302$)	2.4 (0.9)	2.1 (1.0)	3.4 (0.8)
Strategies to learn clinical reasoning (e.g. heuristics, rule out the worst case scenario, etc.) ($n = 306$)	2.3 (0.9)	1.9 (0.9)	3.1 (0.8)
Theories of clinical reasoning (e.g. knowledge encapsulation, illness scripts, etc.) ($n = 306$)	2.2 (0.9)	1.8 (1.0)	2.9 (0.8)
Interprofessional aspects of clinical reasoning (e.g. collaborative reasoning) ($n = 306$)	2.1 (0.9)	1.8 (0.9)	3.1 (0.9)

Not at all: 1; A Little: 2; Much: 3; Very much: 4.

Table 3. How is/should clinical reasoning be taught in your curriculum in sessions with a main focus on clinical reasoning?

	% (n)		
	Is taught	Should be taught	Δ
Bedside teaching	76% (237)	82% (255)	6%
Problem-based learning	62% (194)	80% (251)	18%
Lectures	53% (167)	37% (117)	–16%
Clerkships	52% (163)	62% (195)	10%
Morning rounds	47% (147)	56% (175)	9%
Virtual patients (interactive online cases)	26% (82)	65% (204)	39%
Morbidity and mortality rounds	22% (68)	47% (148)	26%

Most of the participants (74%, $n = 233$) classified themselves as health profession educators. Nearly, half of all respondents were physicians (47%, $n = 147$). The majority of respondents were experienced in healthcare education (median = 16 years; IRQ = 15) with 15–20 years being the most frequently selected range of experience (20%, $n = 61$).

Longitudinal curriculum on clinical reasoning

More than half (53%, $n = 164$) of the respondents answered that they had no explicit longitudinal curriculum on clinical reasoning at their institution. Approximately, one-fourth (28%, $n = 87$) confirmed the presence of such a curriculum and the rest did not know (19%, $n = 59$). A clear majority (85%, $n = 262$) were in favour of introducing a longitudinal curriculum on clinical reasoning while only a handful of respondents (5%, $n = 16$) were against a longitudinal curriculum giving reasons such as the presence of too many themes in the curriculum or a generally overcrowded curriculum.

All presented aspects of clinical reasoning were rated as important in teaching and assessment (Table 2). Four of them: gathering, interpreting, and synthesising patient information; generating differential diagnoses; developing a diagnostic and treatment plan, were seen as most relevant. The latter four, including errors in the clinical reasoning, clinical reasoning strategies, theories of clinical reasoning and inter-professional aspects of clinical reasoning, even though marked as relevant, were being infrequently taught and assessed in the curricula.

Clinical reasoning is most often taught as part of bedside teaching (Table 3; 76%, $n = 237$), problem-based learning (PBL) sessions (62%, $n = 194$), and lectures (53%, $n = 167$). When compared with responses of how clinical reasoning should be taught the two of these venues remained the same (bedside teaching and PBL). A minority of respondents believe that lectures should be used to teach clinical reasoning (37%, $n = 117$). The third leading method how clinical reasoning should be taught was virtual patients (65%, $n = 204$). This method has the largest gap between the desired and actual coverage (+39%) across all the surveyed methods (Table 3). Interestingly, with the exception of lectures, less teaching activities of clinical reasoning was occurring than what was perceived as being relevant.

Analysis of the data on when in the curriculum should aspects of clinical reasoning be explicitly taught is challenging due to the diversity of educational programmes. In Europe ($n = 107$), most of the clinical reasoning aspects were taught in years 3 and 4 (53 and 53%, respectively), less often in years 5 and 6 (51 and 37%) and least often in pre-clinical years 1 and 2 (23 and 38%).

The most popular selected method for assessment of clinical reasoning was objective structured clinical examinations (OSCE) (80%, $n = 250$). This was also the most frequent response when it came to the preferred assessment method (85%, $n = 265$). Written exams (e.g. the Key Feature approach) were used in approximately half of respondent's institutions (60%, $n = 187$), but there was no visible tendency to want to increase the use of written exams to assess clinical reasoning (59%, $n = 184$). Workplace-based exams (e.g. MiniCEX) were reported to be in use in around half of the respondents' institutions (51%, $n = 161$) and this option was selected as the one to invested time in with 84% ($n = 262$) respondents arguing this assessment method should be used (+33% difference).

