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Development and validation of clinical vignettes to inform an educational intervention for physiotherapists to detect serious pathologies: a mixed-methods study

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ABSTRACT

Objectives To develop and validate educational clinical vignettes (CVs) based on real-life patients with serious pathology from the disciplines of oncology, internal medicine and orthopaedics that are relevant for physiotherapists (PTs) working in a non-direct access system.

Design A mixed-methods study using an iterative design was employed to develop and validate CVs that focused on serious pathology.

Setting Academic and clinical settings within health faculties at three universities in Austria and the UK.

Participants Medical doctors (MD) (n=3) and PTs (n=4) developed CVs in the disciplines of internal medicine, oncology and orthopaedics. Validation of the CVs was undertaken in three stages: internal validation by the research team (n=7), external validation by MDs (n=3) and external validation by PTs (n=18).

Results 25 CVs focusing on internal medicine (9), oncology (8) and orthopaedics (8) were developed. Results of the consensus method of Haute Autorité de Santé ranged between 7 and 9 in the internal validation stage. In the external validation stage with MDs, one orthopaedic CV was excluded, resulting in a final total of 24 validated CVs.

Conclusions This is the first time educational CVs have been developed and validated across such a broad range of pathologies for countries without direct access to physiotherapy, for use in the education of PTs. Furthermore, the approach described in the Methods section of this paper may serve as a template in similar future projects.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ The clinical vignettes (CVs) cover a broad spectrum of serious pathologies from the disciplines of internal medicine, oncology and orthopaedics.
⇒ A close collaboration between medical doctors (MDs) and physiotherapists (PTs) resulted in these CVs.
⇒ The CVs went through several rounds of internal and external validations.
⇒ Whilst CVs cannot replace a real patient encounter, they nonetheless represent an important educational tool in the development of PTs' clinical decision-making skills in identifying the presence of serious pathology.

INTRODUCTION

The number of people aged over 65 years will increase in the coming decades.[1] Apart from the resulting higher costs for healthcare systems, an ageing society is also likely to experience an increase in the number of people developing serious pathologies such as cancer, osteoporotic fractures, cardiovascular disease or visceral disease.[2–5]

Even though the survival rate of cancer is constantly increasing due to the improving therapeutic options,[6] a medical history of cancer is the main risk factor for developing metastatic disease in the future.[7] The improved chances of survival after a primary cancer will inevitably lead to more people developing metastases.[8] The significance for clinicians working within the musculoskeletal (MSK) field is that bone is the third most common site for metastasis, with the axial skeleton being primarily affected.[9] Cardiovascular and visceral pathologies are also capable of referring pain to the MSK system,[10] potentially masquerading as an MSK-related disorder.[11 12] This is well documented in an Australian study conducted in an emergency department. Almost 15 per cent of the 1000 patients had a non-spinal (visceral) cause of acute back pain.[12] Clinicians need to be aware that while the prevalence of serious pathology affecting the MSK system may currently be low,[13] these numbers are likely to rise.[14]

Physiotherapists (PTs) can play a critical role in the early detection of serious pathologies affecting the MSK system.[15–21] However, research suggests that PTs and PT students need more support to develop the skills needed to identify the presence of serious pathologies.[22–29] These results are not surprising, as, for instance, Austrian undergraduate PT students[28] and qualified PTs in Austria[30] and Denmark[31] have already expressed concern about their lack of expertise and/or training on how to recognise the presence of serious pathologies.

Others have already demonstrated that additional teaching efforts can increase the ability of PTs and PT students to recognise the presence of a serious pathology and to determine if a patient is suitable for physiotherapy or needs a referral for (further) medical examination.[32–34] The challenge here is not to purely teach a list of facts (such as clusters of risk factors and signs and symptoms of serious pathologies), but to engage the learner in applying theoretical knowledge into practice as effectively as possible.[32]

While it is acknowledged that a wide variety of teaching methods exists, three main teaching methods are commonly discussed within healthcare education literature: lecture-based format,[35–37] case-based learning (CBL)[38–40] and problem-based learning (PBL).[38 41] While there is still inconclusive evidence with regard to pure knowledge acquisition and retention,[42] CBL and PBL both foster deeper learning and understanding and significantly improve critical thinking, problem solving and decision-making competencies within allied healthcare and medical education.[35 39 42–44] Another advantage of the CBL method over the lecture-based format is that it attempts to bridge the gap between theory and practice[32] and may, therefore, increase the effectiveness of knowledge transfer in medical education.[45] To this end, CBL uses authentic clinical vignettes (CVs), which learners apply their knowledge to under the supervision of a lecturer.[42] CVs are concise paper-based or electronic descriptions of actual clinical situations.[46] For CBL to be applied properly, it is paramount to have CVs that are relevant, meaningful and as realistic as possible.[47]

