

Developing, implementing, and disseminating an adaptive clinical reasoning curriculum for healthcare students and educators



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D1.1 (a) Report on specific needs, preoccupations of stakeholders, and barriers: web survey results

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1. Introduction

The aim of the specific needs analysis was to gain detailed knowledge on the specific needs and barriers for explicit, structured teaching and assessment of clinical reasoning (CR). The specific needs of multiple stakeholder groups were investigated. By including different stakeholders we wanted to ensure that different perspectives are represented and that the curriculum can be adopted by different schools. The needs analysis described in the following was built on the results of the general needs analysis that was conducted by the consortium prior to this project. The needs analysis was divided into two forms of data collection: a web survey and semi-structured interviews. In this document we report on the result of a web-survey.

2. Quality criteria

The DID-ACT consortium decided to guide the development and implementation of the web-survey based on following quality criteria:

- Pre-testing of survey (think aloud, piloting with partners)
- Survey and interview questions reviewed and agreed upon by all partners
- Diverse range of participants (faculty, students, educators,...) for the interviews and survey
- ≥ 70 survey responses

3. Survey

3.1 Design of the survey

In order to identify barriers and preoccupations but also expectations for teaching and assessing clinical reasoning in healthcare education in a larger group of stakeholders at the partner and associate partner institutions, the DID-ACT consortium designed a web survey.

We have focused on three groups of stakeholders:

- Students
 - These are learners enrolled in study programmes at medical and healthcare schools, who are the potential users of the DID-ACT clinical reasoning curriculum, and therefore have their own expectations and preferences on how and what they would like to learn.
- Faculty
 - Members of the faculty who are involved in teaching at medical and healthcare schools. Included in this group are educators potentially interested in the use of the DID-ACT curriculum educational resources in their teaching activities and (potential) participants in the train-the-trainer course.
- Experts
 - Included in this group are educators and curriculum planners experienced in clinical reasoning teaching with a good overview of how the current clinical reasoning curriculum at their institution looks like and what the general expectations of their institutions are in this context.

We developed the survey taking as the starting point the general needs analysis that had preceded the DID-ACT project commencement in 2018 [Kononowicz20]. A qualitative content analysis of open-ended comments to questions from the general needs analysis survey led to refinements in the structure and content of the questionnaire. For instance we considered critique on a uni-professional perspective (medicine) and introduced a more inclusive perspective on clinical reasoning to which nursing, occupational and physiotherapists contributed. The final version of the survey was obtained after several draft iterations circulated among the DID-ACT project partners and were discussed in the project online meeting.

The final survey was divided in 6 sections as presented in Fig. 1. Web appendix 1 presents a detailed list of all questions.

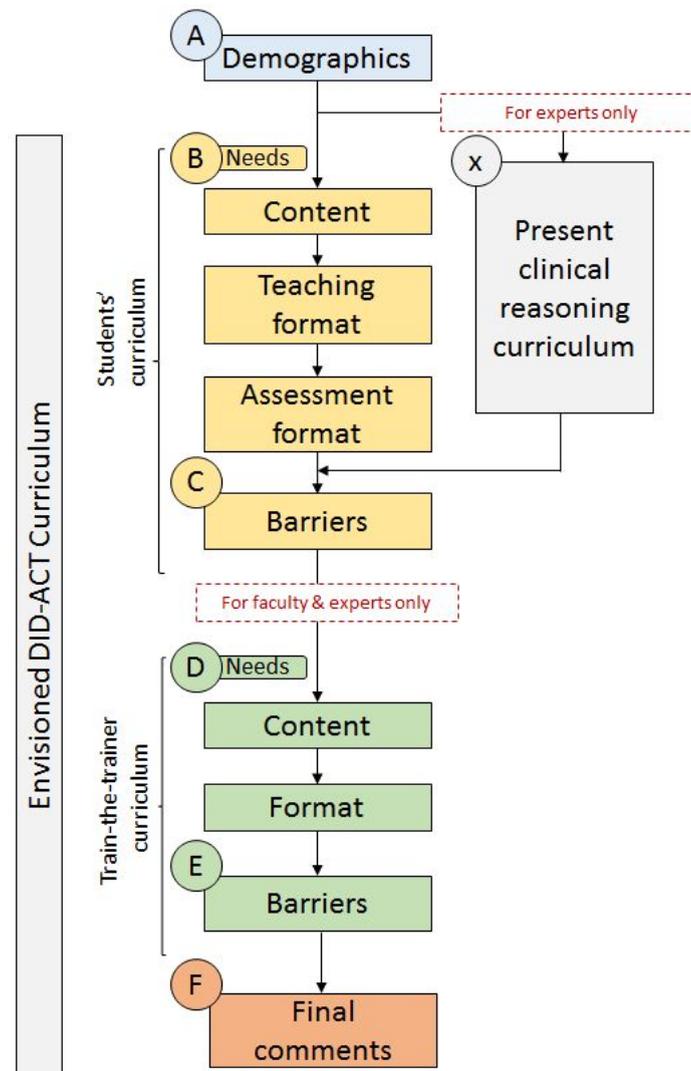


Fig. 1. Structure of the DID-ACT Specific Needs Assessment survey

The sections contained questions about:

