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Construction of an Intervention Program for Intrinsic Capacity in Elderly Patients with Diabetes Mellitus Complicated with Hypertension

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Abstract: This study aims to construct an intervention program for the intrinsic capacity (IC) of elderly patients with diabetes mellitus (DM) complicated with hypertension based on the Integrated Care for Older People (ICOPE) model, providing a reference for clinical intervention. A preliminary intervention program was formulated through literature review, then refined via two rounds of expert panel meetings (11 experts participating, involving deletion of 4 tertiary-level items and clarification of 1 primary-level and 3 tertiary-level items) to form the final program. Conclusions indicate the program is necessary, scientific, and clinically applicable, offering a basis for IC intervention in this population.

1. Introduction

China's seventh national population census showed that in 2020, the proportion of people aged 60 and above was 18.7%, with those aged 65 and above accounting for 13.5%[1], and it is predicted that China will enter a hyper-aging society by 2031[2]. The World Health Organization (WHO) proposed the concept of IC in the "World Report on Aging and Health"[3], referring to the combination of all physical and mental abilities an individual can mobilize at any time, including cognition, vitality, locomotion, psychological well-being, and sensory function[4].

DM and hypertension are the two most common metabolic chronic diseases in China, with increasing prevalence rates year by year. Due to overlapping etiologies and pathogenic mechanisms, they often coexist, and the prevalence is higher in the elderly and increases with age[5]. This comorbid state poses a greater health threat and accelerates IC decline in the elderly compared to either disease alone[6]. Currently, there are relatively few studies on improving IC in elderly patients with DM complicated with hypertension.

The ICOPE model proposed by WHO is based on the community medical service system, including five steps: screening, comprehensive assessment, formulating care goals and nursing plans, ensuring the implementation of referral and monitoring plans, and community participation and support for caregivers[7], with verified feasibility[8]. This study adopts the expert panel meeting method to construct an IC intervention program for elderly patients with DM complicated with hypertension based on the ICOPE model, aiming to provide support for improving their IC.

2. Methods

2.1 Establishment of a Research Team

The research team consists of 5 members: 1 postgraduate supervisor (responsible for research design and quality control), 1 chief nurse, 1 rehabilitation therapist (responsible for program formulation and expert selection), and 2 nursing postgraduates (responsible for literature review, meeting organization, and opinion summary). Weekly meetings were held to review progress and revise the program.

2.2 Formulation of the Preliminary Draft of the Intervention Program

2.2.1 Theoretical Basis

Based on the ICOPE model's "screening - assessment - intervention - follow-up - support" approach[3][4], combined with the interactive mechanism of the five IC dimensions and the characteristics of physical, psychological, and social frailty in elderly comorbid patients[9], the program covers the entire cycle of admission, hospitalization, and discharge, forming a continuous care chain of "hospital - community - family".

2.2.2 Literature Search

Chinese search terms included "diabetes mellitus complicated with hypertension", "hypertension complicated with diabetes mellitus", "hypertension", "diabetes mellitus", combined with "elderly", "older adults", "elderly people", and combined with "intrinsic capacity", "locomotion", "psychological", "malnutrition", "sensory", "hearing", "vision", "cognition". English search terms included (diabetes mellitus and hypertension OR diabetes and hypertension OR hypertension combined with diabetes mellitus OR hypertension and diabetes mellitus OR hypertension and diabetes) AND (old OR the elder OR old people OR older people OR old adult OR older adult OR aged) AND (intrinsic capacity OR locomotion OR psychological OR malnutrition OR sensory OR hearing OR visual OR cognition). A combination of free words and subject terms was used for systematic searches in databases including CNKI, Wanfang Data, VIP Chinese Journal Database, China Biomedical Literature Database, PubMed, Web of Science, Science Direct, and Wiley, from database inception to June 2024. The PIPOST model was used to determine literature inclusion criteria: 1) Population (P): elderly patients with DM complicated with hypertension, aged ≥ 60 years; 2) Intervention (I): interventions related to improving patients' IC; 3) Professional (P): nurses, psychologists, rehabilitation therapists, relatives; 4) Outcome (O): IC, locomotion, psychological well-being, nutrition, vision, hearing, cognition; 5) Setting (S): hospitals, communities, home settings, etc.; 6) Type (T): expert consensus, practice guidelines, systematic reviews, evidence summaries, and interventional studies (including quasi-experimental studies and randomized controlled trials). Exclusion criteria: 1) Literature without full-text access; 2) Duplicate publications; 3) Guideline interpretations, abstracts, and translated guidelines; 4) Literature with updated published versions; 5) Literature with low quality assessment.

2.2.3 Literature Screening and Data Extraction

A total of 4808 literature records were initially retrieved, 3668 remained after deduplication, 3623 were excluded after title and abstract screening, and 45 full texts were reviewed. Finally, 12 high-quality literatures (8 Chinese, 4 English) were included, and key intervention information was extracted (see Table 1).

