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Marie Utsch

marie.utsch@charite.de

Charité – Universitätsmedizin Berlin

Gavin Brupbacher

OBERWAID AG

Gaia Garuffi

ANQ

Anke Scheel-Sailer

Inselgroup, University Bern

Stephan Tobler

ANQ

Manuela Marquardt

Charité – Universitätsmedizin Berlin

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Strengthening the Patient Perspective in Quality Development: A Mixed-Methods

Observational Study on Suitability of the PROMIS GH-10 in Swiss Inpatient Rehabilitation

Marie Utsch¹, Gavin Brupbacher^{2,3}, Gaia Garuffi⁴, Anke Scheel-Sailer⁵, Stephan Tobler⁴,
Manuela Marquardt¹

1 Institut für Medizinische Soziologie und Rehabilitationswissenschaft, Charité –
Universitätsmedizin Berlin, Berlin, Germany

2 OBERWAID AG, St. Gallen, Switzerland

3 Department of Consultation-Liaison Psychiatry and Psychosomatic Medicine,
University Hospital Zurich, Zurich, Switzerland

4 ANQ, Bern, Switzerland

5 Centre for rehabilitation and sport medicine, Inselgroup, University Bern,
Switzerland

Corresponding author: Marie Utsch, E-mail: marie.utsch@charite.de

Abstract

Objective

Healthcare systems increasingly use patient-reported outcome measures (PROMs) to complement traditional clinical and performance-based outcomes by capturing health outcomes from the patient perspective and supporting quality improvement and patient-centred care. In Switzerland, the National competence centre for quality measurements in hospitals and clinics ANQ performs the external quality development program. We conducted a nationwide pilot study in inpatient rehabilitation using the generic PROMIS GH-

10 to assess its suitability as an outcome for quality development by evaluating its responsiveness and feasibility of implementation in everyday clinical practice.

Methods

Our study applied a mixed-method observational design. In a multi-stage expert-based selection process, the PROMIS GH-10 was selected for piloting. In total, 28 rehabilitation clinics recruited patients during the study period and asked them to fill in the PROMIS GH-10 digitally or paper-based at admission and discharge. After the survey, healthcare professionals (HCPs) were asked to document the level of assistance required by patients. Mean T-scores and effect sizes (Cohen's d) were calculated. Assistance requirements were analysed using descriptive statistics. Additionally, qualitative interviews were completed with HCPs to assess facilitating factors and barriers to implementation.

Results

A sample of 2,083 patients was included, resulting in 1,217 complete pre-post measurements. Mean T-scores (SD) for PROMIS GH-10 subscales physical health (PHS) and mental health (MHS) significantly improved ($p < 0.001$) from admission to discharge (total sample PHS: 39.3(7.4); 44.4(7.6); $d = 0.68$; MHS: 44.9(8.0); 48.7(7.5); $d = 0.48$). Effect sizes on PHS ranged from $d = 0.50$ - 0.95 and on MHS from $d = 0.33$ - 1.19 . Overall, 41% of patients required assistance in answering the PROM. Barriers to implementation from HCP perspective included uncertainties about the benefit of a generic PROM and the lack of staff resources. Facilitators were the questionnaire's brevity and the value of including the patient perspective.

Conclusions

44 PROMIS GH-10 showed significant pre-post effects on physical and mental health in Swiss
45 inpatient rehabilitation. Nonetheless, barriers such as increased time needed for assistance
46 in special patient groups should be considered before national implementation.

47 Keywords

48 Patient-reported outcome measures, quality development, PROMIS GH-10, generic health-
49 related quality of life, Switzerland, inpatient rehabilitation, feasibility, mixed-methods

50 Introduction

51 Healthcare systems worldwide are obliged to assess their quality to initiate improvement
52 strategies with the goal of increasing quality and saving costs. This includes the evaluation of
53 diagnostic and treatment processes, structural and health care professional (HCP) resources,
54 and the patient perspective. The use of patient-reported outcome measures (PROMs) is a
55 promising approach to include the patient's perspective in such assessments. PROMs make
56 it possible to record patients' own perceptions of their health-related outcomes in a
57 standardised manner.

58 PROMs are becoming an increasingly important measure of treatment quality enabling
59 focused quality development [1-5]. Recently, PROMs have even been used in cross-country
60 comparisons for quality development [6].

61 In Switzerland, the Federal Office of Public Health has identified patient-centred care as a
62 key area of action within its current quality strategy [7]. Reflecting this emphasis, the
63 Rehabilitation Quality Committee (QA Rehabilitation) of the Swiss national competence
64 centre for quality measurements in hospitals and clinics. ANQ has been refining the
65 rehabilitation measurement plan since 2019, prioritising the patient perspective based on
66 the rehabilitation quality development model. This approach broadens the focus beyond

solely functional and performance-based outcomes by incorporating patient-reported outcomes, which systematically capture the patients' own perspectives on their health and recovery.

Among the typical constructs tested with PROMs are symptoms, functional status, and health-related quality of life (HRQOL). There are now numerous generic as well as disease-specific measurement instruments for recording HRQOL with a wide range of overlapping content and different focal points depending on the development context. Common to all HRQOL measures is their multidimensional construct, considering physical, mental, and social subjective health aspects that are important to patients' everyday lives. In addition to clinical parameters, HRQOL is becoming increasingly relevant as an outcome parameter in medical care research [8] particularly in the case of chronic diseases where complete recovery cannot be achieved [9]. Since rehabilitation follows the framework of the International Classification of Functioning, Disability and Health (ICF), which emphasises functioning, participation, and contextual factors [10], HRQOL is particularly well-suited as an outcome measure in this setting. Improving HRQOL is therefore a central treatment goal of rehabilitation, in addition to improving functioning and participation.

PROM implementation is still difficult or missing in rehabilitation for several reasons, for instance issues with data collection or patient group heterogeneity [11]. A report on PROMs in international comparison identified further challenges such as difficulties in completing the questionnaires or the high administrative burden and lack of benefits in care [12], all of which relate to the overall feasibility of the instrument in routine practice.

Therefore, in external quality assurance and development, most outcomes are still routinely measured using administrative data or clinician-rated instruments.

The international literature on generic PROMs in rehabilitation is sparse. International implementation studies highlight that, while harmonisation is desirable for comparability, national contexts differ significantly and require tailored solutions [13]. Consequently, piloting is recommended to gather insights and experiences prior to full-scale implementation [14].

The primary goal of this pilot project was to strengthen the patient perspective in Swiss inpatient rehabilitation on the national level. We analysed this aim through two complementary aspects: first, we assessed the suitability of the PROMIS GH-10 quantitatively by examining its responsiveness; second, we evaluated the feasibility, focussing on practical implementation aspects in everyday clinical practice to inform a potential implementation process..