- Section A: the background, affiliation and clinical reasoning experience of survey participants. In total: 5 questions;
- Sections B,C: needs for an envisioned longitudinal clinical reasoning for students. This included needs regarding content and teaching / assessment format (part B, 7 question) and perceived barriers of implementing the students' curriculum (part C, 2 questions);
- Section x: included questions as in section B but regarding the current status of the implemented clinical reasoning curriculum at the respondents' institution (6 questions) and not just the needs expressed for the envisioned curriculum;

- Sections D,E: envisioned train-the-trainer course. This comprised of content and teaching format (part D, 5 questions) and perceived barriers for implementing the train-the-trainer course (part E, 3 questions);
- Section F contained one final open-ended question with general comments regarding all aspects of the questionnaire.

In order to improve the response rate by optimising the time required to fill in the questionnaire, but also to take advantage of the strength of the stakeholder groups, the sections were enabled depending on the respondent group as presented in table 1.

Table 1. Access to the sections of the survey by respondent group

| Stakeholder | Available sections | Number of questions |
|-------------|--------------------|---------------------|
| Student | A,B,F | 14 |
| Faculty | A,B,C,D,E,F | 24 |
| Expert | A,B+x,C,D,E,F | 30 |

3.2 Technical implementation and dissemination

The DID-ACT consortium implemented the questionnaire using the open-source survey system *LimeSurvey 4.1.4* [LimeSurvey]. Fig. 2 presents the landing page of the survey, and fig. 3 an exemplary page of the survey. Three subdomains were created for the respective stakeholder groups:

- <http://studentsurvey.did-act.eu>
- <http://facultysurvey.did-act.eu>
- <http://expertsurvey.did-act.eu>

We have estimated the time needed to fill in the survey (depending on the stakeholder group) in the range from 15 to 30 minutes. The survey tool enabled storing and resuming unfinished survey sessions.

