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

612454-EPP-1-2019-1-DE-EPPKA2-KA

D2.4 Publication of recommendations for learning objectives of a clinical reasoning curriculum

Deliverable number	D2.4
Delivery date	December 2020
Status	v1.0 draft | final
License	BY-NC-ND
Authors	ORU, UAU
Reviewed by	All partners

1. Introduction

Learning objectives (LOs) catalogs have been developed for health professions education and serve as a kind of blueprint for healthcare-related study programs. Such catalogs are available in many countries to further elaborate on legal requirements for healthcare education and provide guidance for curriculum developers and can serve as a basis for reforming a curriculum or developing a new study program. For example, the curriculum at the medical school in Augsburg, which started in 2019, is oriented to the National competency-based learning objectives catalog in Germany (NKLM).

Additionally, such catalogs can be used for curriculum mapping purposes [Harden 2001] and facilitate communication about, and comparison of curricula within and across different healthcare professions.

In this deliverable we will develop, summarize, and publish recommendations for learning objectives of a clinical reasoning curriculum based on the agreed categories and learning objectives published in D2.1.

This in-depth knowledge of the LO catalogs will support our efforts to integrate the learning activities of the DID-ACT curriculum into the partner curricula. Also, it can motivate initiatives towards implementing clinical reasoning in existing LO catalogs and guide future catalog developments.

2. Quality criteria

We agreed upon the following quality criteria before the implementation of this deliverable.

- As a base for the recommendations we will analyze at least five different learning objectives catalogs from different healthcare professions and partner countries.
- Consensus workshop in which different competences and perspectives in the DID-ACT team are used to provide input to the recommendations.

3. Methods

We implemented this deliverable following a four-step approach:
Based on the experiences within our consortium and a literature and internet search we
(1) Identified the most relevant and applied national catalogs of learning objectives / learning outcomes (LOs) for health professions education in partner countries and contexts. Each partner provided information about their national catalog specifics (Table 1).
(2) From these catalogs we then identified, extracted, and collected LOs related to clinical reasoning, which were translated by partners into English.
(3) In a next step, we mapped the LOs to the categories developed in D2.1 to identify potential gaps and core areas of the different catalogs. We also analyzed the catalog structures in terms of how clinical reasoning is presented within the catalogs.
(4) Finally, we summarized the findings from the analysis and drafted recommendations for how clinical reasoning-related LOs could be presented and incorporated in LO catalogs. The analysis results and recommendations were discussed and agreed upon by all partners.

4. Results

4.1 Overview of national LO catalogs

Undergraduate health professions education

Overall we identified 8 LO catalogs from Sweden, Poland, Germany, Switzerland , and USA. Additionally, we included the results from the EU-funded TUNING Educational Structures in Europe project into our further analysis. Table 1 provides an overview of learning objective catalogs available and applied in the partner countries for the education in different health professions. The clinical reasoning related LOs from these catalogs have been included in our analysis.

Country	Catalog name	Profession(s)	Language(s)	Description
Europe	TUNING Project	Medicine	en	Learning Outcomes/ Competences for Undergraduate Medical Education in Europe
Germany	NKLM	Medicine	de	National competency-based learning objectives catalog for Germany
Germany	Framework for theoretical and practical teaching in nursing	Nursing	de	National framework with learning objectives and outcomes for the nursing education in Germany
Poland	Polish Ministry of Science and Higher Education Educational Outcomes for Health Professions Catalogue	Medicine	pl	Standards of Education for medicine, implemented in 2019 includes formal requirements, the catalog of learning outcomes and general descriptions of the study program. It also includes other health professions.
Sweden	The Higher Education Ordinance (1993:100) Annex 2, Professional qualifications	Health professions	sw, en	Description of required competencies for health professions
Sweden	Entrustable professional activities (EPA)	Medicine	sw	Description of professional activities (EPA)
Switzerland	PROFILES	Medicine	de	A set of competency and outcome based learning objectives for medical students and faculties in Switzerland

USA	USMLE step 2	Medicine	en	Requirements for passing the USMLE national exam
USA	Adult-Gerontology Clinical Nurse Specialist Competencies	Nursing	en	Competencies for Clinical Nurse Specialists in the USA.