Table 1 Basic Characteristics of Included Studies

Included Literature	Year	Study Type	Intervention Content
Yang Liu[10]et al.	2023	Quasi-experimental study	Control group: Routine exercise and health education; Experimental group: Baduanjin exercise combined with cognitive training.
Liu Wanying[11] et al.	2019	Quasi-experimental study	Control group: Routine community chronic disease health education; Observation group: Emotion release therapy guided by TCM meridian theory on the basis of the control group.
Shi Lei[12]et al.	2023	Randomized controlled trial	Control group: Community diabetes health education and routine exercise intervention; Intervention group: Community diabetes health education and flexibility training.
An Shumin[13] et al	2021	Quasi-experimental study	Control group: Routine nursing intervention; Experimental group: Dual-task training based on self-determination theory.
Yu Huihui[14] et al.	2015	Randomized controlled trial	Control group: No intervention; Intervention group: 5 sessions of group psychological intervention focusing on physical and mental relaxation.
Chen Wuxian[15] et al.	2006	Randomized controlled trial	Control group: Routine antihypertensive drug treatment + health lifestyle education and consultation during hospitalization; Observation group: Routine antihypertensive drug treatment + behavioral intervention measures and music therapy.
Liu Zhixin[16] et al.	2023	Randomized controlled trial	Routine group: Routine nursing intervention; Evidence-based emotional group: Evidence-based emotional nursing model intervention.
Mou Lisha[17] et al.	2022	Before-and-after self-control study	8-week modified Chinese DASH diet intervention, including dietary guidance stage (Weeks 1-2), centralized meal supply stage (Weeks 3-4), and home-based medical care stage (Weeks 5-8).
Paula TP[18] et al.	2015	Randomized controlled trial	Control group: Dietary plan recommended by the American Diabetes Association; Intervention group: Hypertension prevention and control dietary plan combined with increased walking using a pedometer.
Arija V[19] et al.	2018	Randomized controlled trial	Control group: Routine clinical nursing; Intervention group: Group walking exercise + sociocultural activities.
Wheeler MJ[20] et al.	2019	Three-arm randomized crossover trial	Sedentary group (SIT, control group): Continuous sitting for 8 hours; Exercise + sedentary group (EX+SIT): 1 hour sitting + 30 minutes moderate-intensity walking + 6.5 hours sitting; Exercise + intermittent sitting group (EX+BR): 1 hour sitting + 30 minutes moderate-intensity walking + 6.5 hours sitting with 3-minute low-intensity walking every 30 minutes.
Pariser G[21] et al.	2013	Before-and-after self-control study	10-week Diabetes Self-Management Education (DSME) program, including vital sign self-monitoring, group exercise, and diabetes education.

2.3 Expert Panel Meetings

2.3.1 Discussion Content of Expert Panel Meetings

Two online expert panel meetings were held on August 20 and 27, 2024. Before the meetings, relevant materials were sent to experts. The first meeting involved introducing the research and discussing each item of the preliminary program; the second meeting focused on the revised program to reach a consensus.

2.3.2 Expert Selection

Eleven experts were invited, meeting the criteria of: (1) expertise in gerontological nursing, diabetes/hypertension specialist nursing, or rehabilitation; (2) intermediate or above professional title; (3) bachelor's degree or above; (4) at least 5 years of professional experience.

2.4 Statistical Methods

SPSS 26.0 was used for data analysis. Descriptive statistics were applied: captegorical data as

frequency (n) and percentage (%), continuous data as mean ± standard deviation ($\bar{x} \pm s$). $P < 0.05$ was considered statistically significant.

3. Results

3.1 General Information of Experts in the Panel Meetings

The 11 experts participating in the panel discussion cover fields including endocrinology, cardiovascular medicine, internal medicine nursing, and gerontological nursing, consisting of 2 physicians and 9 nurses with an average working experience of (27.36 ± 7.10) years. In terms of educational background, 7 hold bachelor's degrees (63.64%) and 4 have postgraduate degrees (36.36%). Regarding professional titles, 5 are senior-grade specialists (45.45%) and 6 are associate senior-grade specialists (54.55%).

3.2 Results of Expert Panel Meetings

The first meeting discussed 5 primary-level, 11 secondary-level, and 30 tertiary-level items. Four tertiary-level items were deleted; implementation details (timing, frequency, duration) were added to 3.2.1-3.2.3; content of "Monitoring and Implementation" was specified; follow-up methods were added. The second meeting reached a consensus on all items, forming the final program (see Table 2).