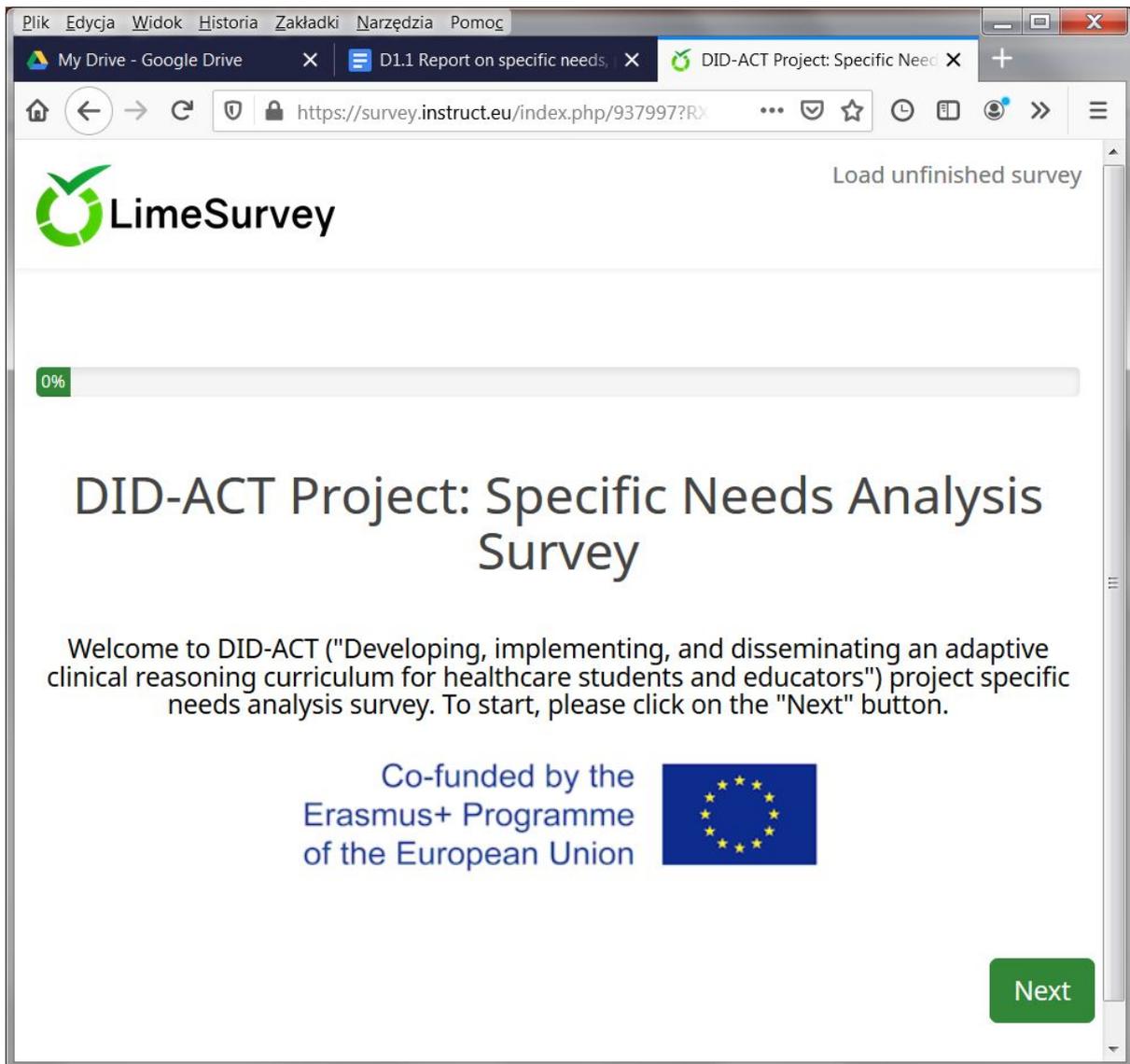
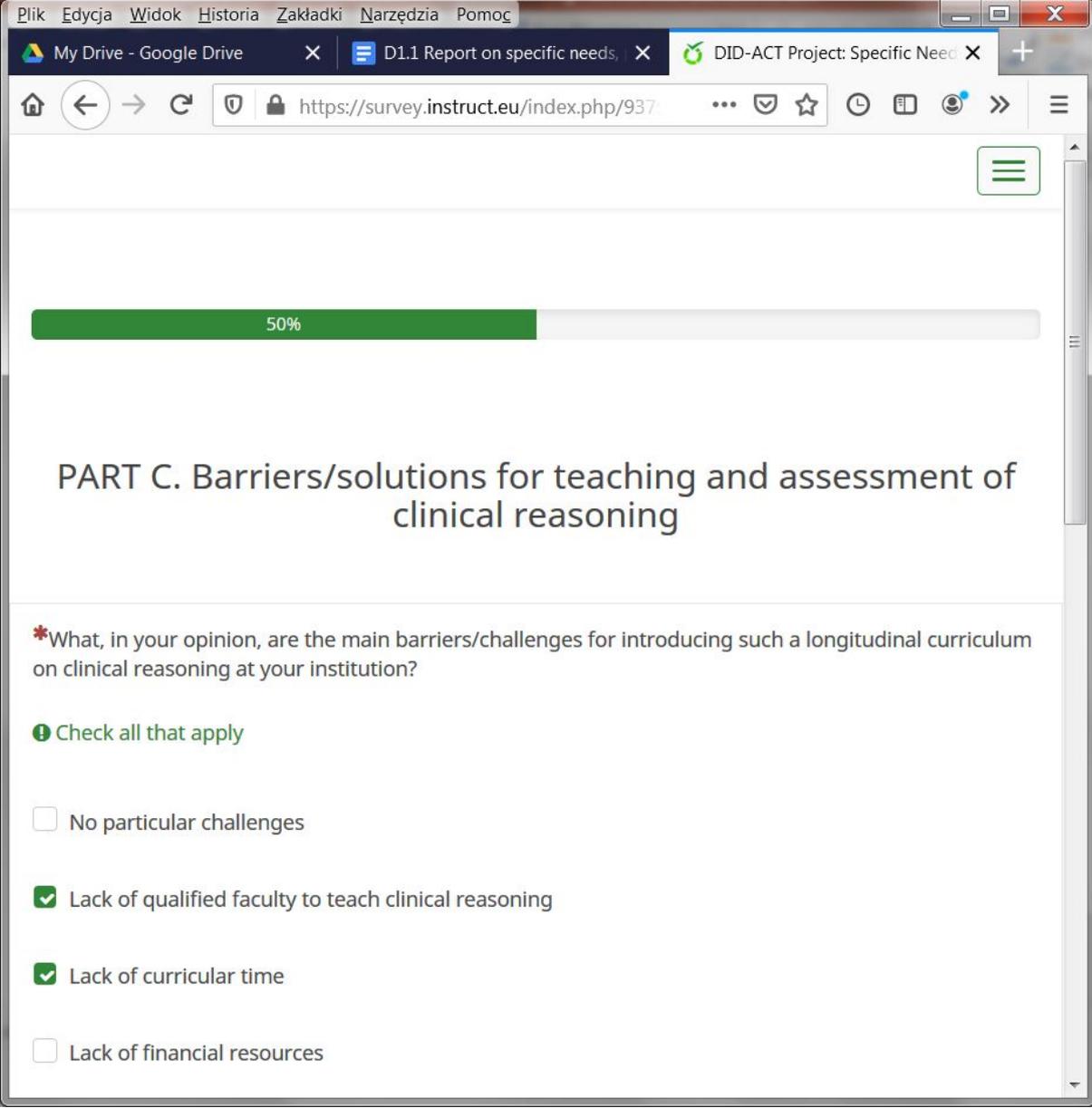


Fig. 2. DID-ACT Specific Needs Analysis Survey landing page



Plik Edycja Widok Historia Zakładki Narzędzia Pomoc

My Drive - Google Drive × D1.1 Report on specific needs × DID-ACT Project: Specific Need ×

https://survey.instruct.eu/index.php/937

50%

PART C. Barriers/solutions for teaching and assessment of clinical reasoning

*What, in your opinion, are the main barriers/challenges for introducing such a longitudinal curriculum on clinical reasoning at your institution?