There were two issues with previously used CVs in the literature. First, existing CVs were created for a healthcare system with direct access to physiotherapy.[22–26 31] Hence, these CVs might not be ideal for PTs without direct access systems. Second, the CVs were developed to assess the ability of PTs to recognise the presence of a serious pathology.[22–29] This resulted in CVs that were brief, and the information given was kept to a minimum (due to time constraints). This limitation was highlighted by Beyerlein[48] and Budtz et al,[31] who argued that PTs usually collect more detailed patient data, background information and findings from the physical examination to make clinical decisions. Therefore, the previously developed CVs were not suitable for teaching purposes, highlighting the need for CVs with realistic, detailed information to enhance learning and knowledge transfer.

Consequently, our aim was to develop and validate educational CVs based on real-life patients with serious pathology from the disciplines of oncology, internal medicine and orthopaedics that are relevant for PTs working in a non-direct access system. These CVs are intended to form the basis for future teaching purposes for PTs with the aim of improving their ability to detect the presence of a serious pathology.

METHODS
Study design
This mixed-methods study used an iterative design to develop and validate CVs that focused on serious pathology. The study consisted of two phases and was based on the consensus method used in Finucane et al.[49] In phase 1, CVs were developed. For this purpose, the internal development group selected the most pertinent serious pathologies in a collaborative process, which was used to develop the CVs.

In Phase 2, the new CVs went through a three-stage validation process: (1) internal validation with the internal development group, (2) external validation with medical doctors (MDs) and (3) external validation with PTs. MDs and PTs were included in the external validation process, as they are the main stakeholders in the detection of serious pathology. Quantitative feedback was used to validate the appropriateness of the CVs, and qualitative feedback was used to incorporate suggested changes.

Patient and public involvement
There was no direct patient or public involvement at any stage of this study. However, other stakeholders in the healthcare system (PTs and MDs) were involved in the study.

Phase 1: initial development of the CVs
First, a list of serious pathologies relevant to the physiotherapy profession in the disciplines of internal medicine, oncology and orthopaedics[15 49–59] was developed from the literature and the clinical experiences of MDs and PTs (see online supplemental file 1).

Then, a development group for each discipline (internal medicine, oncology and orthopaedics) was created within the research team. Each development group consisted of one MD, one PT and one research assistant. All MDs were aged between 45 and 55 years and had specialised in their discipline for between 11 and 16 years. The PTs were aged between 40 and 45 years and had between 17 and 23 years of experience. The research assistants were aged between 20 and 25 years.

In these development groups, pathologies that PTs would realistically encounter in a non-direct access system needed to be chosen from the list. Then, one member (MD or PT) with patient experience took the lead in writing a CV from their everyday professional life and/or published case reports.[16 60–62] This was then discussed in the development group and adapted. A maximum of

Figure 1 Overview of the different levels of concern, adapted from Finucane *et al.*[49]

9 CVs were developed this way, with each development group needing up to three meetings to adapt a CV.

Aspects of the physiotherapy patient assessment process[63] were used as a structure to build the CVs: (a) medical referral, (b) patient history and (c) physiotherapeutic physical examination. These three were identified by the internal development group as the most important aspects for developing a realistic CV for serious pathology identification. The structure also resonated well with qualitative feedback from the national questionnaire,[64] which revealed that Austrian PTs requested additional information about (a) the medical referral: who made the referral and what was the diagnosis; (b) the patient history: risk factors and medical history and (c) the physical examination: specific tests PTs and the MDs performed and their outcomes.[30]

Regarding the therapy intervention referred to in each CV, this was recorded as 'evidence-based physiotherapy' to keep the focus on the main aspects of screening for serious pathologies.

Throughout the CVs, reflective questions were asked to gauge the PTs' level of concern. Following the recommendation of Finucane *et al*,[49] the level of concern for each CV was assessed through the decision traffic light (see figure 1):

► Green=no concerning symptoms and signs→refer for physiotherapy.
► Yellow=few concerning symptoms and signs→refer to physiotherapy and watchful waiting.
► Orange=some concerning symptoms and signs→referral to (referring) MD, no physiotherapy treatment.
► Red=some concerning symptoms and signs→immediate emergency referral, no physiotherapy treatment.