Table 1: Overview of LO catalogs in different health professions and countries.

For Slovenia and Malta no national catalogs are available for the education of the different health professions. In Slovenia each faculty (medicine, nursing, physiotherapy) has their own description of study programmes with learning outcomes), for example, the faculty of medicine in Maribor. Similarly, the medical school in Malta defines specific learning outcomes for their curriculum.

The physiotherapy education in Germany is based on the National training and examination order for Physiotherapy, which does not provide LOs, but a list of topics that have to be covered by a curriculum.

Faculty development and postgraduate Master programs

The catalogs listed in Table 1 are mainly focusing on the undergraduate healthcare education and do not include any LOs for the didactical training of healthcare professionals in their role as teachers (train-the-trainer). In many European countries, a certain didactical qualification of healthcare professionals prior to teaching is mandatory [Lammerding-Köppel 2006], but the frameworks available for faculty development in healthcare professions are on a higher level of abstraction. Table 2 includes exemplary faculty development programs and concepts on national and international level.

Country	Program	Profession(s)	Description and structure
Germany	Requirements for a teaching certificate [Kompetenznetz Medizinlehre, Görlitz 2015]	Medicine	This framework does not refer to any specific teaching methods or contents, but is divided into the three levels: Basic and intermediate levels require attending a certain amount of courses about teaching and learning concepts, presentation and communication techniques, assessment, reflection and evaluation, and coaching and mentoring. Advanced: includes certain activities in the areas teaching

			portfolio, teaching project, teaching consultation and hospitation .
Germany (Heidelberg)	Master of Medical Education	Medicine, Nursing, Health Sciences, Therapy sciences	Postgraduate Master program consisting of 9 modules covering topics such as curriculum development, communication in a team, teaching & assessment, or educational research.
The Netherlands	Master of Health Professions Education	Health professions	The curriculum covers 8 competencies (e.f. "Analyze", "Design", Communicate & collaborate") and 3 roles (designer, researcher, leader)
Sweden	Master of Medical Education	All healthcare professions	A Master's program preparing postgraduate students for academic leadership and educational careers.
Switzerland (Berne)	Master of Medical Education	All healthcare professions	Postgraduate Master of advanced studies in medical education program based on 12 modules on content areas such as communication, curriculum development, learning environment, or assessment

Table 2: Overview about faculty development programs and frameworks.

None of the described programs in table 2 address clinical reasoning explicitly. In addition, in the interviews we conducted as part of our needs analysis, all respondents indicated that there is no faculty development program or course specifically dedicated to clinical reasoning teaching (D1.1 Part 2) at their institution. Therefore, no catalogs on the faculty development level could be included in the analysis.

4.2 Analysis of LOs in catalogs

When analyzing how the LOs of the catalogs map to the categories described in D2.1, we found that some categories are represented in almost analyzed all the catalogs, such as "Gathering, interpreting, and synthesizing patient information" or "Developing a treatment/management plan". Other categories are not covered at all or included only by very few catalogs, such as "Theories of clinical reasoning" or "Attitudes towards clinical reasoning". Table 3 shows an overview of LOs from the catalogs mapped to the DID-ACT categories. Additionally, interprofessional aspects are mostly covered in nursing catalogs, not so much in medicine related catalogs, with the exception of PROFILES .