Check all that apply

- No particular challenges
- Lack of qualified faculty to teach clinical reasoning
- Lack of curricular time
- Lack of financial resources

Fig. 3. Section C in the DID-ACT Specific Needs Analysis Survey

The survey was distributed over local communication channels of the project partner institutions (e.g. university newsletters) and associated partners. We started to collect data on March 4th, 2020 and closed on April 1st, 2020.

3.3 Results

In total, the survey was opened by 857 users. Out of this, 182 (21%) responses concluded at least section B of the survey with complete data and were therefore included in the data analysis.

Below, we present a quantitative analysis of representative questions from the survey. A detailed summary of answers from all questions in the survey is presented in web appendix.

2. A summary of answers to the open-ended questions will be presented together with the outcomes of the qualitative analysis of the semi-structured interviews in deliverable D1.1 (b).

Part A. Demographics

Question 1. In which country do you work/study?

| Country | Student | Faculty | Expert | Total |
|--------------------|-----------|-----------|-----------|------------|
| Slovenia | 30 | 18 | 2 | 50 |
| Germany | 22 | 10 | 7 | 39 |
| Switzerland | 27 | 4 | 0 | 31 |
| Sweden | 5 | 9 | 5 | 19 |
| Poland | 0 | 14 | 1 | 15 |
| United States | 0 | 4 | 11 | 15 |
| Malta | 5 | 0 | 1 | 6 |
| Netherlands | 0 | 2 | 1 | 3 |
| Algeria | 0 | 0 | 1 | 1 |
| Czechia | 0 | 0 | 1 | 1 |
| Slovakia | 0 | 0 | 1 | 1 |
| Solomon Islands | 0 | 1 | 0 | 1 |
| Grand Total | 89 | 62 | 31 | 182 |

Participating institutions included: Czechia (Masaryk University, Brno), Germany (University of Augsburg, Ruhr University of Bochum, University Bonn, University Hospital Cologne, Technical University Dresden, Hannover Medical School, Heidelberg University, Friedrich-Schiller-University Jena, University Rostock, Ludwig Maximilian University of Munich, University of Saarland, University Witten/Herdecke), Malta (EDU College of Medicine), Netherlands (Erasmus MC, Systems Research NL), Poland (Jagiellonian University of Kraków, Poznań University of Medical Sciences, Medical University of Warsaw), Slovenia (University of Maribor), Sweden (Mälardalen University, Örebro University), Switzerland (University of Bern), United States (All American Institute of Medical Sciences, AT Still University School of Osteopathic Medicine, California University of Science and Medicine, Ithaca College, New York Institute of Technology College of Osteopathic Medicine, Philadelphia College of Osteopathic Medicine Georgia, SUNY Buffalo, Uniformed University of the Health Sciences, University of California, University of Cincinnati, University of New Mexico, Wake Forest School of Medicine, Wright State University).

Question 3. What educational programme do you relate mostly to?

| Educational programme | Total |
|------------------------------------|--------------|
| Medicine | 158 |
| Nursing | 10 |
| Physiotherapy/Occupational therapy | 8 |
| Other | 6 |
| Total | 182 |

Part B. Needs - Students' Curriculum**Question 7. Please, rate the importance of inclusion of each of the following aspects in the envisioned longitudinal curriculum on clinical reasoning.**

| CR Content [All] | 7 | 6 | 5 | 4 | 3 | 2 | 1 | IDK* | Score* |
|---|----------|----------|----------|----------|----------|----------|----------|-------------|---------------|
| Gathering, interpreting, and synthesizing patient information | 73% | 23% | 3% | 1% | 1% | 0% | 0% | 0% | 6.7 |
| Generating differential diagnoses including defining and discriminating features | 65% | 27% | 5% | 2% | 0% | 1% | 1% | 0% | 6.5 |
| Developing a treatment/management plan | 60% | 27% | 10% | 2% | 1% | 0% | 0% | 0% | 6.4 |
| Developing a diagnostic plan | 56% | 33% | 7% | 3% | 1% | 1% | 0% | 0% | 6.4 |
| Self-reflection on clinical reasoning performance and strategies for future improvement | 57% | 26% | 13% | 1% | 1% | 0% | 1% | 1% | 6.3 |
| Errors in the clinical reasoning process and strategies to avoid them | 52% | 29% | 14% | 3% | 0% | 1% | 1% | 1% | 6.2 |
| Developing a problem formulation/hypothesis | 39% | 40% | 15% | 3% | 0% | 1% | 0% | 1% | 6.1 |