In each of the three disciplines (internal medicine, oncology and orthopaedics), a combination of different traffic light colours needed to be presented. To ensure that not every CV resulted in the same level of concern or with the same number of sessions, a variety of different traffic light combinations were given for each discipline. When the internal development group indicated their CVs followed the set structure and were ready, they were put forward to the validation phase.

Phase 2: validation of the CVs
The three validation stages are listed below: (1) internal validation with the internal development group, (2) external validation with MDs and (3) external validation with PTs.

Stage 1: internal validation
Internal validation of the CVs was performed by members (n=5) of the other internal development groups and a researcher with international experience in red flag screening (JS/GY). The validation process was conducted in parallel to the development of the CVs. When 6–9 CVs had been developed, members of each group received CVs from the other disciplines. Depending on the number of CVs, 7–14 days were given to provide feedback.

Feedback was of a quantitative and qualitative nature. For the quantitative feedback, the HAS (Haute Autorité de Santé) rating was used.[65] The HAS rating is suitable for at least 9–15 participants. Each participant rated each CV from 1 (totally inappropriate) to 9 (totally appropriate). The qualitative feedback was collected by asking, 'Comment on the content, structure, understanding and completeness of information'. Then, one researcher (SG) collected the quantitative and qualitative feedback and sent it in an anonymised form back to the development group.

When a CV received a HAS median score of ≥7 and all scores were ≥5, it was deemed appropriate, did not need to be adjusted based on the qualitative feedback and was ready for Stage 2. When a CV received a HAS median score of ≤3.5 and all scores were ≤5, the CV was deemed inappropriate and was not taken forward to the next round. When a CV received a HAS median score between 4 and 6.5, the CV was deemed uncertain. Qualitative feedback was required to be discussed in the development group and incorporated into the CV. The validation cycle was started from scratch until it was scored as appropriate or inappropriate.

Stage 2: external validation round with medical professionals
This external validation round was conducted by MDs from the local hospital. The participating MDs received a 60 min training session that provided an overview of the project and the focus group procedure. After providing verbal consent, the focus group was initiated.

Focus groups consisted of two external MDs and an internal researcher (MEL) as moderator. The two external MDs were aged between 40 and 55 years and

had 3–17 years' experience specialising in the field of physical medicine and rehabilitation. The moderator was a master's student studying human medicine. She received training in conducting focus groups prior to conducting them. A total of 6 focus groups were conducted, each lasting for 60 min. In each focus group, four CVs of the same discipline were validated. The CVs were discussed qualitatively, based on the following questions:

► What was missing/should be changed? (Comment on the content, structure, understanding, professional aspects and completeness of information).
► In your opinion, is there enough information to make a referral to physiotherapy? (Would you refer this patient to physiotherapy?) If not, why?
► Is the medical history in the CV comprehensible/understandable? If not, why?
► In your opinion, is there enough information for the PT to make a decision about further treatment or to refer the patient back?
► Would you agree with the traffic light colour and the reasoning behind it? If not, why?

Then the feedback was summarised and anonymised by one researcher (MEL) and sent to each development group. If major adjustments were required, the CV did not advance to the next stage.

Stage 3: external validation round with PTs

This external validation round was conducted by PTs from the local hospital. PTs could participate if they were registered as PTs in Austria and were working at the local hospital. First, a presentation, including information about red flag screening and an introduction to the current project, was held at the hospital. Then, an online survey was sent out along with an information sheet, consent form and the remaining CVs (n=24). After consent was provided, the PTs had 2 months to complete the survey, and a reminder was sent after 4 weeks. The participants were allocated four working hours from the hospital to complete the survey.

The rating of the CV was conducted similarly to the internal validation stage. The quantitative rating was based on the HAS,[65] and a qualitative feedback section was added. According to the HAS, the recommended number of participants (9–15) can be adjusted if the group comprises more than 15 participants. Qualitative feedback was anonymised and returned to the development team. For more detailed information, see 'Stage 1: internal validation'. Afterwards, the qualitative data of Stages 2 and 3 were analysed using an inductive thematic analysis method.[66] One researcher (SG) analysed the feedback inductively and formed themes. These themes were then reviewed by a second researcher (JJ). Both researchers largely agreed in their analysis. Any disagreements were semantic and were resolved through discussion.

