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## MEDICAL OUTCOME QUALITY IN REHABILITATION: LINKING MUSCLE QUALITY, PERFORMANCE AND PATIENT REPORTED HEALTH

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Rehabilitation success is widely recognized as multidimensional, encompassing functional performance, patient-reported health, and physiological integrity [1]. However, routine outcome evaluation often relies on a narrow set of measures, such as pain scores (PROM) or single mobility tests (CROM). These measures are applied heterogeneously across clinics and programs, which limits the comparability and consistency of evaluations. This does not align with what patients and healthcare professionals consider important: in a previous study, we found that both groups value integrated perspectives rather than single endpoints [2]. To reduce interpretative ambivalence and enhance clinical applicability, it is essential to develop multidomain assessment models that integrate objective measures of functional performance, patient-reported health outcomes, and musculoskeletal parameters. Such models could provide a more comprehensive representation of rehabilitation and exercise interventions, potentially capturing dimensions of complexity that single-domain indicators may overlook. We aimed to operationalize a multidomain model of medical outcome quality in rehabilitation, integrating performance and patient reported health. Specifically, we examined whether three distinct exercise therapy settings – a healthy ageing programme and two rehabilitation pathways following knee or hip arthroplasty (early outpatient and standard inpatient) – show similar or divergent response patterns across these domains. Secondary analyses were conducted on three cohorts of older adults: (1) Healthy cohort (N = 131) [3]; (2) Standard inpatient rehabilitation post-arthroplasty (N=160) [4]; (3) Early outpatient rehabilitation post-arthroplasty (N=23) [5]. To operationalize the multidomain model, we defined two primary domains of outcome quality: functional performance and patient-reported health, each represented by one validated factor. Functional performance was assessed using the Timed Up and Go test (TUG), and patient-reported health was assessed using the EQ-5D index. Muscle quality, measured by phase angle (PhA), was included as an exploratory factor in the healthy cohort only. Change from admission to discharge was described with within subject Cohen d, responder rates were based on published minimal clinically important difference (MCID) values [6] and Pearson correlations between change scores. Base-

line age and BMI were similar across cohorts (Healthy: 67.6 ± 5.2 years, BMI 28.0; Early outpatient rehabilitation: 66.4 ± 7.6 years, BMI 29.2; Standard inpatient rehabilitation: 67.6 ± 7.8 years, BMI 27.8), with no statistically significant differences between cohorts (age: p = .727; BMI: p = .478). Observed changes are presented below and visualized in Figure 1. Healthy: Patient-reported health (EQ-5D Index): baseline .938 ± .061; mean change .001 ± .070; d = .02; p = .842; 21% responders. Performance (TUG): baseline 6.1 ± 0.9 s; mean change 0.4 ± 0.59 s; d = .65, p < .001). No participant achieved the clinical MCID for TUG. Muscle quality was available only in the healthy cohort and showed a negligible effect (baseline: 5.60 ± .63°; MD: .04 ± .43°; d = .08; p = .358, 15% responders. Standard inpatient rehabilitation: Patient-reported health (EQ-5D Index): baseline .825 ± .140; mean change .047 ± .153; d = .31; p < .001; 43% responders. Performance (TUG): baseline 11.4 ± 4.7 s; mean change 2.6 ± 3.2 s; d = 0.80; p < .001; 24% responders. Early outpatient rehabilitation: Patient-reported health (EQ-5D Index): baseline .721 ± .171; mean change .101 ± .134; d = .75; p < .001; 65% responders). Performance (TUG): baseline 17.8 ± 5.6 s; mean change 7.8 ± 4.4 s; d = 1.79; p < .001; 96% responders. Correlations between domain-specific changes were small to moderate across cohorts (e.g., ΔTUG vs ΔEQ-5D Index: r = .12 (p = .129) in standard inpatient rehabilitation; r = .40 (p = .059) in early inpatient rehabilitation; r = .17 (p = .059) in healthy. Viewing rehabilitation outcomes as multidomain patterns rather than single endpoints enables more nuanced evaluation across programmes. Our analysis showed that functional performance (CROM) achieved the largest gains during the intervention period, whereas muscle quality and patient-reported health (PROM) remained largely stable. Correlations between domain-specific changes were weak to moderate, confirming that these domains capture complementary, non-redundant aspects of outcome quality. This observation aligns with previous findings, which emphasized that PROMs and CROMs provide different but complementary information [4]. Recognizing this multidomain perspective is essential for personalized care, as domains respond differently across rehabilitation settings and time points. For example, MCID thresholds were developed for



clinical populations, meaning healthy cohorts rarely achieve them due to ceiling effects, while patients in early outpatient rehabilitation start from lower functional levels and show greater potential for improvement. These baseline-driven differences highlight the need for contextual interpretation

rather than uniform thresholds. To address these challenges, future work will focus on developing a multidomain outcome model that integrates functional performance, patient-reported health and muscle quality. This will support personalised interventions, enable comparisons across rehabilitation settings and allow the early recognition of non-responders.

**Keywords:** Patient-Reported Outcome Measures (PROM), Clinician-Reported Outcome Measures (CROM), Minimal Clinically Important Difference (MCID), Healthy Cohort vs Musculoskeletal Rehabilitation Patients, Exercise Therapy, Response Patterns, Outcome Domains.

