

Development of a Nurse-Led Intrinsic Capacity Intervention Protocol Based on the Health Action Process Approach for Older Adults with Stroke

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Abstract: This study aimed to develop an intrinsic capacity (IC) intervention protocol for older adults with stroke based on the Health Action Process Approach (HAPA). A preliminary protocol was drafted through literature retrieval, evidence extraction, and team discussion, with the HAPA used to organise the behavioural process and the five IC domains (locomotion, vitality, cognition, psychological capacity, and sensory capacity) used to specify intervention content. Two rounds of Delphi consultation were conducted with 16 experts from hospitals and nursing education institutions, and item importance, coefficient of variation (CV), expert authority, and Kendall's coefficient of concordance were analysed. The response rate was 100% in both rounds, with an expert judgement coefficient of 0.900, a familiarity coefficient of 0.731, and an authority coefficient of 0.816. Kendall's W increased from 0.235 in round 1 to 0.317 in round 2 (both $P < 0.001$), and the final-round CVs ranged from 0.000 to 0.136. The final protocol contained 3 primary indicators, 10 secondary indicators, and 20 tertiary indicators, which covered risk perception, outcome expectancy, self-efficacy, action planning, coping planning, home practice, follow-up, peer support, and recovery after interruption. The protocol offers a structured, Delphi-informed intervention plan that links HAPA-based behaviour change processes with domain-specific IC content for older adults with stroke, although further feasibility testing is needed before effectiveness evaluation.

1. Introduction

Stroke remains a major source of death and disability worldwide. The World Stroke Organization Global Stroke Fact Sheet 2025 describes a large and continuing burden of prevalent

stroke, mortality, disability, and cost, while the Global Burden of Disease Study 2021 shows that stroke continues to impose substantial health loss across regions [1,2]. For older adults, recovery after the acute stage depends on residual physical and mental capacity, family support, risk-factor control, and the ability to continue rehabilitation-related behaviours after discharge.

Intrinsic capacity (IC), proposed in the World Health Organization healthy ageing framework, refers to the composite of physical and mental capacities that an individual can draw upon [3]. WHO integrated care for older people guidance uses IC to organise attention to locomotion, vitality, cognition, psychological capacity, and sensory capacity, and recommends assessment and care planning around declines in these domains [4]. Longitudinal evidence further indicates that higher IC is associated with lower risks of functional decline and mortality in older adults [5]. These findings make IC a useful target for older stroke patients, whose motor impairment, swallowing difficulty, cognitive changes, post-stroke depression, and sensory problems may interact during recovery.

Existing stroke rehabilitation guidance stresses early assessment, goal setting, rehabilitation planning, secondary prevention, and continuity between hospital and community care [6,7]. However, most intervention content for older stroke patients is still organised around single problems such as mobility, nutrition, mood, or cognition. An IC-oriented intervention protocol can provide a more integrated content structure, but it also needs a behavioural pathway that explains how patients and families move from receiving information to practising and maintaining daily actions.

The Health Action Process Approach (HAPA) addresses this need by distinguishing motivational and volitional processes in health behaviour change. Risk perception, outcome expectancy, and action self-efficacy support intention formation, whereas action planning, coping planning, maintenance self-efficacy, and recovery self-efficacy support action initiation and maintenance [8]. Therefore, this study aimed to develop a HAPA-based IC intervention protocol for older adults with stroke through evidence synthesis and Delphi expert consultation.

2. Methods

2.1 Study design and research team

This methodological study developed an IC intervention protocol through literature retrieval, preliminary item generation, two rounds of Delphi consultation, and final revision. A seven-member research team was established, including specialists in neurological nursing, rehabilitation medicine, and clinical psychology. The team was responsible for evidence extraction, protocol drafting, expert consultation, data analysis, and finalisation of the intervention items.

2.2 Development of the preliminary protocol

Chinese and international databases were searched, including CNKI, Wanfang Data, VIP, the Chinese Science Citation Database, PubMed, Web of Science, Embase, and Medline, from inception to December 1, 2025. Search terms covered stroke, older adults, intrinsic capacity, locomotion, cognition, vitality, psychological capacity, sensory capacity, HAPA, health education, nursing intervention, rehabilitation, nutrition, cognition, mood, sensory function, and home practice. Inclusion criteria were: older stroke patients or older adults as the population; IC assessment, IC intervention, or one of the five IC domains as the content; guidelines, evidence summaries, expert consensus, systematic reviews, randomised controlled trials, or intervention development studies as eligible literature types; and full text available in Chinese or English. Duplicates, inaccessible full texts, and studies unrelated to IC or stroke-related intervention content were excluded. Two trained

researchers independently screened titles, abstracts, and full texts; disagreement was resolved through team discussion. Sixteen sources were finally used to draft the preliminary protocol, including expert consensus, clinical guidelines, evidence summaries, systematic reviews, and randomised trials.