RESULTS
Phase 1: development of CVs

25 CVs were developed. Nine in internal medicine and eight in both orthopaedics and oncology. These CVs are listed in the online supplemental file 2. The main characteristics of the CVs are shown in table 1.

Phase 2: validation of the CVs
Stage 1: internal validation

Four validation stages were held from October 2022 to January 2023, and in each of them, a maximum of 10 CVs were evaluated. 15 CVs passed the first round (table 2). The other 10 CVs (internal medicine CVs 2, 3 and 5; oncology CVs 1, 2, 4 and 5 and orthopaedics CVs 1, 2 and 5) had to be changed based on the qualitative feedback and went through the internal validation stage again before being deemed appropriate.

Stage 2: external validation round with medical professionals

External validation in this stage was qualitative in nature. In total, six focus groups, two for each discipline, were held from February to March 2023. From analysis of the focus group data, two themes were identified: 'spelling, grammar and phrasing' and 'clinical picture'. A full list of the quotes of the MDs related to the themes is listed in the online supplemental file 3.

The 'spelling, grammar and phrasing' category provided feedback to clarify narrow descriptions or make the text easier to understand, for example, 'diagnosis and referral reason not clearly formulated' (internal medicine CV9, MD) or 'BMI away (remove BMI) and just write obesity' (orthopaedics CV8, MD).

In the 'clinical picture', the feedback focused on providing a clearer picture and more detailed information. The focus group mentioned that 'restriction in hip, knee and shoulder should be described in more detail; for example, extension deficit in hip and knee and shoulder global restriction' (internal medicine CV1, MD) or 'neurodynamic testing? What exactly is tested?' (oncology CV3, MD).

Following the analysis, the development groups incorporated the findings into the CV. Minor changes were made in all internal medicine and oncology CVs. In the orthopaedic section, CV2 was excluded for having misleading information. The following feedback was given regarding information for differential diagnosis: 'this CV should rather go in the direction of polyneuropathy' or clearer hints for cervical myelopathy were missing: 'active cervical spine movement: not restricted?—This can't be' (orthopaedic CV2, MD). Correcting this information would have led to the creation of a new CV with a different underlying pathology. As such, CV2 was excluded.

Stage 3: external validation round with PTs

The external validation with PTs took place from March to May 2023, with 18 PTs completing the survey. 16 PTs were identified as female, and 2 as men. The age of the PTs varied between 20 and 60 years. 9 PTs had 1–10 years

Table 1 Overview of the main characteristics of CVs

Discipline	No.	Referral diagnosis	Traffic light order			Age (years)	Gender	Occupation
Internal medicine	1	Parkinson's disease	Green			72	F	Pensioner
	2	ACL reconstruction	Green			22	M	Nursery worker
	3	Asthma	Green	Yellow	Green	25	Enby	Student
	4	Posterior cardiac infarction	Green	Yellow	Orange	74	F	Pensioner
	5	Back pain	Yellow	Yellow	Red	29	M	Car salesman
	6	COPD	Yellow	Orange		58	M	Nurse
	7	Cerebellar stroke	Yellow	Red		63	F	Attorney
	8	Chronic heart failure	Red			76	M	Pensioner
	9	Pubic rami fracture	Yellow	Red		73	F	Pensioner
Oncology	1	Chronic low back pain	Green			42	F	Software engineer
	2	Spinal stenosis	Orange	Yellow	Orange	76	M	Pensioner
	3†	Chronic low back pain	Orange	Green		53	F	Accountant
	4	Gluteal pain	Orange			40	F	Retail saleswoman
	5	Low back pain	Orange			63	F	Radio editor
	6	Back pain	Yellow	Orange		74	M	Pensioner
	7	Shoulder pain	Green	Yellow	Green	75	M	Pensioner
	8	Chronic low back pain	Yellow	Orange		38	F	Accountant
Orthopaedics	1†	Low back pain	Yellow	Yellow	Red	32	F	Soldier
	2	Cervicalgia	Orange			79	M	Pensioner
	3	Weber C fracture	Red			43	F	Retail saleswoman
	4†	Acute cervical pain	Yellow	Red	Green	40	M	Factory worker
	5†	Recurrent sciatica	Orange			74	F	Pensioner
	6	Chronic low back pain	Green			63	F	Mechanic
	7	Back pain	Green	Orange		45	M	Mechanic
	8	Hip replacement	Green	Yellow	Orange	73	F	Pensioner

*Excluded in validation Stage 2.
†Based on published case report.
ACL, anterior cruciate ligament; COPD, chronic obstructive pulmonary disease; CVs, clinical vignettes; enby, non-binary; f, female; m, male.

of experience, and the other 9 had over 20 years of experience. The main area of work was for 9 PTs in orthopaedics and trauma, 8 were in internal medicine and 1 did not complete the question.