| | | | | | | | | | |
|--|-----|-----|-----|-----|----|----|----|----|------------|
| Aspects of patient participation in clinical reasoning (e.g. shared decision making) | 38% | 34% | 23% | 2% | 1% | 1% | 1% | 0% | 6.0 |
| Interprofessional aspects of clinical reasoning | 38% | 40% | 15% | 3% | 1% | 1% | 1% | 1% | 6.0 |
| Collaborative aspects of clinical reasoning | 38% | 36% | 19% | 4% | 1% | 1% | 1% | 1% | 6.0 |
| Strategies to learn clinical reasoning (e.g. heuristics, rule out worst case scenario, | 35% | 33% | 23% | 7% | 1% | 1% | 1% | 1% | 5.9 |
| Theories of clinical reasoning (e.g. knowledge encapsulation, illness scripts, narrative reasoning | 16% | 40% | 24% | 10% | 5% | 2% | 1% | 2% | 5.3 |

n=176

{7=Very important; 6=Important; 5=Somewhat important; 4=Neutral; 3=Rather unimportant; 2=Unimportant; 1=Very unimportant; IDK=I don't know; Score=Mean score}

Question 8. Please, rate the importance of inclusion of each of the following formats in the envisioned longitudinal curriculum on clinical reasoning.

| CR Teaching Format | 7 | 6 | 5 | 4 | 3 | 2 | 1 | IDK* | Score* |
|---|-----|-----|-----|-----|----|----|----|------|------------|
| Case-based Learning | 59% | 31% | 9% | 0% | 0% | 0% | 1% | 1% | 6.4 |
| Human simulated patients | 45% | 30% | 15% | 6% | 1% | 1% | 1% | 2% | 6.0 |
| Problem Based Learning (PBL) | 39% | 34% | 17% | 6% | 2% | 1% | 2% | 0% | 6.0 |
| Team-based Learning | 36% | 39% | 18% | 3% | 1% | 1% | 1% | 1% | 5.9 |
| High fidelity simulation (mannequins) | 35% | 32% | 14% | 10% | 5% | 3% | 1% | 2% | 5.6 |
| Virtual Patients (interactive online cases) | 22% | 38% | 24% | 9% | 3% | 1% | 2% | 1% | 5.5 |
| Lectures | 16% | 28% | 31% | 10% | 7% | 3% | 3% | 1% | 5.1 |

n=176

{7=Very important; 6=Important; 5=Somewhat important; 4=Neutral; 3=Rather unimportant; 2=Unimportant; 1=Very unimportant; IDK=I don't know}

Question 11. Which of these assessment formats should be implemented in the envisioned longitudinal curriculum on clinical reasoning?

| CR Assessment Format | 7 | 6 | 5 | 4 | 3 | 2 | 1 | IDK* | Score* |
|---|-----|-----|-----|-----|----|----|----|------|------------|
| Clinical examinations (e.g. OSCE or other practical examinations) | 49% | 39% | 7% | 3% | 1% | 0% | 0% | 1% | 6.3 |
| Workplace-based assessments (e.g. MiniCEX, summative approach) | 39% | 34% | 14% | 7% | 1% | 0% | 1% | 5% | 5.7 |
| Oral examination | 28% | 41% | 16% | 8% | 4% | 2% | 1% | 2% | 5.6 |
| Assessment using virtual patients | 25% | 41% | 20% | 9% | 2% | 1% | 1% | 1% | 5.6 |
| Written test (e.g. multiple choice questions, key feature approach, script concordance tests) | 13% | 32% | 31% | 10% | 8% | 4% | 2% | 1% | 5.1 |

n=167

*{7=Very important; 6=Important; 5=Somewhat important; 4=Neutral; 3=Rather unimportant; 2=Unimportant; 1=Very unimportant; IDK=I don't know; Score=Mean score}

Nearly half of the respondents (44%) answered that the clinical reasoning curriculum should be started in the first year of the undergraduate programme. Only 10% answered it should start in year four or later.

Part C. Barriers for teaching and assessment of clinical reasoning

Question 14. What, in your opinion, are the main barriers/challenges for introducing such a longitudinal curriculum on clinical reasoning at your institution?

| Barriers for introducing longitudinal CR curriculum | Total | % |
|--|-------|-----|
| Lack of qualified faculty to teach clinical reasoning | 50 | 57% |
| Lack of curricular time | 50 | 57% |
| Lack of guidelines for clinical reasoning curriculum development | 46 | 53% |
| Lack of financial resources | 43 | 49% |
| Lack of awareness of the need for explicit clinical reasoning teaching | 43 | 49% |
| Lack of top-down support | 30 | 34% |
| Perception that clinical reasoning cannot be taught | 20 | 23% |

| | | |
|-------------------------------|----|-----|
| No particular challenges | 11 | 13% |
| Curriculum invented elsewhere | 6 | 7% |
| Don't know | 3 | 3% |

n=87

Part D. Needs - Train the trainer curriculum

Question 17. Do you think the DID-ACT train-the-trainer course is necessary for healthcare educators at your institution?

| | Total | % |
|------------|-------|-----|
| Yes | 66 | 80% |
| No | 4 | 5% |
| Don't know | 12 | 15% |

n=82

Question 18. What should the DID-ACT train-the-trainer course on clinical reasoning cover?