Methods

We conducted a mixed-methods observational study on the national level in inpatient rehabilitation across all nine rehabilitation domains in Switzerland. As defined in the national DefReha paper, the ANQ distinguishes nine rehabilitation domains: geriatric, internal medicine, cardiac, musculoskeletal, neurological, oncological, paraplegic, psychosomatic, and pulmonological rehabilitation [15]. These domains are based on medically defined service types in the national health system to support national planning and tariffing, rather than being strictly diagnosis-based. Due to the distinct medical

113 characteristics and patient populations within each rehabilitation domain, all analyses were
114 conducted according to rehabilitation domains, consistent with routine quality assurance
115 practices.

116 To address the responsiveness of the PROMIS GH-10 as a HRQOL measure, data were
117 collected using quantitative methods. Feasibility was examined through a parallel collection
118 of both quantitative and qualitative data.

119

120 Reporting of our study followed the Strengthening the Reporting of Observational Studies in
121 Epidemiology checklist [16], the Good Epidemiological Practice guidelines [17], and the
122 MMR-RHS Checklist [8].

123

124 Setting

125 This pilot project was conducted as a voluntary additional measurement in the setting of the
126 ANQ's regular national quality assessment in inpatient rehabilitation, whose results are
127 published yearly on the ANQ's website (www.anq.ch).

128 In a multi-stage selection process, the QA Rehabilitation decided to pilot a suitable PROM.

129 The expert-consented criteria to define a subset of suitable measures were: generic,

130 electronically usable, validated in all three Swiss languages (German, French and Italian),

131 psychometric properties, length, and costs. We carried out research into common HRQOL

132 instruments and their use in international quality assurance systems. In addition to the

133 expert-consented selection criteria, the QA Rehabilitation considered the PROMIS GH-10 as

134 the most appropriate PROM due to its dual physical and mental scoring, and broad

135 international use, including several ICHOM standard sets [19].

136 To realise the PROMIS GH-10 Data Project Network, the following project partners were
137 brought together, led by the ANQ. The Bern University of Applied Sciences, MIDATA, and
138 Brightfish were responsible for the measurement logistics of the electronic data collection.
139 The semi-structured interviews were realised with a project partner, socialdesign. The
140 Charité - Universitätsmedizin Berlin was responsible for data monitoring, data analysis and
141 reporting.
142

143 A total of 28 inpatient rehabilitation clinics with 67 rehabilitation domains from the three
144 language regions of Switzerland (German, French, Italian) took part in this study.
145 All pilot clinics were trained in the planned processes of the pilot project (e.g.
146 implementation and use of PROMIS GH-10, use of tablets to complete the questionnaire)
147 and were supported throughout the whole data collection process, which was accompanied
148 by data monitoring. However, processes were flexible enough to allow for individual
149 approaches in the clinics.

150 Data was collected between April and December 2023. Initially, the clinics obtained
151 informed consent from patients. The clinics were instructed to carry out the admission
152 measurement (T1) within the first three days after admission to inpatient rehabilitation and
153 the discharge measurement (T2) within the last three days of inpatient rehabilitation
154 (admission/discharge day included, analogous to the ANQ's rehabilitation measurement
155 plan). The typical rehabilitation period is 21 days. However, in some rehabilitation domains,
156 such as paraplegia, the average length of rehabilitation stays is much longer.

157 The questionnaire was completed either on a digital device or on paper. By giving their
158 consent to participate, patients also agreed to the matching of their data with the regular
159 ANQ measurement data, including sociodemographic and administrative data (submitted to

160 the Federal Statistical Office) and the Cumulative Illness Rating Scale (CIRS) [20], a scale for
161 morbidity assessment.

162

163 Sample size

164 We conducted a power calculation using G-Power to determine the required number of
165 cases per rehabilitation domain. A one-sided t-test for paired samples was applied, with an
166 alpha level of 0.05 and a beta level of 0.95, assuming a medium effect size for most
167 rehabilitation domains on both subscales (PHS and MHS) of the PROMIS GH-10. The
168 calculations indicated that, for medium effect sizes (d : 0.4 to 0.6), between 32 and 70
169 complete pre-post measurements with the PROMIS GH-10 are necessary per rehabilitation
170 domain.

171 In consultation with the QA Rehabilitation, the minimum requirements for the pilot sample
172 were established. These included the participation of 5 clinics, with adequate
173 representation from each language region (preferably 2 clinics from the German-speaking
174 region, 2 from the French-speaking region, and 1 from the Italian-speaking region of
175 Switzerland). Ideally, each clinic should provide at least 30 complete cases, with both pre-
176 and post-intervention data.

177 Participants/eligibility criteria

178 The pilot clinics actively recruited patients between the beginning of April and the beginning
179 of December 2023. Eligibility criteria for inclusion in the dataset followed the standards
180 defined in the national measurement plan of the ANQ for inpatient rehabilitation cases and
181 included:

182 - Age 18 years or older

- Completion of inpatient rehabilitation treatment (>7 days)

Measurements

The PROMIS GH-10 consists of ten generic formulated items covering physical, mental, and social aspects of subjective health [9] (see Supplementary material 1). Each item is scored on a 5-point scale, except Global07, which is scored on an 11-point numerical scale and recoded to a 5-point scale by the recommendations outlined in the PROMIS-GH Scoring Manual [21]. For three questions, an observation period of the previous seven days is addressed, while the remaining seven questions relate to the current condition at the time of the survey e.g. “In general, how would you rate your physical health?” or “How would you rate your fatigue on average?”

After the PROMIS GH-10 assessment, HCP additionally recorded whether the patient required assistance with filling out the survey. Possible assistance requirements were: reading out questions/answers, data entry on behalf of the patient, answering questions about the questionnaire, and other (with a free text field). In addition, the free text field answers were grouped and a new category ‘multiple support’ emerged. In the case of patients who refused the test despite giving consent, the HCP documented the reasons for this. Possible answers were no interest, physical/motor impairment, cognitive impairment, patient not encountered, survey not available in preferred language, other (with free text field). Drop-outs, in the sense of unexpected discontinuation of treatment, were instructed to document by the HCP in the open field.

Information on the rehabilitation domain, mode of administration of the survey (electronic or paper-based), language version and dates were available for both measurements.

As part of the data monitoring, field notes were made on problems and questions that arose in the clinics.

Statistical analysis

Availability and completeness of measurements at admission or discharge were analysed descriptively. The pre-post effects were analysed for complete cases only. Two summary scores were calculated, based on eight of the 10 PROMIS GH-10 items: the physical health summary score (PHS) and the mental health summary score (MHS). The remaining two items were not necessary for the calculation of the score. To calculate the scores using the T-score table, the point values [1-5] were added to a raw total score [5-9, 11-14, 16, 17, 21-23] and then assigned to the corresponding T-value. The following applied to the interpretation of the values: A T-value of 50 corresponds to the average of the general population. T-values of 40 and 60 are one standard deviation below and above the population average, respectively. A higher score indicates better global mental/physical health [19, 5].

In addition to the T-score mean values for admission and discharge and other distribution parameters, t-tests and effect sizes (Cohen's d) were calculated using pooled standard deviation [19]. Effect sizes were calculated for each rehabilitation domain and are reported descriptively; no formal statistical comparisons between domains were planned.