Table 2 Intrinsic Capacity Intervention Program for Elderly Patients with Diabetes Mellitus Complicated with Hypertension

Primary-Level Items	Secondary-Level Items	Specific Content
1 Preliminary Screening	1.1 Screen for IC decline	Use the WHO ICOPE screening tool to assess the IC of included subjects and determine whether they have IC decline.
2 Comprehensive Assessment	2.1 In-depth assessment	2.1.1 Interview patients on admission to identify nursing problems and needs. 2.1.2 Collect personal information, living habits, and dietary preferences via questionnaires. 2.1.3 Assess locomotion (SPPB), vitality (MNA-SF), cognition (MMSE), psychological well-being (GDS-15) to determine IC decline degree.
	2.2 Assess and manage potential diseases	2.2.1 Investigate the patient's medication history. 2.2.2 Conduct diabetes complication screening, determine the presence of target organ damage, and assess the patient's cardiovascular risk level. 2.2.3 Inquire about the occurrence of stressful events (falls, hospitalization for acute diseases) within one year.
	2.3 Assess support needs	Use the Chinese version of Barthel Index (BI) to assess daily living assistance needs.
3 Formulate Personalized Care Plans	3.1 Set person-centered nursing goals	3.1.1 Based on preliminary assessments, physicians formulate blood glucose and blood pressure control goals for patients. 3.1.2 Combined with the goals formulated by physicians, jointly determine goals with the patient according to their priorities, needs, and preferences.
	3.2 Develop care plans	3.2.1 Diet: Low-salt, low-fat, diabetic diet; calculate daily energy intake; formulate plans considering preferences; provide guidance during hospitalization; weekly follow-up and biweekly lectures after discharge; assess MNA-SF at 1 and 3 months post-discharge. 3.2.2 Exercise: Multi-component program (aerobic, resistance, balance, flexibility training) with personalized frequency/duration/intensity; supervise during hospitalization; weekly follow-up and exercise videos after discharge; assess SPPB at 1 and 3 months post-discharge. 3.2.3 Cognition: Twice-weekly group activities during hospitalization; train caregivers on cognitive stimulation before discharge (3 times/week, 10 minutes/time); weekly follow-up after discharge; assess GDS-15 and MMSE at 1 and 3 months post-discharge.
4 Monitoring and Implementation	4.1 Disease knowledge guidance and	4.1.1 Guide patients on disease knowledge, monitoring, and risk factors. 4.1.2 Conduct 6 weekly 30-minute lectures. 4.1.3 Follow-up to assess knowledge mastery.

	monitoring	
	4.2 Motivation guidance and monitoring	4.2.1 Guide patients to establish a correct understanding of the disease. 4.2.2 Invite 3 patients with good prognosis to give lectures every month to help patients build confidence in healthy living and good prognosis.
	4.3 Guidance and monitoring of behavioral skills	4.3.1 Provide guidance on monitoring, diet, exercise, medication, etc., during admission and discharge. 4.3.2 Establish WeChat groups with check-in and reward systems. 4.3.3 Remind patients of regular follow-up. 4.3.4 Home visits for low-compliance patients.
5 Support Caregivers	5.1 Inquiry of caregivers	5.1.1 Assess care burden via two questions. 5.1.2 Assess emotions via two questions about depression and interest loss.
	5.2 Provision of support	5.2.1 Train caregivers on nursing skills (monitoring, insulin injection). 5.2.2 Establish caregiver WeChat groups for advice and encourage patient participation in decision-making. 5.2.3 Provide psychological support for stressed caregivers.

4. Discussion

4.1 Necessity of the Program

The "China Cardiovascular Health and Disease Report 2024"[22] shows that the prevalence of hypertension and DM in Chinese adults is 31.6% and 12.8%, respectively, with high comorbidity rates (24.3%-70.3% DM in hypertensive patients, ~60% hypertension in diabetic patients)[23]. Elderly patients with DM complicated with hypertension often have cognitive impairment, poor mental health, and nutritional problems[24][25][26], and IC declines with age, accelerated by comorbidity[27]. Current clinical guidelines focus on single diseases[28], with simplistic IC interventions[29]. This program, centered on individuals and multi-dimensional, addresses aging challenges and meets the health needs of this population, with important practical value.

4.2 Scientificity of the Program

The preliminary program was formulated through rigorous literature review (12 high-quality literatures included) and multidisciplinary team discussion. The 11 invited experts have rich experience (average 27.36 years of work experience) and high professional levels (5 senior titles, 4 postgraduates). The program aligns with IC development laws in this population and is supported by evidence-based medicine, adopting a multi-disciplinary collaborative approach, ensuring scientificity.

4.3 Clinical Applicability of the Program

Integrating the ICOPE model with the "admission - hospitalization - discharge" process, the program includes 5 primary-level, 11 secondary-level, and 27 specific items. A multidisciplinary team formulates "diet + exercise + cognition" interventions, considering individual differences. The content is specific, easy to operate, and does not require complex equipment, demonstrating good clinical applicability.

5. Conclusion

Based on the ICOPE model, this study constructed an IC intervention program for elderly patients with DM complicated with hypertension through literature review and two rounds of expert panel meetings. The program is comprehensive, operable, necessary, scientific, and clinically applicable, providing a reference for IC intervention. Limitations include the need for expanded sample size in future clinical trials to verify effectiveness.

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