| Train-the-trainer course | 7 | 6 | 5 | 4 | 3 | 2 | 1 | IDK* | Score* |
|---|-----|-----|-----|----|----|----|----|------|------------|
| Teaching methods on the wards and/or clinic | 61% | 33% | 3% | 1% | 0% | 0% | 0% | 1% | 6.5 |
| Strategies on how to avoid common errors and biases in clinical reasoning process | 58% | 32% | 8% | 0% | 1% | 0% | 0% | 0% | 6.5 |
| Teaching methods for face-to-face courses (e.g. seminars, problem-based learning courses, lectures) | 56% | 35% | 8% | 1% | 0% | 0% | 0% | 0% | 6.4 |
| Clinical reasoning strategies | 51% | 42% | 7% | 0% | 0% | 0% | 0% | 0% | 6.4 |
| Common errors in the clinical reasoning process | 49% | 47% | 4% | 0% | 0% | 0% | 0% | 0% | 6.4 |
| Assessment methods of clinical reasoning | 46% | 43% | 4% | 3% | 3% | 0% | 0% | 1% | 6.2 |
| Technology-enhanced methods (such as virtual patients, e-learning) | 39% | 42% | 13% | 4% | 1% | 0% | 0% | 1% | 6.1 |

| | | | | | | | | | |
|---|-----|-----|-----|-----|----|----|----|----|------------|
| Blended learning / Flipped (inverted) classroom methodology | 35% | 35% | 22% | 6% | 0% | 0% | 0% | 3% | 5.9 |
| Theory on clinical reasoning | 22% | 40% | 29% | 8% | 0% | 0% | 0% | 0% | 5.8 |
| Literature on clinical reasoning | 24% | 40% | 19% | 13% | 1% | 1% | 1% | 0% | 5.6 |

n=72

*{7=Very important; 6=Important; 5=Somewhat important; 4=Neutral; 3=Rather unimportant; 2=Unimportant; 1=Very unimportant; IDK=I don't know; Score=Mean score}

Question 19. In your opinion, what is the best format for the DID-ACT train the trainer course?

| Best train-the-trainer format | Total | % |
|---|-------|-----|
| Blended learning/flipped classroom approach (combination of e-learning and face-to-face meetings) | 46 | 59% |
| Series of face-to-face meetings | 23 | 29% |
| E-learning course | 6 | 8% |
| One time face-to-face meeting | 3 | 4% |

n=78

Part E. Barriers for train the trainer course

Question 22. What critical aspects/barriers/challenges do you see in implementing the DID-ACT train-the-trainer course at your institution?

| | Total | % |
|--|-------|-----|
| Lack of time of participants | 58 | 71% |
| Lack of time of trainers | 52 | 63% |
| Lack of qualified trainers to teach the train-the-trainer course | 46 | 56% |
| Lack of financial resources | 43 | 52% |
| Lack of awareness of the need for a train-the-trainer course | 36 | 44% |
| Lack of guidelines for teaching and assessing clinical reasoning | 32 | 39% |
| Lack of top-down support | 31 | 38% |
| Perception that clinical reasoning cannot be taught | 10 | 12% |
| No particular challenges | 9 | 11% |

Course invented elsewhere 0 0%

n=82

3.4 Current situation (at partner institutions)

Similarly as it was the case of the general needs analysis, the specific needs analysis asked about the current practice of clinical reasoning teaching. These questions were asked in the expert version of the survey only (n=31).

7.x.a In your curriculum (i.e. overall programme, not a particular course or clerkship you might be overseeing), which of the following aspects are taught?

| CR Content Taught | 4 | 3 | 2 | 1 | IDK* | Score* |
|--|-----|-----|-----|-----|------|------------|
| Gathering, interpreting, and synthesizing patient information | 58% | 29% | 10% | 0% | 3% | 3.4 |
| Generating differential diagnoses including defining and discriminating features | 42% | 45% | 13% | 0% | 0% | 3.3 |
| Developing a treatment/management plan | 52% | 32% | 13% | 0% | 3% | 3.3 |
| Developing a diagnostic plan | 48% | 32% | 13% | 3% | 3% | 3.2 |
| Developing a problem formulation/hypothesis | 32% | 42% | 23% | 3% | 0% | 3.0 |
| Aspects of patient participation in clinical reasoning (e.g. shared decision making) | 32% | 35% | 23% | 6% | 3% | 2.9 |
| Interprofessional aspects of clinical reasoning | 13% | 45% | 23% | 13% | 6% | 2.5 |
| Collaborative aspects of clinical reasoning | 13% | 42% | 26% | 13% | 6% | 2.4 |
| Errors in the clinical reasoning process and strategies to avoid them | 23% | 32% | 10% | 26% | 10% | 2.3 |
| Strategies to learn clinical reasoning (e.g. heuristics, rule out worst case scenario, | 23% | 23% | 26% | 19% | 10% | 2.3 |
| Self-reflection on clinical reasoning performance and strategies for future improvement | 23% | 26% | 13% | 23% | 16% | 2.2 |
| Theories of clinical reasoning (e.g. knowledge encapsulation, illness scripts, narrative reasoning | 3% | 35% | 29% | 26% | 6% | 2.0 |

n=31

*{4=To a great extent; 3=To some extent; 2=A little; 1=Not at all; IDK=I don't know; Score=Mean score}