The effect size was interpreted as a standardised mean difference: around 0.2 was considered a small effect, around 0.5 a medium effect, and 0.8 or above a strong effect [22].

The data on assistance requirements was analysed using descriptive statistics. For this purpose, all cases, complete and incomplete, were analysed.

230 Qualitative methods and analysis

231 To assess the PROMIS GH-10's feasibility in clinical practice, we conducted semi-structured
232 individual interviews and group interviews with HCPs, who were involved in carrying out the
233 study, regardless of their profession.

234 The experienced Swiss survey institute socialdesign organised and carried out the qualitative
235 interviews. The qualitative guide was conducted in accordance with a set of 11 guiding
236 questions, which were complemented by a series of more detailed inquiries pertaining to
237 the following subject areas (see Supplementary material 2):

- 238 ● Challenges and potential solutions
- 239 ● Effort and benefits
- 240 ● Practicability and acceptance
- 241 ● Concept of PROMs
- 242 ● Implementation

243 Participants were recruited via the pilot clinics. Depending on capacity and preference,
244 individual interviews (interview with one participant) or group interviews (interview with
245 two or more participants) were offered. Apart from a round of introductions in the group
246 interviews, the procedure was the same. All qualitative interviews were done online and
247 audio-recorded. All recordings were pseudonymised, transcribed and translated into
248 German by socialdesign and sent to Charité.

249 We analysed the materials of all interviews using qualitative content analysis according to
250 Kuckartz with MAXQDA [23]. A deductive and inductive approach was used to create
251 categories. For the analysis, deductive main categories were first formed based on the
252 research question and the interview guide, which were then inductively supplemented with
253 material-based subcategories. This structured and iterative coding process, which involved

constant comparison across roles and rehabilitation fields, allowed us to identify facilitating factors, barriers, and implementation suggestions of the PROMIS GH-10 in clinical practice.

Results

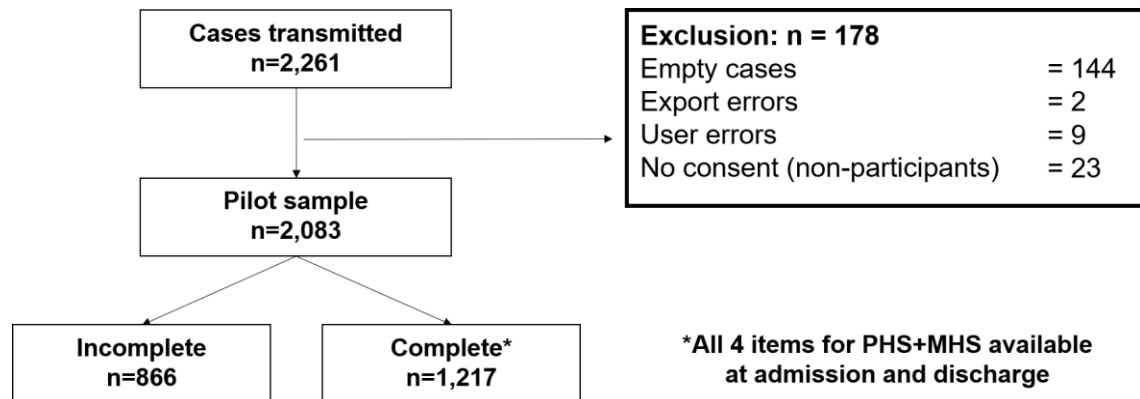


Fig. 1: Flow chart

A total of 2,261 cases were transmitted from the pilot clinics, of which 178 were excluded (Fig. 1). This resulted in a final database of 2,083 cases, divided into 866 incomplete and 1,217 complete cases. The sample description of the matched cases can be found in Supplementary material 3. The pilot sample was largely comparable to the regular ANQ measurement sample in terms of the distribution of characteristics, except for the length of stay in paraplegic rehabilitation.

The proportion of complete cases for all rehabilitation domains was 58.4%. The proportion of complete cases was comparatively higher in the oncological (76.3%), cardiological (75.2%), and psychosomatic (66.7%) rehabilitation domains, whereas the internal medicine (49.0%), geriatric and paraplegiological (47.3%) rehabilitation domains had a lower rate (Figure 2).

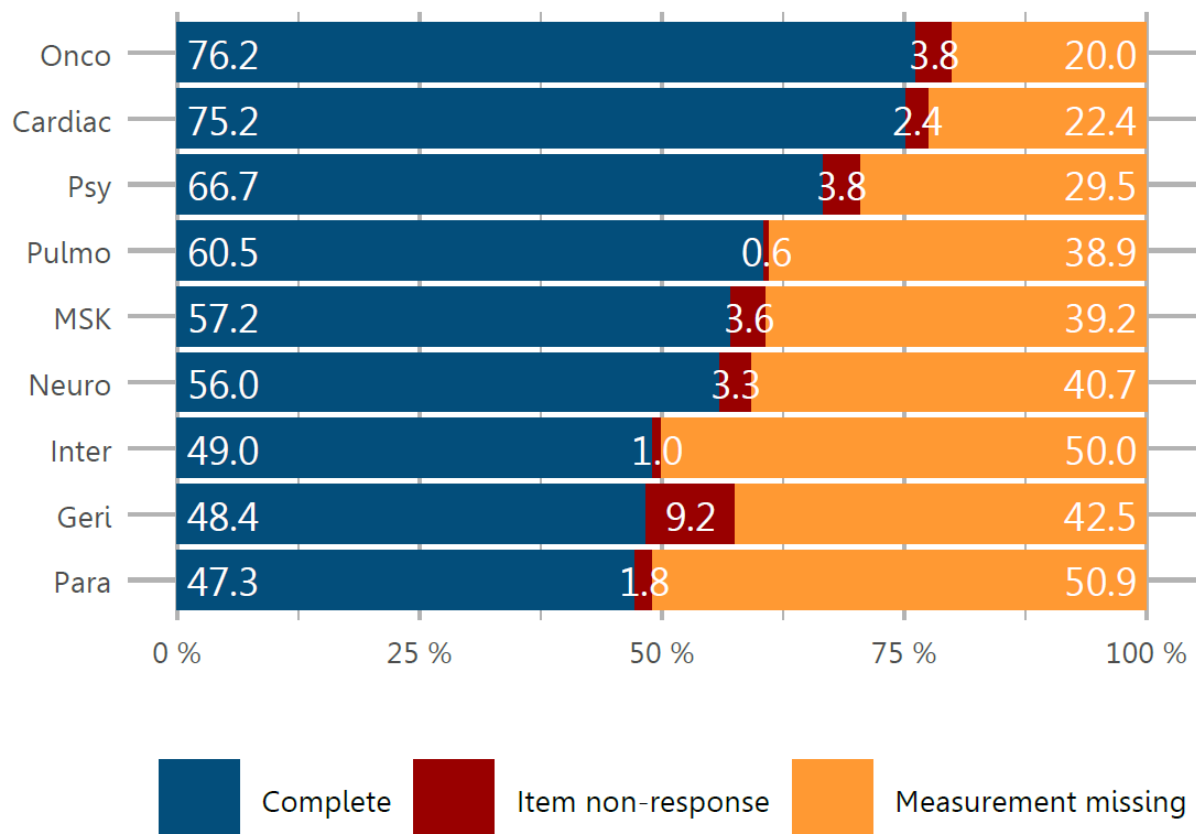


Fig. 2: Data quality by rehabilitation domain

The majority of all incomplete cases (n=866, 41.6%) had completely missing measurements at either admission or discharge (n=787, 37.8%). Only 3.8% (n=79) were incomplete due to item-non-response, although this proportion was higher in geriatric rehabilitation (9.2%). A detailed analysis of the incomplete cases showed that most of the measurements were complete at admission (n=735, 84.9%) and that most cases were incomplete at the discharge measurement.