The preliminary protocol retained the HAPA process as the main structure: pre-intentional, intentional, and action stages. Evidence-based IC content was mapped into the protocol according to the five domains. Domain-specific content was selected mainly from WHO ICOPE guidance, stroke rehabilitation and secondary prevention guidelines, geriatric nutrition guidance, and stroke rehabilitation/recovery recommendations [4,6,7,9,10]. The final protocol specified the target person, timing, contact mode, frequency, executor, implementation content, and referral reminders where needed.

2.3 Ethical considerations

This study was approved by the Ethics Committee of North China University of Science and Technology (approval No. 2025091). All experts were informed of the study purpose and participated voluntarily. Completion and return of the questionnaire were considered informed consent. Expert information and consultation results were anonymised and used only for research purposes.

2.4 Delphi expert consultation

Experts were recruited from hospitals and nursing education institutions in Hebei Province, China. Eligible experts had at least 10 years of work experience in a relevant field or an intermediate or senior professional title, a bachelor's degree or above, expertise in neurological nursing, neurological medicine, rehabilitation, clinical nutrition, psychology, nursing management, or nursing education, and willingness to complete two consultation rounds. The consultation questionnaire included four parts: an introduction to the study background and purpose, expert demographic and professional information, expert judgement basis and familiarity, and item-importance ratings. Each item was scored on a 5-point Likert scale from 1 (not important) to 5 (very important), with open spaces for revision comments and additional suggestions.

Questionnaires were distributed by email or paper form between December 2025 and February 2026. After round 1, the research team summarised quantitative ratings and qualitative comments, revised item wording, merged overlapping expressions, and adjusted operational details. The revised questionnaire was then used in round 2. Items were retained when the mean importance score was at least 4.0 and the CV was 0.25 or lower; items not meeting these criteria were revised or removed after team discussion and expert comments.

2.5 Statistical analysis

Data were analysed using SPSS 25.0. Expert enthusiasm was expressed as the questionnaire response rate. Expert authority was calculated as $Cr=(Ca+Cs)/2$, where Ca represented judgement basis and Cs represented familiarity. Expert agreement was evaluated using mean importance score, standard deviation, CV, and Kendall's coefficient of concordance. Statistical significance was set at $P<0.05$.

3. Results

3.1 Expert characteristics and consultation results

Sixteen experts participated in both rounds of Delphi consultation, with a response rate of 100% in each round. Their professional experience averaged 17.69 ± 7.45 years (range: 10 to 30 years). Four experts held senior professional titles, seven held associate senior titles, and five held intermediate titles. In terms of educational background, five held doctoral degrees, four held master's degrees, and seven held bachelor's degrees. The experts were drawn from cerebrovascular disease nursing (n=6), neurological rehabilitation (n=2), nursing education (n=5), nursing psychology (n=2), and clinical nutrition (n=1). Eight experts provided suggestions for revision in round 1 and four in round 2, with comments mainly concerning wording clarity, intervention feasibility, and integration of the five IC domains.

3.2 Expert authority and engagement

The expert authority coefficient (Cr) was 0.816, derived from a familiarity coefficient (Cs) of 0.731 and a judgment coefficient (Ca) of 0.900, indicating an acceptable level of expert authority. Both the response rate and the rate of expert feedback remained high across the two rounds.

3.3 Consensus and coordination of expert opinions

Across the two Delphi rounds, item importance scores ranged from 3.69 to 5.00. The coefficients of variation decreased from 0.000 – 0.237 in the first round to 0.000 – 0.136 in the second round, suggesting improved convergence of expert opinions after iterative revision. Kendall's W increased from 0.235 to 0.317 ($P < 0.001$).

3.4 Iterative revision and final protocol formation

Following two Delphi rounds and multidisciplinary team review, the intervention protocol underwent iterative refinement. In round 1, eight tertiary indicators were revised, mainly to clarify behavioural descriptions and refine alignment with the five IC domains. In round 2, three additional tertiary indicators were modified based on expert feedback to improve feasibility and clinical applicability.

The final protocol consisted of 3 primary indicators, 10 secondary indicators, and 20 tertiary indicators. It was structured around the HAPA behaviour change process and mapped to the five intrinsic capacity domains: locomotion, vitality, cognition, psychological capacity, and sensory capacity (Table 1).