DID-ACT clinical reasoning category	Number of LOs	Number of catalogs including this aspect
Gathering, interpreting, and synthesizing patient information	25	8
Developing a treatment/management plan	22	8
Ethical aspects	10	6
Decision Making	10	6
Collaborative aspects of clinical reasoning	9	3
Generating differential diagnoses including defining and discriminating features	9	7
Errors in the clinical reasoning process and strategies to avoid them	7	5
Aspects of patient participation in clinical reasoning	6	4
Interprofessional aspects of clinical reasoning	5	3
Self-reflection on clinical reasoning performance and strategies for future improvement	4	3
Theories of clinical reasoning	1	1
Attitudes towards clinical reasoning teaching	0	0
Teaching, assessing, and evaluating clinical reasoning	0	0

Table 3: Mapping of the clinical reasoning related LOs from the catalogs to the DID-ACT categories.

The category "Gathering, interpreting, and synthesizing patient information" has been covered most extensively. Examples include:
- "Synthesize essential data from previous records, integrate the information derived from history, meaningful physical and mental symptoms and physical exam; provide initial diagnostic evaluations; take into account the age, gender and psychosocial context of the patient as well as social determinants of health" (PROFILES)
- "Graduates in medicine will have the ability to order appropriate investigations and interpret the results" (TUNING)
- The trainees collect care-related data from people of all ages with health problems and related resources and resistance factors (Framework for theoretical and practical teaching in nursing)

Examples from the category "Developing a treatment/management plan" include LOs, such as:

- The student is able to demonstrate knowledge of the planning, management and coordination of health care measures. (The Higher Education Ordinance)
- In a patient, identify conditions that require urgent treatment and establish and initiate an initial treatment plan in consultation with the patient and / or relatives. (EPA Sweden)
- Chooses a treatment that minimizes the social consequences for the patient. (Polish Ministry of Science and Higher Education Educational Outcomes for Health Professions Catalogue)

The topics most prominent on the LO catalogs - "Gathering, interpreting, and synthesizing patient information", "Developing a treatment/management plan", and "Generating differential diagnoses" are also the most prominent aspects emerging from our needs analysis (D1.1). Topics less prominent in the LO catalogs (e.g. "Theories of clinical reasoning") were also less requested in the needs analysis.

4.3 Analysis of the catalog structure

To identify how clinical reasoning is covered, we analyzed the structure of the catalogs, especially in which chapters the clinical reasoning related LOs are provided. The structures of the catalogs are quite heterogeneous (Table 4), which makes a comparison of the catalogs very difficult.

Catalog	Chapter structure of catalog	Representation of clinical reasoning related LOs
PROFILES	LOs are structured into the following 3 chapters: (1) CanMEDS roles, (2) EPAs, and (3) Situations as Starting Points (SPSs).	Clinical reasoning related LOs are formulated as EPAs under the clinical reasoning-related sub-chapter "Prioritize a differential diagnosis following a clinical encounter".
Polish Ministry of Science and Higher Education Educational Outcomes for Health Professions Catalogue	25 main LOs are divided into 3 categories (knowledge, skills, social competencies). These main LOs are followed by a list of 315 specific LOs, which are grouped in the following 7 chapters corresponding to medical domains and assigned to either knowledge or skills: (1) Morphological sciences, (2) Scientific basis of medicine, (3) Preclinical sciences, (4) Social and behavioral sciences with elements of professionalism, (5) Clinical nonsurgical sciences, (6)	The clinical reasoning related LOs are covered in four chapters, with a focus in "Social and behavioral sciences with elements of professionalism" and are mostly categorized as skills.