For some of the missing measures, HCPs documented reasons (n=168, 21.3%). In 41.1% of these cases, the patient could not be encountered, followed by other reasons (27.4%) such as the patient being transferred and a lack of interest (18.5%). Cognitive (9.5%) and physical (2.4%) impairments accounted for a small proportion of the reasons for not taking the test. In only two cases (1.2%) the reason for non-response was that the survey was not available in the preferred language. In the open-ended information on cases with missing

measurements, 40 cases were reported to have discontinued the rehabilitation treatment (drop-outs).

Cases with complete admission and discharge measurements for both PROMIS scores (PHS, MHS) were used for the analysis (n=1,217). Figure 3 shows the mean T-score and associated 95% confidence intervals of the MHS and PHS for the admission and discharge measurements by rehabilitation domain. The corresponding effect sizes can be found in Table 1.

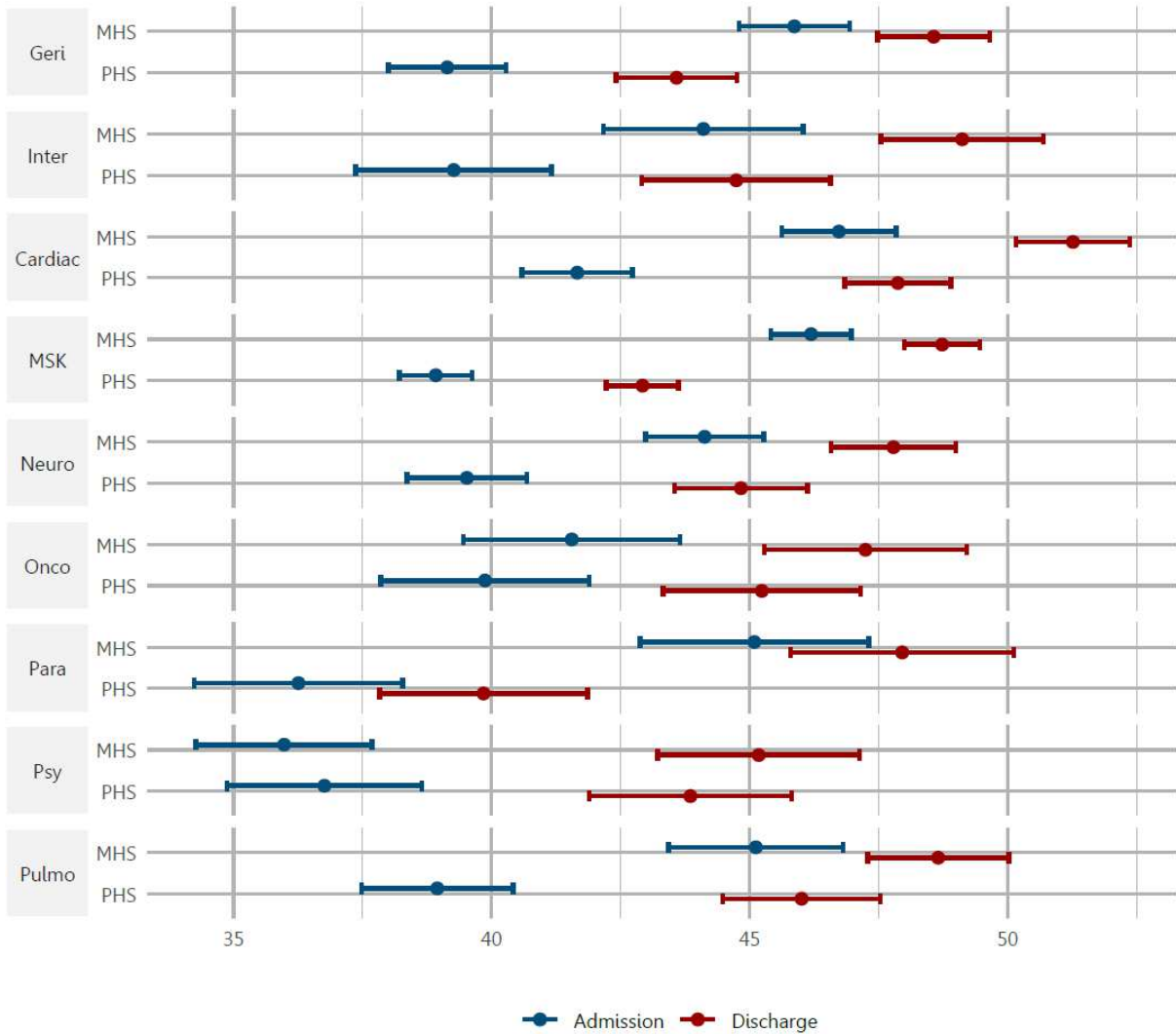


Fig. 3 Pre-post scores according to rehabilitation domain

295 Tab. 1: PROMIS GH-10 T-score mean values and effect sizes for PHS and MHS by
 296 rehabilitation domain

rehabilitation domain	score	admission		discharge		n	T	Cohen's	
		mean	SD	mean	SD			p	d
geriatric	PHS	39.1	7.0	43.6	7.2	148	7.6	<0.001	0.63
	MHS	45.9	6.6	48.6	6.7	148	5.6	<0.001	0.41
internal medicine	PHS	39.3	6.8	44.7	6.5	51	5.8	<0.001	0.83
	MHS	44.1	6.9	49.1	5.6	51	6.5	<0.001	0.80
cardiac	PHS	41.7	7.4	47.9	7.2	188	12.2	<0.001	0.85
	MHS	46.7	7.7	51.3	7.6	188	9.8	<0.001	0.59
musculoskeletal	PHS	38.9	7.2	42.9	7.1	395	11.3	<0.001	0.56
	MHS	46.2	7.9	48.7	7.4	395	7.8	<0.001	0.33
neurological	PHS	39.5	7.3	44.8	8.1	154	9.7	<0.001	0.69
	MHS	44.1	7.2	47.8	7.6	154	6.5	<0.001	0.49
oncological	PHS	39.9	7.9	45.2	7.5	61	7.2	<0.001	0.70
	MHS	41.6	8.2	47.2	7.7	61	6.6	<0.001	0.72
paraplegic	PHS	36.3	7.2	39.8	7.2	52	3.6	<0.001	0.50
	MHS	45.1	8.0	48.0	7.8	52	3.2	0.002	0.36
psychosomatic	PHS	36.8	7.9	43.9	8.2	70	9.6	<0.001	0.88
	MHS	36.0	7.2	45.2	8.2	70	11.3	<0.001	1.19
pulmonological	PHS	38.9	7.3	46.0	7.6	98	11.0	<0.001	0.95
	MHS	45.1	8.4	48.7	6.8	98	5.4	<0.001	0.46
total	PHS	39.3	7.4	44.4	7.6	1217	25.7	<0.001	0.68

