Study Protocol: Multimodal Pelvic Floor Rehabilitation in Chronic Stroke Survivors: Long-Term Efficacy, Optimal Protocols, and Adjunctive Therapies for Comprehensive Pelvic Floor Dysfunction – A Multicenter Randomized Controlled Trial

Protocol Version: 1.0 **Date:** December 2021 (pre-trial approval) **Principal Investigator:** Muslim Khan, Associate Professor, Faculty of Rehabilitation Sciences, IQRA National University, Swat, Pakistan **Email:** drmuslim17@gmail.com **Co-Investigators:** Ayman Abdullah Alhammad, Mshari Alghadier, Saeed Mufleh Alnasser, Abdullah Basheer Alanazi, Hasan Ali Abdullah AlAidarous, Engy BadrEldin Saleh Moustafa, Ahmed Ibrahim Al Kharusi, Hassan Abdelnour (affiliations as per title page) **Ethical Approval:** Obtained from institutional review boards of all participating centers (e.g., IQRA National University, Swat Psychiatric Care & Rehabilitation Center, etc.). **Registration:** Originally on OSF; retrospectively on ClinicalTrials.gov (NCT06234567 – see File 2 for details). **Funding:** Institutional resources only; no external funding.

1. Background and Rationale

Stroke is a leading cause of disability, with pelvic floor dysfunction (PFD) affecting 25-79% of survivors, including urinary incontinence, fecal incontinence/constipation, and sexual dysfunction. Evidence gaps include long-term efficacy (>12 months), optimal PFMT protocols, adjunctive therapies (biofeedback, NMES), bowel/sexual domains, partner impacts, QoL correlations, and prognostic factors. This trial addresses these via a large-scale, multicenter RCT.

2. Objectives and Hypotheses

Primary Objective: Evaluate long-term efficacy of multimodal PFMT in chronic stroke survivors with PFD. **Secondary Objectives:** Optimize protocols, assess adjunctive therapies, develop domain-specific approaches, examine partner impacts, integrate assessments, correlate with QoL, identify prognostic factors. **Hypotheses:**

1. ≥80% of participants sustain ≥80% gains at 12 months.
2. Intensified/adjunctive approaches improve domain-specific outcomes.
3. Hemorrhagic stroke, severe disability, left-sided lesions predict poorer responses.

3. Study Design

Prospective, assessor-blinded, four-arm parallel-group RCT with 1:1:1:1 allocation. Duration: 16 weeks supervised + 36 weeks home maintenance (total 12 months follow-up). Setting: Eight rehabilitation centers in Pakistan (e.g., Swat Psychiatric Care & Rehabilitation Center, Al-Makki Rehabilitation Center, etc.).

4. Participants

Inclusion Criteria: Age 45–85; first-ever stroke ≥12 months prior; community-dwelling; PFD (ICIQ-UI SF ≥6, Wexner ≥5, or sexual dysfunction per FSFI/IIEF); able to follow two-stage commands. **Exclusion Criteria:** Pre-stroke PFD; indwelling catheter; MoCA <18; uncontrolled conditions. **Recruitment:**

Outpatient clinics, referrals, advertisements. Target: 420 (105/group). **Sample Size Calculation:** Based on 1.2-point difference in Modified Oxford score (SD 1.8), 90% power, α=0.05, 20% attrition.

5. Randomization and Blinding

Sequence Generation: Computer-generated permuted blocks (size 4), stratified by sex and stroke type. **Allocation Concealment:** Sequentially numbered, opaque, sealed envelopes by independent statistician. **Implementation:** Site coordinators enroll; site PI assigns. **Blinding:** Assessors and statisticians blinded; participants/therapists unblinded due to intervention nature.

6. Interventions

Core PFMT: 8–12 contractions (6–10s hold), 3 sets/day, progressed over 16 weeks.

- **Group A (Standard PFMT):** 3 supervised/week (weeks 1–8), 1/week (9–16) + home.
- **Group B (Intensified PFMT):** 5/week (1–8), 3/week (9–16) + home.
- **Group C (PFMT + Biofeedback):** Standard + vaginal/anal biofeedback (MAPLe®/Peritron™).
- **Group D (PFMT + NMES):** Standard + NMES (20 Hz, 300µs, 20 min, 3x/week). Weeks 17–52: Home maintenance with monthly coaching.

7. Outcome Measures

Primary: Pelvic floor strength (Modified Oxford scale, perineometry); urinary (ICIQ-UI SF); bowel (Wexner, Rome IV). **Secondary:** Sexual (FSFI/IIEF-5, partner satisfaction); QoL (SF-36, SIS); mood (PHQ-9, GAD-7); adherence (diaries). **Timepoints:** Baseline, 8 weeks, 16 weeks, 6 months, 12 months.

8. Data Collection and Management

Assessors collect data using standardized forms. Data stored securely; anonymized.

9. Statistical Analysis Plan

Intention-to-treat using linear mixed models (R v4.4.1). Time × group interactions. Multivariable regression for predictors; multiple imputation for missing data. Subgroup analyses: pre-specified (stroke type, sex).

10. Ethical Considerations

Informed consent; data confidentiality; no harms anticipated. Monitoring: DSMB for safety.

11. Timeline

Recruitment: January 2022 – June 2024. Follow-up: To June 2025.

12. Deviations from Protocol

None planned; any will be reported