Table 1: HAPA-based intrinsic capacity intervention protocol for older adults with stroke.

Indicator	Score, mean $\pm$ SD	CV
1 Pre-intentional stage	5.00 $\pm$ 0.00	0
1.1 Risk perception	5.00 $\pm$ 0.00	0
1.1.1 Content: Structured education on intrinsic capacity (IC), five IC domains, stroke-related capacity decline, and daily warning issues including dysphagia, spasticity, falls, and depressive symptoms. Timing/frequency: Within 24 – 48 h after admission; 20 – 30 min group or bedside session.	4.81 $\pm$ 0.403	0.084
1.1.2 Content: Patient – family discussion on loss of independence, participation restriction, symptom burden, and home-care concerns, supported by guided questions and short scenarios. Timing/frequency: During hospitalization; 15 – 20 min.	4.69 $\pm$ 0.479	0.102
1.2 Outcome expectancy	5.00 $\pm$ 0.00	0

1.2.1 Content: Peer experience sharing through recovered stroke survivors or recorded narratives to strengthen realistic expectations for daily recovery. Timing/frequency: Once during hospitalization or before discharge; 10 – 15 min.	4.63 ±0.500	0.108
1.2.2 Content: Explanation of expected benefits of IC-related behaviours, including safer mobility, adequate nutrition, cognitive stimulation, emotional adjustment, sensory compensation, and improved daily participation. Timing/frequency: Combined with goal-setting session before discharge.	4.94 ±0.250	0.051
1.3 Action self-efficacy	5.00 ±0.00	0
1.3.1 Content: Clinicians summarise baseline intrinsic capacity results and immediately co-identify one priority, feasible behaviour that the patient feels confident to perform in daily life. Timing/frequency: After baseline assessment; 10-15 min.	4.81 ±0.403	0.084
1.3.2 Content: Clarification of family roles in reminders, encouragement, daily assistance, safety observation, and reinforcement of planned behaviours. Timing/frequency: Before discharge; 10-15 min with patient and caregiver.	4.75 ±0.447	0.094
2 Intentional stage	5.00 ±0.00	0
2.1 Action planning	5.00 ±0.00	0
2.1.1 Content: Individualized short-term goal setting based on IC assessment, stroke-related function, swallowing status, cognition, mood, home environment, tolerance, and caregiver availability. Timing/frequency: Before discharge; 20-30 min.	4.75 ±0.447	0.094
2.1.2 Content: A structured intrinsic capacity action plan is developed based on baseline assessment and predefined rehabilitation goals. The intervention provides standardized intervention framework across five IC domains with protocol-guided adjustment based on clinical assessment and caregiver context. Locomotion guidance includes safe physical activity, progressive home-based exercise, balance and fall-prevention strategies, and assisted functional training when appropriate. Vitality guidance includes dietary optimization, adequate protein intake, regular meals, swallowing precautions, food texture modification, weight and nutrition monitoring, and oral nutritional supplementation when indicated. Cognitive guidance includes daily cognitive stimulation, memory aids, task reminders, calendars or clocks, and caregiver-supported cueing. Psychological guidance includes breathing relaxation, emotional expression, peer or family support, problem-solving strategies, and referral advice for persistent depressive or anxiety symptoms. Sensory guidance includes vision and hearing care, environmental modification (lighting and noise reduction), use of assistive devices, and home safety optimization. Timing/frequency: The plan is formulated before discharge, implemented at home by patients and caregivers according to tolerance, and reviewed during scheduled follow-up visits for reinforcement and adjustment.	5.00 ±0.00	0
2.2 Coping planning	5.00 ±0.00	0
2.2.1 Content: Identification of barriers to home implementation, such as fatigue, pain, forgetting, low mood, limited family support, poor swallowing safety, and uncertainty about exercise intensity; matching coping strategies are prepared. Timing/frequency: Before discharge; 15-20 min.	4.69 ±0.479	0.102
2.2.2 Content: Recall of previous successful rehabilitation or coping experiences to strengthen confidence in handling setbacks. Timing/frequency: Before discharge or during early follow-up; 10-15 min.	4.38 ±0.500	0.114
2.3 Maintenance self-efficacy	5.00 ±0.00	0
2.3.1 Content: Short health messages, graphics, or videos delivered through WeChat/text message, with a fixed question-and-answer period for home practice problems. Timing/frequency: Twice weekly after discharge.	4.56 ±0.512	0.112
2.3.2 Content: Teach-back confirmation of key knowledge and skills, including medication use, fall prevention, swallowing precautions, nutritional monitoring, activity safety, and warning signs requiring professional help. Timing/frequency: Before discharge and reinforced during follow-up.	4.56 ±0.512	0.112
3 Action stage	5.00 ±0.00	0
3.1 Action initiation	5.00 ±0.00	0
3.1.1 Content: Use of an action log to record IC-related behaviours and outcomes; records may be completed independently or with caregiver assistance. Timing/frequency: Initiated at discharge; completed daily or several times weekly according to the action plan.	4.56 ±0.512	0.112
3.1.2 Content: Early video follow-up to review home safety, lighting, walking routes, bathroom safety, obstacles, food preparation, feeding position, and communication conditions. Timing/frequency: Within 1 week after discharge; 15-20 min.	4.44 ±0.512	0.115
3.2 Action maintenance	5.00 ±0.00	0
3.2.1 Content: Review of recent implementation, reinforcement of completed behaviours, and feedback linked to agreed goals. Timing/frequency: Every 2 weeks after discharge.	4.50 ±0.516	0.115