	MHS	44.9	8.0	48.7	7.5	1217	19.7	<0.001	0.48
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PHS physical health summary score / MHS mental health summary score of the PROMIS

GH-10; Cohen's d: 0.20-0.49 small effect; 0.5-0.79 medium effect; ≥0.80 strong effect

297 The mean PHS at admission was between 38.9 and 39.9 in most rehabilitation domains,
 298 which was around one standard deviation below the population average. At discharge, the
 299 T-scores of the PHS in most rehabilitation domains varied between 42.9 and 46.0 and were
 300 thus much closer to the norm. Descriptively, paraplegiological rehabilitation had a lower
 301 mean discharge score (39.8), while cardiac rehabilitation had a higher score (47.9) than the
 302 other rehabilitation domains.

303 The distribution of the MHS also differed descriptively across the various rehabilitation
 304 domains. In most rehabilitation domains, the MHS at admission was between 44.1 and 46.7
 305 and thereby somewhat closer to the norm than the PHS. At the time of discharge, the
 306 average MHS was between 47.2 and 49.1 and thus almost corresponded to the population
 307 average. Cardiac rehabilitation showed a descriptively higher mean T-score (51.3) and in
 308 psychosomatic rehabilitation slightly lower (45.2) than in the other rehabilitation domains.

309

310 Effect sizes are reported descriptively by domain, without formal statistical comparisons
 311 between groups. There were statistically significant pre-post effects across all rehabilitation
 312 domains for PHS and MHS ($p < 0.001$). However, in paraplegiological rehabilitation, the pre-
 313 post effect in MHS differed slightly, reaching statistical significance at the 99% confidence
 314 level ($p = 0.002$). The average effect size for the PHS was 0.68, indicating a medium effect.
 315 For the MHS, the average effect size was 0.48, indicating a small effect (see Table 1).

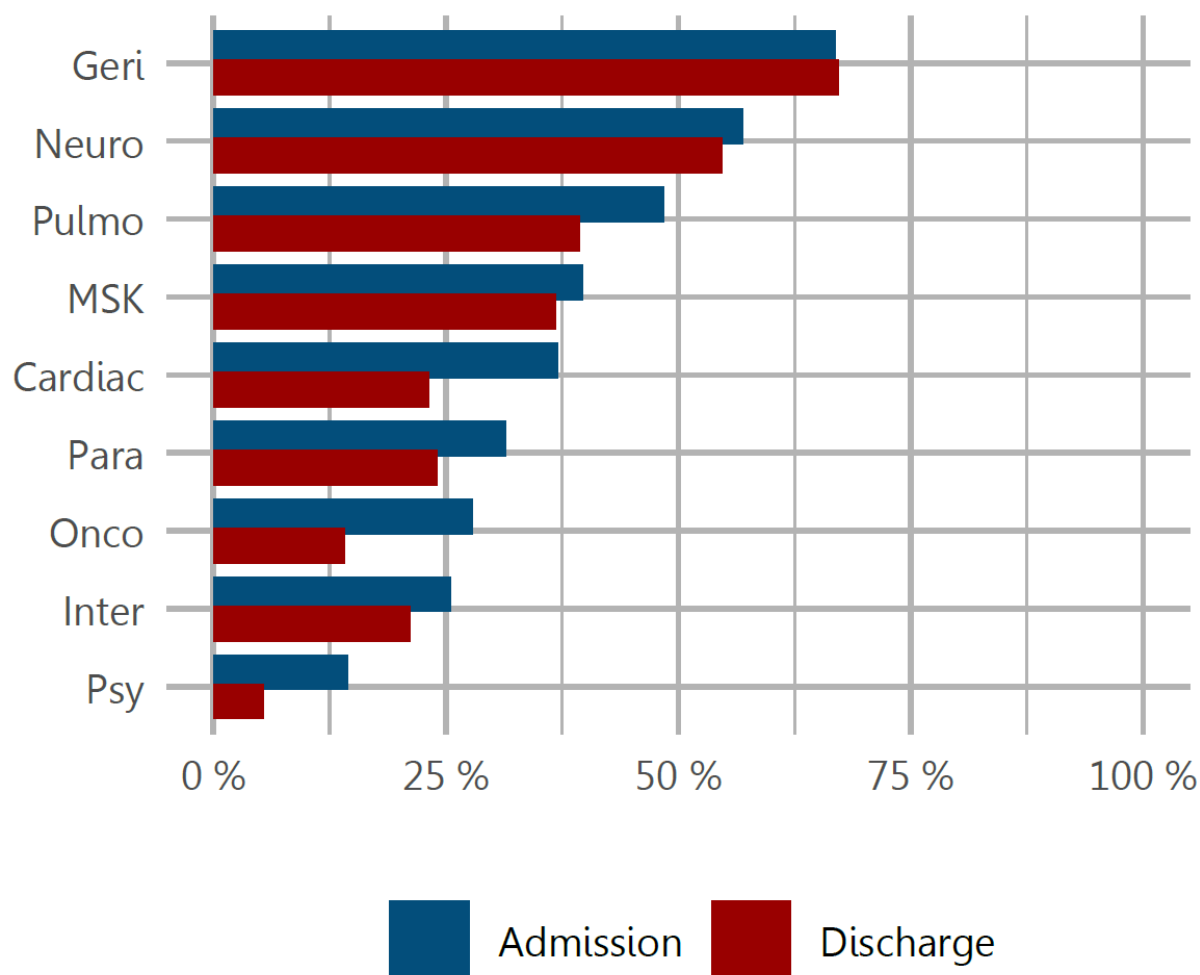
316 When differentiated by rehabilitation domain, PHS consistently showed medium to high
 317 effect sizes. The pre-post effects were strongest in internal, cardiac, psychosomatic and

318 pulmonary rehabilitation. The other rehabilitation domains showed medium effect sizes for
319 the PHS, with paraplegiological and musculoskeletal rehabilitation showing the lowest
320 average effects of all rehabilitation domains.

321 For the MHS, the pre-post effect was the strongest in psychosomatic rehabilitation, followed
322 by internal medicine rehabilitation. Medium effects were found in oncological and cardiac
323 rehabilitation. Neurological, pulmonary, geriatric, paraplegiological and musculoskeletal
324 rehabilitation showed small pre-post effects on the MHS.