Barriers to introducing clinical reasoning in curricula

The main perceived barrier for introducing clinical reasoning in the curriculum (Table 4) was lack of awareness of the need for explicit clinical reasoning instruction. Two-thirds of responses (66%, $n = 207$) endorsed this view, followed by a lack of guidelines for clinical reasoning curriculum development (62%, $n = 194$) and lack of qualified faculty to teach clinical reasoning (58%, $n = 181$). Lack of financial resources was perceived as a challenge in less than one-third of responses (32%, $n = 99$).

Faculty development

According to the survey results, more than half of the respondents lack a train-the-trainer program in clinical reasoning teaching, with approximately one-third of the respondents reporting such courses at their institutions (36%, $n = 113$). Yet the respondents almost unanimously agree that such courses are necessary (92%, $n = 284$). When it comes to the subjects that should be addressed in a train-the-trainer course the most frequent answer was clinical reasoning strategies (92%, $n = 288$). This was

Table 4. What, in your opinion, are the main barriers/challenges for introducing a clinical reasoning curriculum?

	% (*n*)
Lack of awareness of the need for explicit clinical reasoning teaching	66% (207)
Lack of guidelines for clinical reasoning curriculum development	62% (194)
Lack of qualified faculty to teach clinical reasoning	58% (181)
Lack of curricular time	49% (154)
Perception that clinical reasoning cannot be taught	34% (107)
Lack of financial resources	32% (99)
No particular challenges	7% (21)
Don't know	0% (1)

Table 5. What should a train-the-trainer course on clinical reasoning cover?

	% (*n*)
Clinical reasoning strategies	92% (288)
Teaching methods on the wards and/or clinic	83% (259)
Assessment methods of clinical reasoning	82% (256)
Common errors in the clinical reasoning process	80% (251)
Cognitive errors and biases and strategies on how to avoid them	74% (230)
Teaching methods for face-to-face courses (e.g. seminars, problem-based learning courses, lectures)	73% (227)
Theory on clinical reasoning	71% (222)
Technology-enhanced methods (such as virtual patients, e-learning, etc.)	61% (192)
Literature on clinical reasoning	59% (183)
Don't know	2% (7)

followed by three others: clinical reasoning teaching methods on the wards and/or clinic, assessment methods of clinical reasoning, and common errors in the clinical reasoning process (Table 5).

Free-text answer content analysis

Three salient themes were found in the free-text responses ($n = 78$): the importance of introducing clinical reasoning in the curriculum (28%, $n = 22$, e.g. 'Need to talk more and more about that!!'), elaborations (or contextualisation) of responders' perspectives (19%, $n = 15$, e.g. some respondents voiced concerns that the clinical reasoning perspective was biased towards a medical setting), and clinical reasoning teaching adaptation suggestions (17%, $n = 13$, 'Political will of leadership matters a lot!'). The remaining categories were positive expressions (24%, $n = 19$, e.g. 'Although this was a survey, I found this to be enlightening and thought-provoking.'), and miscellaneous/other (12%, $n = 9$, e.g. requests for contact).

Discussion

This study offers a global perspective into practice of clinical reasoning teaching, assessment, and faculty development with responses from 76 countries. The collected data suggest a need for more emphasis on explicit teaching of clinical reasoning across the curriculum. We believe that the wide gap (only 28% of respondents reporting the presence while 85% expressing the need) for an explicit longitudinal curriculum on clinical reasoning is a call for change. This resonates well with findings reported in the recent US national survey (Rencic et al. 2017) and perception of importance of clinical reasoning in health professions education (Huhn et al. 2018).