3.2.2 Content: Adjustment of task intensity, frequency, or content according to tolerance, symptoms, safety concerns, and home feasibility. Timing/frequency: At each follow-up or when problems occur.	4.50 ±0.516	0.115
3.3 Recovery self-efficacy	4.81 ±0.403	0.084
3.3.1 Content: When planned behaviours are interrupted, triggers such as fatigue, pain, dizziness, poor sleep, emotional distress, or caregiver difficulty are analysed and the plan is revised. Timing/frequency: As needed during follow-up.	4.38 ±0.500	0.114
3.3.2 Content: For repeated interruptions, the nurse conducts a one-to-one telephone discussion using OARS strategies (open-ended questions, affirmations, reflective listening, and summarizing) to help the patient identify a practical point at which to resume the interrupted behaviours. Timing/frequency: As needed; 15-30 min per call.	4.25 ±0.577	0.136
3.4 Long-term maintenance	5.00 ±0.00	0
3.4.1 Content: Online peer support for sharing practical experiences in activity, nutrition, mood adjustment, cognitive reminders, sensory aids, and family care. Timing/frequency: Weekly or biweekly after discharge.	4.38 ±0.500	0.114
3.4.2 Content: Guidance on transferring learned behaviour-change strategies to new IC goals and daily contexts. Timing/frequency: Late follow-up or before completion of the intervention cycle.	4.75 ±0.447	0.094

Note: The implementer is a trained neurological nurse or trained member of the research team. Timing and frequency may be adjusted according to clinical stability, cognitive status, rehabilitation tolerance, and caregiver availability. Abbreviations: CV, coefficient of variation; HAPA, Health Action Process Approach; IC, intrinsic capacity; OARS, open-ended questions, affirmations, reflective listening, and summarizing; SD, standard deviation.

4. Discussion

This study developed a HAPA-based IC intervention protocol for older adults with stroke through evidence synthesis and two rounds of Delphi consultation. The 100% response rate, Cr value of 0.816, decreasing CVs, and increased Kendall's W after revision indicate active expert participation and progressive convergence of opinion. The final protocol retained the HAPA process while incorporating five-domain IC content into operational nursing actions.

The main value of the protocol is its clinical specificity. IC provides the content focus for older stroke patients, while HAPA gives the intervention sequence. In the pre-intentional stage, education and feedback are used to make capacity-related risks concrete. In the intentional stage, the five-domain action plan translates IC into home-practice tasks. In the action stage, logs, early video follow-up, periodic review, peer support, and restart support are used to sustain practice after discharge.

The protocol also responds to the need for practical intervention descriptions. Stroke rehabilitation guidelines emphasise early screening, accessible goal setting, coordinated rehabilitation, and transition from hospital to community care [6,7]. The present protocol specifies when education is given, how long key contacts last, how often follow-up occurs, who is involved, and which IC-domain actions are included. This helps the protocol function as an implementable intervention plan.

Several limitations remain. The expert panel was drawn from one province, so wider regional consultation may improve generalisability. The protocol was developed through literature synthesis and expert consensus, and its feasibility, acceptability, and clinical effects should be tested in subsequent studies. Patient and caregiver preferences were reflected indirectly through clinical experience and expert judgement; future refinement should include direct patient and caregiver feedback.

5. Conclusion

This study developed a HAPA-based IC intervention protocol for older adults with stroke. The final protocol contains 3 primary indicators, 10 secondary indicators, and 20 tertiary indicators, integrating behaviour-change stages with five IC domains and specifying operational content for ward education, discharge preparation, home practice, follow-up, and recovery after interruption.

The protocol provides a structured reference for IC-oriented nursing intervention and offers a basis for future feasibility and effectiveness studies.

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