325

326 Figure 4 shows the proportion of cases with assistance requirements by rehabilitation
327 domain for admission and discharge measurements (based on all available assessments:
328 admission n=2,015; discharge n=1,290).



Assistance requirements include: reading out questions/answers, ticking on behalf of the patient, answering questions about the questionnaire, other

Fig. 4: Proportion of cases with assistance requirements by rehabilitation domain for admission and discharge measurement

Overall, assistance requirements were documented for 41.0% of patients at both time points (n=1,355 of 3,305). Marked differences in assistance requirements were observed across rehabilitation domains: geriatric rehabilitation had the highest rates (admission: 66.9%; discharge: 67.2%), while psychosomatic rehabilitation had the lowest (admission: 14.4%; discharge: 5.4%).

Tab. 2: Distribution of the categories of assistance requirements

Category	n	%
reading questions or answers aloud	698	51.5
recording responses on behalf of patients	270	19.9
answering questions about the questionnaire	157	11.6
multiple support	205	15.1
Other	25	1.8

340

341 Assistance needs were slightly lower at discharge compared to admission across most
342 rehabilitation domains.

343 A subgroup analysis examining the requirements for assistance, the completeness of the
344 data, and the mode of administration at both time points did not reveal a clear pattern
345 within the rehabilitation domains. In the overall sample, 38.3% of the complete cases
346 required assistance, compared to 48.3% of the incomplete cases. However, in some
347 rehabilitation domains, the ratio was reversed. Concerning the mode of administration,
348 HCPs documented assistance requirements for 28.1% of the paper-based measurements,
349 compared to 49.4% of the electronic questionnaires.

350

351 Qualitative results

352 One group interview with three participants, three group interviews with two participants
353 each and four individual interviews were conducted. A total of 13 HCPs from 10 clinics,
354 working in different functions (quality management (four), health care professionals:

medical doctors (three), nursing (one) and therapy (one), administration (three), research (one)) and in different rehabilitation fields, were interviewed. Of these, four were French-speaking and nine were German-speaking. The interviews lasted between 30 and 90 minutes.

A total of five main categories were formed, each comprising two to five subcategories. For four of these subcategories, up to two sub-subcategories were added to obtain a more differentiated picture of the interview statements (Figure 5). Finally, the content in the categories was assigned to facilitating factors, barriers, and implementation suggestions of the PROMIS GH-10 in clinical practice (Figure 5 and Supplementary material 4).

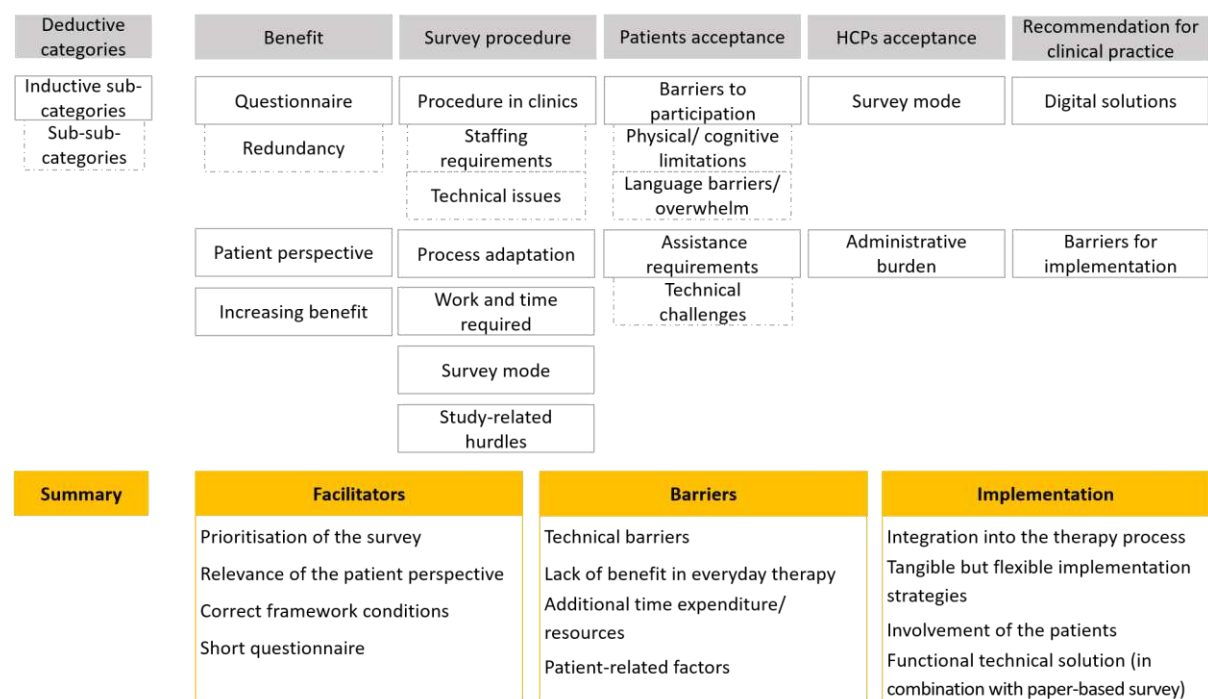


Fig. 5. Deductive and inductive categories and summary of the qualitative results

A key facilitator for the successful conduct of the PROMIS GH-10 in clinical practice was providing dedicated time and a calm setting for completion, along with ensuring that patients understood the importance of their participation. The short completion time (around 3–6 minutes) was generally well received. *“The goal was that patients really have*

370 *time for the questionnaire [...] we created a time slot so they could actually fill it in.” (G11).*
371 Barriers included poor digital integration, tablet usability issues, patient reluctance or
372 inability to use technology (especially in geriatrics), and the additional workload—
373 sometimes up to 30 minutes per patient—without sufficient resources. Some questioned its
374 value for routine care if results were not integrated into treatment. *“There were very few*
375 *who could fill it out on the tablet [...] many were tired, didn’t want to read on the tablet, and*
376 *the font was small.” (E12).* Interviewees proposed embedding the process into existing
377 workflows, avoiding redundancy with other questionnaires, ensuring paper-based options,
378 improving technical reliability and integration, and giving patients feedback, potentially in
379 multiple languages. *“If the digital tool were already in the clinical information system [...] it*
380 *would be much easier than doing it separately on an iPad.” (FG1).*

381 Discussion

382 Key results

383 The aim of this pilot project was to evaluate the responsiveness and feasibility of PROMIS
384 GH-10 for quality measurements across nine inpatient rehabilitation domains. The PROMIS
385 GH-10 detected statistically significant improvements in HRQOL from admission to discharge
386 in all domains. For the PHS, medium to high effects were found ($d=0.68$, by rehabilitation
387 domain 0.50-0.95) whereas the MHS showed small to high effects ($d=0.48$, by rehabilitation
388 domain 0.36-1.19).