As for the reason for the presence of the gap, despite such a clearly expressed need in this survey, our data suggest a few potential answers. First, respondents requested more faculty development suggesting that teachers recognise the importance of the topic and also the need for training to successfully teach and assess this topic. In particular, respondents commented on the need for explicit training in teaching strategies, assessment, teaching in the workplace, and instruction on errors. Second, the survey was distributed in a community active in educational research and development with members who are likely aware of the possibilities to explicitly teach clinical reasoning. A third reason, suggested in the free-text comments, was that while important, existing curricula are already overcrowded.

Similarly, as was observed in the field of physical therapy (Christensen et al. 2017), the aspects of clinical reasoning that are perceived important to be taught varied considerably. While there is little controversy that gathering and interpreting patient information and generating hypotheses is important, the relevance of teaching strategies to avoid error and heuristics may be more contentious. On the one hand, there is a clear need to reduce the number of errors in medical practice (Makary and Daniel 2016). In the former US national survey about teaching clinical reasoning, cognitive bias and premature closure topped the list of important topics (Rencic et al. 2017). On the other hand, the evidence to support the effectiveness of particular debiasing strategies is regarded as sparse and questioned by some authorities in the field of clinical reasoning research (Norman et al. 2017). This might be reflected in the lower score of importance of those aspects in our survey. We should seek to enhance the level of empirical evidence of the effectiveness of particular teaching strategies.

If we prioritise the drive for change in clinical reasoning education by the difference between the present and desired state of adoption according to our survey results, virtual patients (interactive online cases) represent an important opportunity (Kononowicz et al. 2015). A recent systematic review and meta-analysis show empirical evidence supporting such a direction (Kononowicz et al. 2019).

Our study identified gaps in the current practice of clinical reasoning assessment methods as expressed in the

conclusions of a recent scoping review (Daniel et al. 2019). Whereas non-work-based and simulation-based assessment methods (e.g. OSCE) are reported in our survey to be adequately represented in assessment programmes, the need for more workplace-based assessment is apparent. This is understandable in face of the fact that implementing workplace-based assessment involves several challenges as outlined in a recent grounded theory study (Lörwald et al. 2019) and that work-place based assessments are usually done on a one-to-one basis which requires high numbers of teachers trained in assessing clinical reasoning.

In terms of barriers that hinder explicit teaching of clinical reasoning, the former US national survey (Rencic et al. 2017) reported the top problem was limited curricular time. This was perceived differently in our survey with a lack of qualified faculty appearing to be a greater perceived need than more curriculum time. A potential solution is creating teacher training courses in clinical reasoning. This is clearly supported by the opinions of the respondents and could provide several benefits. First of all, such courses can raise awareness of best practices. Second, they can improve preparedness of educators for changes in the curriculum. Notably, topics marked as most relevant for the faculty development courses (Table 5) – e.g. clinical reasoning strategies – were also seen as unrepresented in teaching and assessment practice (Table 2). Finally, such courses could facilitate core learning objectives and expectations regarding the performance level of clinical reasoning expertise at different stages of the curriculum.

Our study had several limitations. We were limited by a low response rate. The estimated response rate of 14% is below that what is traditionally expected and thus the potential of non-response bias. However, we managed to collect responses from a broad context that includes 76 out of 90 AMEE member countries, our findings are consistent with a recent survey in the US (Rencic et al. 2017). Further, while we collected a low percentage, our respondents accounted for 84% of the potential geographical coverage of respondents and the geographical breakdown of our respondents was similar to a former study using the AMEE mailing list (Huwendiek et al. 2010) with most answers from Europe (leading by UK) and North America (leading by US) and the same number of responding countries.

Conclusions

This study addresses the current adoption of explicit clinical reasoning teaching and assessment methods in health professions curricula worldwide. We were able to highlight the importance of the topic for the medical education community but also pointed out low implementation of explicit clinical reasoning teaching and assessment methods in curricula. Common barriers include persisting doubts about the utility of explicit teaching of clinical reasoning and lack of qualified faculty, which could be addressed by organising faculty development courses in teaching clinical reasoning strategies.

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Disclosure statement

The authors report no conflicts of interest. The views expressed herein are those of the authors and not necessarily those of the U.S. Department of Defense or other federal agencies.

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