	Clinical surgical sciences, and (7) Legal and formal aspects of medicine.	
NKLM	The catalog's structure is based on the CanMEDS roles and the following 8 additional chapters: (1) Normal structures and functions, (2) Pathogenesis and pathomechanisms, (3) Medical scientific skills, (4) Communication skills, (5) Clinical skills, (6) Diagnostics, (7) Therapeutic procedures, and (8) Emergency measures.	Clinical reasoning related LOs are included in the chapters of the Canmeds roles.
Framework for theoretical and practical teaching in nursing	The framework is based on 11 chapters based on different nursing areas and levels. Examples are (1) Promoting Health and Prevention, (2) Supporting people in curative processes and strengthening patient safety, or (3) Act safely in emergency situations.	Clinical reasoning related LOs are distributed over 8 of the 11 chapters with a focus on the chapter "Supporting people in movement and self-care"
The Higher Education Ordinance	The main chapters correspond to the different Bachelor and Master programs of healthcare and other professions.	Clinical reasoning related LOs are included directly under the different healthcare professions.
Entrustable professional activities (EPA)	These 10 EPAs are formulated for undergraduate medical education, each EPA is divided into sub-aspects	Clinical reasoning related LOs are included in three EPAs
TUNING	Specific LOs (level 2) are assigned to more general level 1 LOs (= chapters). The chapters are based on 12 clinical core activities, such as (1) Graduates in medicine will have the ability to carry out a consultation with a patient or (2) Graduates in medicine will have the ability to apply ethical and legal principles in medical practice.	Clinical reasoning related LOs are distributed over 5 chapters, with a focus on the chapter "Graduates in medicine will have the ability to assess clinical presentations, order investigations, make differential diagnoses, and negotiate a management plan"
USMLE Step 2	7 chapters are based on physician tasks / competencies activities including for example (1) Patient Care: Diagnosis, (2) Communication, or (3) Professionalism, Including Legal and Ethical Issues.	Clinical reasoning related LOs are mainly included in the tasks related to "Diagnosis" and "Management", but are also included into other chapters.
Adult-Geron tology Clinical	7 chapters are based on general competencies, such as (1) Direct Care Competency, (2) Consultation	Clinical reasoning related LOs are distributed over 4 different competencies with a focus on

Nurse Specialist Competencies	Competency, or (3) System Leadership Competency.	"Direct Care Competency".

Table 4: Summary of the chapter structure of the LO catalogs and the representation of clinical reasoning within these chapters.

5. Recommendations

In general, many scientific articles and recommendations on learning objectives and curriculum mapping [Harden 2001] have been published. Taxonomies, e.g. by Bloom [Anderson 2001], the constructive alignment theory [Biggs 2011], and guidelines on how to write LOs, for example the SMART approach, support educators in formulating learning outcomes and align them with the curriculum.

In addition to such general guidelines we have developed three recommendations that specifically address the representation of clinical reasoning in LO catalogs and an overall curricular level (5.1-5.3). These are based on our analysis of the listed LO catalogs and have been discussed and agreed upon within our consortium. We also highlight how these recommendations are related to the identified barriers for introducing a clinical reasoning curriculum we provided in D1.1

The recommendations are described in the following subchapters:

5.1 Make clinical reasoning explicit

Based on our experience and research we acknowledge that clinical reasoning is a complex ability, which is challenging to capture in precise learning outcomes for students. However, this should not hinder efforts to spell out and aim for explicit teaching of clinical reasoning.

Therefore, our first recommendation is that clinical reasoning should be made more explicit in LO catalogs. There are several possibilities to implement this:

- Subsuming clinical reasoning related LOs, for example under an explicit clinical reasoning chapter.
- Flagging or marking clinical reasoning-related LOs as related to clinical reasoning.
- Including LOs related to selected basic theories of clinical reasoning, which also would make its teaching more explicit.

Making clinical reasoning more explicit in LO catalogs can support exchange and communication about this core ability among educators and also implicitly addresses the following barriers identified in D2.1:

- Lack of awareness of clinical reasoning
- Lack of awareness that clinical reasoning can be taught
- Lack of standards of teaching clinical reasoning

In the long term, making clinical reasoning more explicit in LO catalogs can be a first step to provide more and dedicated curricular time for teaching clinical reasoning.