389 Assistance requirements varied widely: the highest proportions of patients requiring help to
390 complete the questionnaire were in geriatric and neurological rehabilitation, while
391 psychosomatic rehabilitation had considerably lower proportions.

392 Qualitative interviews indicated that clinics often adapted data collection processes to local

conditions, which sometimes required additional staff resources. Commonly cited facilitators for implementation included the short length of the questionnaire and the perceived value of incorporating the patient perspective.

Interpretation

The quantitative findings reflect the diversity of the rehabilitation domains and indicate that the PROMIS GH-10 is methodologically suitable as a generic instrument for detecting changes in HRQOL in different rehabilitation contexts.

The observed effect sizes predominantly indicate sufficient responsiveness of the instrument, especially for the PHS [24]. Determining whether these differences are clinically relevant was beyond the scope of this pilot project. However, Terwee et al. [25] cite T-score differences of 2 to 6 for meaningful change for most PROMIS instruments. This is also in line with PROMIS GH-10 specific literature: Khalil et al. [26] report minimally clinically important differences (MCID) for the PHS between 2.3 and 2.5 for patients after knee arthroplasty, depending on the calculation method (distribution vs. anchor-based), while Spiering et al. [27] found corresponding PHS MCIDs between 3.0 and 6.6 and for MHS between 4.3 and 1.6 for baseline and 1-year follow-up in US-based samples for knee arthroplasty. Notably, the anchor-based MCID for the MHS is much smaller than the distribution-based, which means that patients, when asked about meaningful change, tend to perceive smaller changes on the MHS as significant compared to what the distribution-based method suggests. Further studies on specific populations are still needed to go beyond these rules of thumb.

Another way to interpret T-score values in relation to general health (poor, fair, good, very good, excellent) is outlined on the PROMIS website ([score cut points](#)). According to their guidelines, the fair-good threshold for PHS is 42 and for MHS it is 40, while the good-very

good cut-off is set at 50 for PHS and at 48 for MHS. This would mean that the PHS at admission in this study is below the fair-good cut-off in all rehabilitation domains and above it at discharge (except for the paraplegic rehabilitation), while the MHS is already in the "good" range in all rehabilitation domains at admission (again, except for paraplegic rehabilitation).

The different effect sizes in rehabilitation domains emphasize the relevance of assessing both the physical and mental aspects of HRQOL separately. This is particularly relevant as many outcome measures for rehabilitation have specific objectives regarding physical or mental health [28, 29]. The two-factor structure of the PROMIS GH-10 thus appears to be differentiated enough in order to depict the multidimensional construct of HRQOL. One finding that requires further investigation is the low effect sizes observed in the musculoskeletal and paraplegic rehabilitation domains on the PHS, while other rehabilitation domains (such as cardiology or pulmonology) show significantly higher effects. There are several possible explanations for this: the presence of more complex or chronic conditions in musculoskeletal and paraplegic patients, making significant improvements harder to achieve; and the limitations of the generic measure, which may not be sensitive enough to detect subtle functionality improvements in these areas. Additionally, differences in rehabilitation approaches, and different patients' expectations for improvement after acute versus chronic conditions, could also play a role. However, other studies using the VR-12, a 12-item generic PROM of HRQOL, which, like the PROMIS GH-10, provides separate physical and mental health subscores, in German rehabilitation settings show a different pattern, where musculoskeletal rehabilitation demonstrates the largest effect sizes on the physical subscore, while patients with depression score the lowest [30]. The differing effect

size patterns compared to German VR-12 studies may be partly due to patient differences: orthopaedic patients in German rehabilitation are on average about 20 years younger than in our Swiss PROMIS sample, which could explain larger physical improvements. Additionally, the VR-12 focuses more on role functioning, potentially making it more sensitive to changes in musculoskeletal rehabilitation than the more general physical health captured by the PROMIS GH-10. A further reason for the larger physical health effect sizes observed in psychosomatic rehabilitation in Switzerland may be the substantial improvements in symptoms such as fatigue and physical distress, which are well captured by the PROMIS GH-10 physical subscale. In general, response shift, where changes in patients' self-evaluations impact the perceived effects, cannot be ruled out [31].

The interpretation concerning feasibility draws on a mixed-methods approach integrating various data sources, comprising not only the key results but also data quality and field notes from monitoring and support activities. The quantitative findings on assistance requirements indicate diverse domain-specific barriers and for some domain's considerable additional effort for the clinical staff in administering PROMs. The finding that reading out questions and answers was the most common type of assistance required (about half of all cases across rehabilitation domains and time points) highlights opportunities for technical solutions, such as speech-supporting technologies [32].

However, our data does not reflect that the PROMIS GH-10 led to the numerous missing measurements. HCPs were asked to record the reasons for missing measurements despite patients' consent. Those reasons were available for only one in five incomplete cases. Both the field notes and the interviews suggest that these were primarily due to clinic-specific processes rather than to the instrument itself or to patients' refusal to undergo an

465 additional measurement.

466

467 Some difficulties in this project arose from structural barriers/operational constraints, such
468 as the lack of digital networking in the hospital system, as revealed in the interviews. In
469 principle, however, there were only a few indications that the PROMIS GH-10 was not
470 practicable as a tool. Occasionally, the desire for an indication-specific tool was expressed to
471 increase clinical usability. This is the major trade-off between a generic instrument that is as
472 short as possible and a longer, disease-specific instrument. The latter can provide greater
473 usability for the treatment and communication process with patients, as already discussed
474 during the PROMs selection process and in the literature [33, 34]. In other words, it is
475 generally only possible to maximise two of the following at the same time: the breadth of
476 health aspects covered (measurement range), the accuracy of measurement (precision), and
477 the brevity of the questionnaire (number of items) [35]. Improving one aspect often
478 requires compromising on another. Further results of the qualitative interviews on barriers
479 and facilitating factors, such as technical administration or clarification of a responsible
480 person, are in line with other international research [12, 36-38]. The intensive use of both
481 survey modes (tablet 60.4%/paper 39.6%) in all rehabilitation domains illustrates how
482 relevant it is to continue to offer paper-based surveys. According to other research, the
483 combination of paper and electronic questionnaires is crucial, for example, to ensure that
484 the implementation does not create bias by disadvantaging populations with lower digital
485 literacy [39-41].

486

487 Generalisability

488 The results of the study provide insights into rehabilitation in Switzerland as a whole, as it
489 included 28 clinics from three different language regions and all rehabilitation domains.
490 However, potential PROM-specific bias sources, such as (self-)selection or nonresponse,
491 should be considered. The OECD PaRIS study supports the validity of this pilot study data, as
492 it reported similar mean scores for the PHS (45.4) and MHS (47.8) for people living with
493 chronic conditions in primary care in Switzerland [42], aligning with the discharge values in
494 the current study (PHS: 44.4; MHS: 48.7). However, generalisability to other countries is
495 limited due to differences in rehabilitation systems and potential selection effects. For
496 Germany, whose rehabilitation system is the most similar in an international comparison,
497 partly comparable PROMIS GH-10 data for neurological rehabilitation after stroke are
498 available [43]. Apart from that, the authors are not aware of any similarly detailed studies
499 on the PROMIS GH-10 or a similar PROM that report effect sizes across different
500 rehabilitation domains.