13 CVs (internal medicine CVs 1, 4, 6 and 8; oncology CVs 1, 2, 3, 4, 5 and 7 and orthopaedics CVs 3, 6 and 7) were appropriate according to the HAS guideline (table 3). The remaining 11 CVs were considered as 'uncertain', and minor adaptations were made by the development group based on the qualitative feedback.

From analysis of the data from the 'uncertain' CVs, three themes were identified: 'missing information', 'different estimation for the level of concern' and 'missing knowledge of red flags'. Feedback from the first two themes was considered for the amendment of the CVs. A full list of the quotes of the PTs related to the themes is listed in the online supplemental file 4.

In the first theme, 'missing information', additional information needed to be included in the CV. Examples of this included: 'the circulatory collapse could well be related to the previous infection. This was not addressed, although in practice, these problems occur again and again after previous infections!' (internal medicine CV2, PT9) or 'in this example, I would need more information regarding the cause of the 2nd pubic bone fracture.' (internal medicine CV9, PT11).

In the 'different estimation for the level of concern' theme, the participants provided feedback on the traffic light decision. One participant mentioned, 'I would have set the CV to orange earlier, not only after 6 weeks' (oncology CV8, PT6), while another said, 'I would have recommended internal clarification for the patient as early as the 2nd therapy session!' (internal medicine CV5, PT6).

Table 2 Overview of the HAS scores in the internal validation phase

Clinical vignette number	Internal medicine	Oncology	Orthopaedics
1	9	9	9
2	8	7	7
3	7	8	9
4	8	8	8
5	9	8	8
6	8	8	9
7	8	8	8
8	8	8	9
9	8	Nd	Nd

Green shading, appropriate; Grey shading, uncertain; Nd, not developed.

In the last category, 'missing knowledge in red flag screening' participants listed feedback which contradicted that given in the literature. For example, one participant said, 'In my opinion, the positive findings of the cranial nerve test remained without consequence—even if the MRI was without finding—doesn't it need further clarification?' (orthopaedics CV4, PT2). Another mentioned, 'I don't really find the risk factor osteoporosis conclusive; the last bone density scan was normal. Older age and gender are not significant risk factors for me.' (orthopaedics CV5, PT9). Following the 3-stage process, 24 CVs had been successfully developed and validated.

DISCUSSION

The aim of this study was to create educational CVs focused on serious pathology from the disciplines of oncology, internal medicine and orthopaedics, which are

Table 3 Overview of the HAS scores in the external validation phase with PTs

Clinical vignette number	Internal medicine	Oncology	Orthopaedics
1	9	9	6
2	8	8	Ex
3	8	8	9
4	9	9	7.5
5	7	8	8
6	8	6	9
7	8	9	9
8	9	9	7
9	6	Nd	Nd

Ex, excluded; green shading, appropriate; grey shading, uncertain; Nd, not developed; PTs, physiotherapist.

relevant for PTs working in a non-direct access system. After the third validation stage, 24 CVs were approved. This is the first time educational CVs have been developed in such a broad range of pathologies for countries without direct access to physiotherapy.

A fundamental change to the CVs previously used and published in the literature[22–26] is the different answer options. For the 24 CVs produced in the current study, the authors refrained from keeping the three traditional answer options (keep, keep and refer and refer).[22–26] Instead, the response options were based on the PTs' level of concern as described by Finucane et al.[49] The decision to alter the answer options was based on Beyerlein,[48] who highlighted a potential problem with the answer option 'keep and refer'. They argued that, for instance, in the case of a suspected fracture,[23 31] PTs have no other immediate role than to send the patient for medical assessment and imaging.[48] However, as a suspected fracture was rated as a medical non-critical situation in previous studies,[23 31] the answer option 'keep and refer' was considered correct. The critique on the three traditional answer options (keep, keep/refer and refer) was also reflected by participants in the qualitative feedback in a survey among qualified PTs in Austria.[30]