5.2 Emphasize interprofessional and collaborative aspects of clinical reasoning

Our analysis shows that collaborative and interprofessional aspects of clinical reasoning are only included in LO catalogs for nursing education. A high degree of specialization in healthcare and an increasing multi-morbidity due to a demographic development towards elderly populations, requires collaboration across health professions. Therefore, collaborative and interprofessional aspects of clinical reasoning should be included in all health profession curricula and we recommend that the interprofessionality of clinical reasoning should be made more explicit in all LO catalogs. Doing so can help to address culture-related barriers to introducing a clinical reasoning curriculum (see D1.1), especially communication issues between healthcare professions and profession-specific perspectives on clinical reasoning.

5.3 Include aspects of teaching clinical reasoning

Teaching aspects of clinical reasoning are neither explicitly included in the faculty development frameworks (table 2), nor in the LO catalogs (table 3), despite the importance and relevance of this aspect. Some of the LO catalogs, such as the NKLM or PROFILEs, are based on the CanMEDS framework, including LOs for the role of a "scholar". For these catalogs we recommend adding LOs covering the teaching of clinical reasoning, such as "The learner will be able to choose appropriate teaching, assessment and evaluation methods for clinical reasoning and adapt these to the cultural context" we defined as part of the DID-ACT curriculum.

This supports our first recommendation of making clinical reasoning more explicit with an emphasis on the teacher level. In addition, this can address the lack of awareness and perception that clinical reasoning can be taught - a barrier we identified in the needs analysis in WP1.

5.4 Other aspects

During the implementation of this deliverable, we discovered that talking about curricula and exchanging experiences between partners and contexts is significantly hindered by the different languages of the catalogs. Typically, the national LO catalogs are available in the national language only.

With the increasing reliability and availability of translation applications, such as DeepL, we hope that in the future these tools can support such undertakings. At the current stage it seems unrealistic for LO catalog providers to develop and update bilingual catalog versions.

Another difficulty we encountered during our analysis were the heterogeneous structure and levels of granularity of the LO catalogs, a well-known challenge in curriculum mapping and development also encountered by other projects like BCIME. The number of clinical reasoning related LOs in the catalogs ranges from 4 to 22 on different levels of granularity, which makes a comparison and in-depth analysis difficult.

6. Conclusions

We analyzed several LO catalogs from different health professions and countries regarding the representation of clinical reasoning. Based on this analysis we developed three main recommendations (5.1 - 5.3) to emphasize clinical reasoning in future curricula. The recommendations address some of the barriers we have identified in D1.1. Especially, making clinical reasoning more explicit may raise awareness that clinical reasoning is relevant and that it can be taught. Additionally, these recommendations may inform catalog initiatives and committees in further developing their respective catalog, but they can also support educators and curriculum developers in emphasizing clinical reasoning teaching in their curriculum through learning objectives and curriculum mapping processes. We will also consider them for the development of the DID-ACT curriculum.

7. References

- Anderson LW, Krathwohl DR, et al. A Taxonomy for Learning, Teaching,
- and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives. Allyn & Bacon. 2001. Boston, MA (Pearson Education Group)
- Biggs JB, Tang CKC. Teaching for quality learning at university: what the student does. Maidenhead: McGraw-Hill. 2011.
- Harden RM. AMEE Guide No. 21: Curriculum mapping: a tool for transparent and authentic teaching and learning. Med Teach. 2001;23(2):123–37.
- Lammerding-Köppel M, fabry G, Hofer M, Ochsendorf F, Schirlo C. Faculty Development Initiatives in Medical Education in German-Speaking Countries: I. State of Affairs. GMS Z Med Ausbild 2006;23(4):Doc73
- Görlitz A, Ebert T, Bauer D, Grasl M, Hofer M, Lammerding-Köppel M, Fabry G. Core Competencies for Medical Teachers (KLM) – A Position Paper of the GMA Committee on Personal and Organizational Development in Teaching. GMS Z Med Ausbild 2015;32(2):Doc23