

"Back in the saddle": early training in critical care

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IMPACT PARAGRAPH

Research needs to be implemented into clinical practice in order to be meaningful. The research of this PhD thesis arose because of clinical questions that could not be answered with the current evidence. I was lucky enough to get the necessary support and funding for these physiotherapy-initiated research questions. The resulting pragmatic research designs enhance the clinical implementation of the findings of this thesis like the use of the translated and validated Chelsea Critical Care Physical Assessment tool (CPAx) in routine care, the interpretation of physiological parameters during training and recovery to support physiotherapists' clinical reasoning or the knowledge of outcomes and risk factors for muscle weakness in our hospital to answer questions on patients' potential trajectory of recovery. This thesis also created a solid basis for future, pragmatic and individually-adapted randomised controlled trials that can be evaluated with a validated outcome measurement of the target population.

One could argue that a negative trial like our randomised controlled study does not inform clinical practice. However, this is not completely true. First, our trial confirmed the safety of early endurance training using an in-bed cycling ergometer within our own hospital indicating that our current safety standards are adequate. Second, our trial showed us the disadvantages of using in-bed cycling, namely that it could be prioritised over more effective interventions such as early mobilisation. We have therefore adjusted our clinical practice. Nowadays, we primarily use in-bed cycling for patients with a contraindication to early mobilisation or as an adjunct to early mobilisation in long stayers. Patients report that they like to use the bike because it provides both a training opportunity and activity. We have therefore increased the duration to a maximum of 60 minutes and usually determine cycling duration by patients' preferences and perceived exertion. Also, given the proven safety profile of early in-bed cycling, physiotherapists are no longer required to continuously supervise sessions at the bedside and nurses have been instructed in the safe handling of the bikes increasing overall cycling opportunities and training time. Finally, we have adjusted the number of daily physiotherapy sessions. At the time of the trial, physiotherapy was commonly available for only one session per day. However, the trial clearly showed us, that twice-daily interventions can be done with the existing resources. Splitting therapy into two or more sessions better accounts for patient exhaustion and increases motivation, but it also allows to focus on several treatment objectives. The secondary analysis on cardiorespiratory parameters confirmed this approach as shorter sessions were more likely to elicit an adequate cardiorespiratory response.

As a consequence of the studies in this thesis, physiotherapists became used to regularly

assess function and activity with validated measurement instruments as recommended by international guidelines. Currently physiotherapists within our intensive care unit are encouraged to regularly evaluate muscle strength with the Medical Research Council sum-score and to measure physical function and activity with the newly available German CPax version from this PhD-project. The CPax is the first comprehensive German measurement instrument that has established validity and reliability to assess physical function and activity in critically ill adults from ICU baseline to ICU and hospital discharge. The CPax is therefore likely to affect clinical practice and future research in German-speaking areas. However, it is also important to distribute this information to relevant stakeholders. After its official publication, we advertised the German CPax through the German Network of Early Mobilisation and within the special physiotherapy edition of the DIVI journal (e.g., Deutsche Interdisziplinäre Vereinigung für Intensiv- und Notfallmedizin) [1]. Interest from other hospitals has been high, but enquires about training opportunities for the CPax indicate the need for an official German training opportunity. This underlines the importance of an adequate translation since many German-speaking physiotherapists seem to have barriers in accessing the original material. Given that all assessors during the CPax project received training, a German training opportunity is indicated to translate results into clinical practice. Following consultation and approval from the original CPax developer, Evelyn J. Corner, PhD, we have started to develop a German e-learning tool. This e-learning tool will be based on the original CPax e-learning module [2] with cross-cultural adaptations, new video material from our clinical practice as well as a quiz to assess interrater reliability in order to maximise learning. While it will be implemented within our university hospital's systems, it will be made freely accessible to others in the spirit of open science. The project is assisted by a Master of Science student and funded with the research prize 2018 for the best paper [3] from the Swiss national physiotherapy association. This example clearly shows that a study is not finished after its publication and that researchers need to ensure that their results reach the relevant audiences. The target groups that profit from the research of this PhD-thesis are the patients and their families, critical care clinicians from within our university hospital, but also from elsewhere and specifically German-speaking early rehabilitation specialists. To this end, the research from this PhD-thesis has been presented at national (Swiss and German) and international conferences and has been promoted on social media. This seems important as the impact of social media has increased in recent years and can be highly effective in distributing research output to important stakeholders [4].

This PhD-trajectory also led to the creation of two post-graduate courses in collaboration with the Bern University of Applied Science in Bern, Switzerland. The curricula for a Bachelor of Science degree in Physiotherapy in Switzerland lacks a detailed introduction to early rehabilitation within critical care. Physiotherapists are therefore often insecure

and avoid acute care settings. However, the increasing numbers of critical illness survivors necessitate specialists for adequate early rehabilitation [5]. The recent COVID-19 pandemic further highlighted the lack of critical care clinicians and the urgent need for education. The first course “Fachkurs Physiotherapie auf der Intensivstation, Basic” was conducted in 2015 and has since been completed six times. The second course “Fachkurs Physiotherapie auf der Intensivstation, Advanced” first started in 2018 and will run again in 2021. Together these two courses can be newly combined into a Certificate of Advanced Studies with 12 ECTS-Credits [6]. The created curricula were both influenced by the clinical and research experience from this thesis. All teachers have a multiprofessional background to enhance teamwork and collaboration. Content includes medical knowledge, clinical reasoning, practical techniques and current evidence. Learning assessments consists of an informal quiz, the CPaX e-learning, a written case report and peer job shadowing. In their final assignment, students will be required to conduct a quality improvement project within their intensive care unit to implement the learned content into their daily clinical practice. In the last years, these courses were mostly fully booked and thus seem to fulfil the urgent need for education in the field of critical care rehabilitation that is not covered with a standard Bachelor of Science degree. Moreover, contacts through these courses, but also through (inter-) national conferences, proved highly beneficial to exchange ideas on best clinical practice. Rapid communication, advice and information was especially relevant during the outbreak of the COVID-19 pandemic which was a very stressful time for critical care clinicians. In the end, this allowed us to write a comprehensive, multicentre Swiss case report series to inform about the role of physiotherapists in the treatment of the novel coronavirus at the beginning of the COVID-19 pandemic [7]. An altimetric score of 66 puts this article in the top 5% of all research outputs with a similar publication date [8] highlighting the importance of national collaboration and the promotion of research results. This collaboration also existed on an international level using simple social media canals such as YouTube to provide education and to exchange experience [9]. The knowledge from this thesis about intensive care unit acquired weakness and the post-intensive care syndrome further inspired the creation of an interprofessional health-care app for people suffering from post-acute sequelae from COVID-19. This app ‘INSELhealth – cofit’ aims to inform about symptom management and to guide rehabilitation after a critical illness. It is freely available in app stores [10] and currently intended as an adjunct to interprofessional follow-up. Future steps should include evaluation of its useability and efficacy.

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In summary, the research from this PhD-project enhanced knowledge about critical care rehabilitation, specifically for German-speaking clinicians by providing a valid and reliable assessment tool for the target population. Patients within our intensive care unit profited from the immediate implementation of new evidence into practice, but also from

international collaboration and innovation during the COVID-19 pandemic. Finally, this thesis enabled the development of evidence-based critical care physiotherapy courses in Switzerland and therefore, likely inspired other physiotherapists to implement current evidence into their clinical practice.

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