According to numerous participants in Lackenbauer et al,[30] the clinical information provided within CVs in previously published research[22–26] was very limited. The reason previous CVs could not provide additional clinical information was due to time constraints within a survey.[23 31 48] As the newly developed 24 CVs did not focus on knowledge testing but on learning and knowledge transfer, significantly more information (eg, patient's background information, history, risk factors, symptoms and clinical signs of serious pathology) was included. Moreover, the clinical scenario for some of the new CVs described signs and symptoms developing over several therapy sessions. This was done to reflect clinical reality, as some serious pathologies in the early stages of the disease process may often be difficult or impossible to distinguish from a harmless pathology.[67] As the disease progresses, the signs and symptoms might become clearer. PTs work very closely with their patients, sometimes for long periods of time. PTs are, therefore, well placed to monitor the clinical situation of their patients (termed watchful waiting)[68] and to repeatedly check for the occurrence or presence of specific signs and symptoms (red flags) that could indicate the presence of a serious pathology.[64]

During the external validation round with PTs, some CVs scored lower because the participating PTs rated the clinical situation differently due to gaps in their knowledge about risk factors and signs and symptoms of serious pathology. For instance, one participant concluded that older age and gender were not relevant risk factors for osteoporotic spinal fractures, which contradicts the available evidence.[49] Consequently, the participant would have classified their level of concern as lower. The consequence of this and other similar examples, however, was not to change the CVs but to draw more attention to these

evidence-based facts in future educational programmes about recognising risk factors and signs and symptoms of serious pathologies. This decision was in line with Vaughn *et al.*[27] For two of the 12 CVs used in their study, the validation participants also did not reach 100% consensus on the optimal clinical decision (whether a patient is suitable for physiotherapy or needs a medical referral). However, this did not result in any changes to the CVs or the clinical decisions associated with them. However, the authors acknowledged that clinical decisions often leave room for a certain degree of interpretation.[27]

Differences existed regarding the validation of the CVs between the MDs and the PTs. Several factors could have played a part in creating these differences. First, MDs and PTs had different clinical background knowledge, which influenced their clinical decision-making.[69] Especially in a country such as Austria, where there is no direct access to physiotherapy, MDs are better trained in recognising serious pathologies than PTs. Second, the method of validation was different between the two professions. Where MDs discussed the CVs in a focus group, the PTs provided their feedback in written form. This could have led to a different level of feedback. Third, different professions view information from their own clinical perspective.[70] Where an MD could assess the signs and symptoms of the serious pathology more clearly, a PT would also assess if the CV would make sense for a PT setting. Both perspectives were important for the development of the CVs. PTs were included in the last validation round, as the CVs needed to be tailored to this profession.

Strengths and limitations

This is the first time that CVs have been developed, not only for spinal pathologies, but also for a broader range of pathologies, including internal medicine, oncology and orthopaedics. This reflects our ageing society, which will experience an increase in the number of people developing serious pathology such as cancer, cardiovascular or visceral disease.[2–5] The multistage validation process ensured that a close interprofessional collaboration between MDs and PTs took place. The developed CVs are specifically designed for educational purposes and can be used in a non-direct access physiotherapy setting.

Limitations of the study include the limited specialised PTs and MDs included in the study. In Austria, it is currently not possible for PTs to specialise as extended scope practitioners. One way to capture the PTs' clinical knowledge was to measure their years of clinical experience. The large variation in clinical experience in this study should be considered. Further studies should validate these CVs with more specialised PTs.

Due to the lack of clear national or international guidance on which serious pathologies are most pertinent for PTs to recognise, the selection of relevant pathologies was an important consideration. The first step was to review relevant literature,[15 49–59] which was then supplemented by the clinical experiences of MDs and PTs. However, further research is needed to establish which serious pathologies are most relevant to physiotherapy practice and should, therefore, be included in preregistration physiotherapy programmes.

CONCLUSIONS

This study has developed and validated 24 CVs, which can be used as an educational resource for the development of clinical decision-making skills to identify serious pathology, especially for PTs who are not working in a direct access system. While these newly developed CVs can never replace a real patient encounter, they nonetheless represent an important tool in the development of PTs' clinical decision-making skills in identifying the presence of serious pathology.

It is acknowledged that the set of serious pathologies in the current study does not claim to be exhaustive. Future efforts should be made to create further CVs for other serious pathologies. The approach used in this study may serve as a template for future projects to develop clinically robust CVs concerning serious pathology.

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