7.x.b In your curriculum (i.e. overall programme, not a particular course or clerkship you might be overseeing), which of the following aspects are assessed?

| CR Content Assessed | 4 | 3 | 2 | 1 | IDK* | Score* |
|--|-----|-----|-----|-----|------|--------|
| Generating differential diagnoses including defining and discriminating features | 35% | 48% | 13% | 0% | 3% | 3.1 |
| Developing a treatment/management plan | 42% | 35% | 16% | 3% | 3% | 3.1 |
| Gathering, interpreting, and synthesizing patient information | 29% | 55% | 13% | 0% | 3% | 3.1 |
| Developing a diagnostic plan | 26% | 52% | 13% | 3% | 6% | 2.9 |
| Developing a problem formulation/hypothesis | 19% | 42% | 32% | 6% | 0% | 2.7 |
| Aspects of patient participation in clinical reasoning (e.g. shared decision making) | 19% | 16% | 29% | 29% | 6% | 2.1 |
| Collaborative aspects of clinical reasoning | 0% | 45% | 29% | 16% | 10% | 2.1 |
| Interprofessional aspects of clinical reasoning | 3% | 39% | 29% | 23% | 6% | 2.1 |
| Errors in the clinical reasoning process and strategies to avoid them | 13% | 19% | 32% | 26% | 10% | 2.0 |
| Self-reflection on clinical reasoning performance and strategies for future improvement | 16% | 16% | 29% | 23% | 16% | 1.9 |
| Strategies to learn clinical reasoning (e.g. heuristics, rule out worst case scenario, | 0% | 23% | 42% | 26% | 10% | 1.8 |
| Theories of clinical reasoning (e.g. knowledge encapsulation, illness scripts, narrative reasoning | 6% | 13% | 35% | 35% | 10% | 1.7 |

n=31

*{4=To a great extent; 3=To some extent; 2=A little; 1=Not at all; IDK=I don't know; Score=Mean score}

8.x How is clinical reasoning TAUGHT in your curriculum (i.e. overall programme, not a particular course or clerkship you might be overseeing) in sessions with a main focus on clinical reasoning?

| CR Teaching Format | 4 | 3 | 2 | 1 | IDK* | Score* |
|--------------------------|-----|-----|-----|-----|------|--------|
| Case-based Learning | 35% | 42% | 23% | 0% | 0% | 3.1 |
| Lectures | 19% | 29% | 39% | 10% | 3% | 2.5 |
| Team-based Learning | 13% | 52% | 19% | 6% | 10% | 2.5 |
| Human simulated patients | 19% | 35% | 16% | 23% | 6% | 2.4 |

| | | | | | | |
|---|-----|-----|-----|-----|-----|------------|
| Problem Based Learning (PBL) | 23% | 35% | 6% | 26% | 10% | 2.4 |
| Virtual Patients (interactive online cases) | 3% | 45% | 16% | 23% | 13% | 2.0 |
| High fidelity simulation (mannequins) | 6% | 35% | 23% | 26% | 10% | 2.0 |

n=31

*{4=To a great extent; 3=To some extent; 2=A little; 1=Not at all; IDK=I don't know; Score=Mean score}

11.x How is clinical reasoning ASSESSED in your curriculum?

| CR Assessment Format | 4 | 3 | 2 | 1 | IDK* | Score* |
|---|-----|-----|-----|-----|------|------------|
| Written test (e.g. multiple choice questions, key feature approach, script concordance tests) | 46% | 29% | 11% | 11% | 4% | 3.0 |
| Clinical examinations (e.g. OSCE or other practical examinations) | 29% | 50% | 11% | 4% | 7% | 2.9 |
| Oral examination | 29% | 29% | 11% | 29% | 4% | 2.5 |
| Workplace-based assessments (e.g. MiniCEX, summative approach) | 21% | 29% | 21% | 25% | 4% | 2.4 |

n=28

*{4=To a great extent; 3=To some extent; 2=A little; 1=Not at all; IDK=I don't know; Score=Mean score}

3.5 Summary

A specific needs assessment is based on the findings from the general needs assessment. Its purpose is to show how the findings from the general needs assessment relate to the local conditions at the target institutions. It verifies whether what was learned in a past more general study is still current, is not above/below the level of the particular target group, but also serves as a first step in informing and motivating the target audience at a particular institution before curricular change. In the following, in case of a 7-point Likert question we will count as agreement answers 5-7 (i.e. 7=very important; 6=Important; 5=Somewhat important).