501 Nevertheless, similar challenges in implementing PROMs are also likely to occur in other
502 countries [38]. Generic instruments have the potential to enable both international and
503 cross-sector comparisons, further emphasising their value.

504

505 Strengths and limitations

506 The strength of the study lies in its successful piloting of the PROMIS GH-10 across nine
507 rehabilitation domains in three language regions at a national level. In addition, the number
508 of cases achieved was sufficient for the planned statistical calculations.

509 Furthermore, the selection of the questionnaire to be used was decided by the QA using a
510 multi-stage selection process, which is one of the most important steps in the use of PROMs
511 [44].

512 Another strength is the detailed assessment of assistance requirements, which allows for
513 further aspects relevant to the implementation of PROMs. The database was extended to all
514 available cases with documented assistance requirements, regardless of data completeness
515 (n=2,015 admission and n=1,290 discharge measurements). This approach ensures that the
516 analysis captures the entire spectrum of reported assistance needs, rather than being
517 restricted to complete cases. By leveraging all available information, the analysis minimises
518 potential bias and provides a more comprehensive understanding of the assistance required
519 across the study population.

520 Despite the positive results, this study is subject to limitations.

521 First, it cannot be ruled out that other clinics in individual rehabilitation domains with a
522 different patient mix would have resulted in different scores. The pilot clinics voluntarily
523 agreed to participate, which indicates a high level of commitment and potential research
524 interest. Nevertheless, the results of this Study are similar to the OECD Paris Survey
525 suggesting that our sample is comparable to the population in Switzerland [42].

526 With 866 cases (41.6%), there was a high number of incomplete cases. However, the
527 majority of these incomplete cases in this pilot study resulted from missing discharge
528 measurements (30.1%), while the admission measurement was complete. No clear patterns
529 in the response behaviour were identified, so that no selection bias between rehabilitation
530 domains can be assumed. No rehabilitation domain-specific issues were found that would
531 challenge the suitability of the PROMIS GH-10 for the use in individual rehabilitation
532 domains.

533 Additionally, in the study population (Supplementary material 3), a selection bias is
534 recognisable, particularly regarding the duration of rehabilitation in paraplegiologic
535 rehabilitation. For administrative reasons, the participating clinics only included patients
536 who were discharged earlier than the usual length of rehabilitation in this domain. This
537 selection limited the sample to patients who undergo a second rehabilitation, while patients
538 in the usually longer-lasting first rehabilitation phase typically achieve greater progress.
539 Thirdly, the limited patient perspective in the interviews represents a limitation. Although
540 telephone-based interviews were attempted as part of the study, they were discontinued
541 after three sessions because the patients did not recall the questionnaire. This is due to the
542 brevity of the questionnaire and the number of questionnaires to be completed at
543 admission. Therefore, the value of the interviews was limited.

544 Conclusion

545 In summary, the pilot project shows statistically significant pre-post effects of HRQOL in all
546 nine rehabilitation domains, which supports the responsiveness of the instrument for
547 measuring changes in HRQOL in different rehabilitation contexts. Concerning feasibility in
548 clinical practice, the findings point to both facilitating factors and notable challenges, such
549 as the high assistance requirements in some rehabilitation domains.

550 This pilot project was able to provide important insights into the suitability of the PROMIS
551 GH-10 as an outcome indicator for the Swiss rehabilitation measurement plan.

552 Emphasising the patient perspective as a national outcome parameter, this pilot project
553 reflects an expansion from primarily functional and performance-based outcome measures
554 to include patient-reported health aspects as a complementary enrichment of quality
555 assessment. By systematically capturing patients' own perspectives on their health and

556 recovery, this approach supports a more patient-centred evaluation of rehabilitation
557 outcomes. At the same time, it indicates that further methodological refinement and
558 validations are necessary to ensure the meaningful complementary integration of PROMs
559 within quality measurements.

560 While HRQOL is an indicator that ICF-based rehabilitative treatment should target, the
561 extent of its relevance may vary across different rehabilitation fields.

562 The results of this pilot project, however, also make it clear that the collection of PROMs is
563 associated with considerable effort for the clinics and should not be an end in itself, which
564 should be taken into account when discussing possible implementation. A sustainable
565 strengthening of the patient perspective through PROMs can only be achieved if the results
566 are incorporated into clinical processes and clinical staff also recognise their added value.

567 List of abbreviations

568 CIRS – Cumulative Illness Rating Scale

569 d – Effect size

570 HCP – Health Care Professionals

571 HRQOL – Health-Related Quality of Life

572 ICF - International Classification of Functioning, Disability and Health

573 ICHOM – International Consortium for Health Outcomes Measurement

574 MCID - minimally clinically important differences

575 MHS – Mental Health Summary Score

576 n – Sample Size

577 P – p-value

578 PHS – Physical Health Summary Score

579 PROM – Patient-Reported Outcome Measure

580 PROMIS GH-10 – Patient-Reported Outcomes Measurement Information System Global

581 Health-10

582 QA Rehabilitation – Quality Committee Rehabilitation

583 sd – Standard Deviation

584 T – T-Score

585 T1 – Admission Measurement

586 T2 – Discharge Measurement

587 Ethics approval and consent to participate

588 This study did not require the approval of an ethics committee since the data are part of the

589 Swiss national quality assurance program.

590 This was confirmed on 20.07.22 by the Cantonal Commission for Research Ethics of the

591 Health, Social, and Integration Directorate of the Canton of Bern, stating that the project

592 does not fall under the Human Research Act, Article 2, Paragraph 1. The study was

593 conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

594 From all of the participants in the study an informed consent to participate was obtained
595 and stored in the clinics.

596 Consent for publication

597 Not applicable.

598 Availability of data and materials

599 Data is available upon request by submitting an application to the ANQ. Further information
600 can be found on the ANQ-Webportal

601 ([https://www.anq.ch/de/downloads/?category=3027&deepid=b73ef88b1f8e1d540ec8f1d6](https://www.anq.ch/de/downloads/?category=3027&deepid=b73ef88b1f8e1d540ec8f1d6330c229f)
602 [330c229f](https://www.anq.ch/de/downloads/?category=3027&deepid=b73ef88b1f8e1d540ec8f1d6330c229f)).

603 Competing interests

604 The authors declare that they have no competing interests.

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608 Authors' contributions

609 M.U. and M.M. were responsible for the scientific oversight of the study, data analysis, and
610 manuscript drafting. S.T. and G.G. led the project management and coordination efforts.

611 A.S.-S. and G.B., as members of the quality committee, contributed to the planning process

and reviewed the manuscript for consistency. All authors critically reviewed the manuscript, approved the final version, and accepted responsibility for its submission for publication.

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