Most (96%) of the respondents in the survey were representing institutions from partner countries with just a handful (4%) of external respondents. This is arguably signalling that we have reached the target group of the specific needs assessment which is different from the one in the general needs analysis [Kononowicz20]. The respondents were mainly representing the medical perspective (87%) with the minority (13%) representing other healthcare professions. The most numerous group of stakeholders were students (49%) but

we also had many responses from the faculty (34%) and clinical reasoning experts (17%) which gives a well-balanced perspective.

The most urgent need for aspects to be covered by the envisioned clinical reasoning DID-ACT curriculum is content on gathering, interpreting and synthesizing patient information (99% agreement it is important), followed by content on generating differential diagnosis (97%) and developing a diagnostic (96%) and a treatment plan (97%). We obtained very similar results in the general needs assessment. Least important were theories on clinical reasoning which were also perceived less important in the general needs analysis. However, it ought to be stressed that 80% agreement to include theories of clinical reasoning in teaching is still a high acceptance score. Notably, interprofessional aspects of clinical reasoning were slightly more relevant in the specific needs analysis than in the general needs analysis which might be because of a specific characteristic of the DID-ACT partner institutions and a higher degree of non-medical respondents.

The most desired format of teaching clinical reasoning was case-based learning (98%) and it is also currently the most frequently used format in the existing curricula. This was followed by team-based learning (93%), human patient simulators (90%), and problem-based learning (90%). Virtual patients and high fidelity mannequins were less rated (84%; 81% respectively) which is still a good score, but could be interpreted for instance as anxiety of making the curriculum overly technology focused or lack of familiarity with creating or using virtual patients. It is also noticeable that these two methods were least frequently applied in the existing curricula (not at all according to 23% and 26% responses, respectively). The least popular answers were lectures (75%).

The expectations regarding assessment include clinical examinations (e.g. OSCE): 95% of respondents regard it as important. Workplace-based assessment (e.g. MiniCEX), virtual patients assessment and oral examinations (85-87%) were slightly less rated. The least popular format are written forms of assessment of clinical reasoning (76%), but paradoxically, these are the most popular formats of testing clinical reasoning in existing curricula. A potential reason could be the high cost of other forms of assessment. Overall, the above presented preferences regarding teaching and assessment format were similar in the general and specific needs assessment.

The most notable barriers perceived by the respondents to introduce the clinical reasoning curriculum were lack of qualified faculty to teach clinical reasoning and lack of curricular time (57% each). We compared these results with the results of the general needs analysis where the most frequently mentioned barriers were lack of awareness of the need for explicit clinical reasoning and lack of guidelines for clinical reasoning curriculum development. This might be an indication that the situation regarding hindrances and consequently strategies to overcome them might vary across countries and it should be treated individually and tailored to local circumstances.

Similar to the general needs analysis, there is no doubt that a train-the-trainer course on clinical reasoning teaching methods is needed (80% in the specific needs analysis and 85% in the general needs analysis) of respondents support the idea in the general and specific needs analysis respectively) but such courses are rarely present in the institutions of the

respondents (12% in the specific needs analysis and 28% in the general needs assessment).

The most frequent needs in content to be covered in the train-the-trainer course were: teaching methods on the ward; strategies to avoid errors and biases in clinical reasoning; teaching methods in face-to-face courses; clinical reasoning strategies and common errors in clinical reasoning (97-100% of the participants agree it is important). The importance of clinical reasoning strategies and teaching methods on the ward were also the top answers in the general needs assessment. More important in the specific needs analysis than in the general needs analysis were topics around cognitive errors.

The most popular suggested format for the train-the-trainer course was blended learning (59% of the answers) that combines the best of e-learning (for theory) and face-to-face meetings (for practice). By far less popular were pure e-learning or one-time face-to-face meetings (4-8% of the responses). Based on the answers it seems to be important to distribute the effort of participation in the train-the-trainer course over time (29% responses preferring a series of face-to-face meetings), which will give a possibility to receive feedback on the development of clinical reasoning teaching abilities.

Finally, the most often mentioned barriers that hinder the implementation of a train-the-trainer course were lack of time of participants (71%), followed by lack of time and availability of trainers for such a course (56-63%). The perception that clinical reasoning cannot be taught and unwillingness to adopt a curriculum developed externally to the institution ("non-invented here syndrome") were the least common barriers (0-12%). The questions on the format and barriers to the train-the-train course cannot be compared with the answers of general needs analysis as they were added to the specific needs analysis only.

4. References

1. [Kononowicz20] Kononowicz AA, Hege I, Edelbring S, Sobocan M, Huwendiek S, Durning SJ. *The need for longitudinal clinical reasoning teaching and assessment: Results of an international survey*. Med Teach. 2020; Feb 4:1-6.
2. [LimeSurvey] Limesurvey GmbH. / LimeSurvey: An Open Source survey tool /LimeSurvey GmbH, Hamburg, Germany. URL <http://www.limesurvey.org>

Web appendix 1. List of questions in the web survey

The web appendix 1 is available on the DID-ACT project website: <http://did-act.eu>

Web appendix 2. Detailed summary of responses given in the web survey

The web appendix 2 is available on the DID-ACT project website: <http://did-act.eu>