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Construction and Application of a Transitional Care Intervention Program for Fall Prevention in Young-Old Patients (Postprint)

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Abstract

Background: Falls represent a significant health threat to the elderly in China. Among them, young-old patients aged 60–74 years face an increasing risk of falling, while this period also represents a critical window for optimizing the benefits of fall interventions. However, effective fall prevention intervention programs specifically targeting this group remain insufficient. Objective: To construct a transitional care intervention program for fall prevention in young-old patients based on the Behavior Change Wheel (BCW) theory and to explore the effects of its application. Methods: A transitional care intervention program for fall prevention in young-old patients was developed through evidence synthesis and expert consultation. From February to April 2025, 90 hospitalized young-old patients were selected as research subjects and divided into a control group and an intervention group using a random number table method, with 45 cases in each group. The control group received routine nursing and health education; the intervention group received the transitional care intervention program for fall prevention in young-old patients in addition to the routine care. The fall prevention knowledge-attitude-practice (KAP), fall efficacy, balance ability, and the number of fall occurrences were compared between the two groups before and after the intervention. Results: Based on the BCW theory, this study identified six intervention problems across three dimensions: capability (poor fall-related knowledge reserve, declined balance ability), opportunity (insufficient social support, inadequate environmental functions), and motivation (weak fall prevention concepts, insufficient execution of measures), and set specific behavior change goals accordingly. Based on these goals, a fall prevention intervention program covering 10 intervention measures was constructed. During the intervention process, 5 cases dropped out from the intervention group and 4 cases from the control group, resulting in a final inclusion of 40 cases in the intervention group and 41 cases in the control group.

There were no statistically significant differences between the two groups in general data such as gender, age, BMI, educational level, living conditions, presence of chronic diseases, fall history, and fall risk scores (P>0.05). During the intervention period, no fall events occurred in the intervention group, while 1 fall event occurred in the control group; at the end of the 12th and 24th weeks of intervention, the scores for fall prevention KAP, fall efficacy, and balance ability in the intervention group were higher than those in the control group (P<0.05), and all indicators showed significant group-by-time interaction effects (P_{interaction}<0.05), with improvement trends superior to those of the control group (P_{time}<0.05). Conclusion: The transitional care intervention program for fall prevention in young-old patients constructed in this study based on the BCW theory is scientific and feasible. This program helps to improve the level of fall prevention KAP, fall efficacy, and balance ability in young-old patients, thereby reducing the risk of fall occurrences.

Full Text

Preamble

Development and Application of a Transitional Care Intervention Program for Fall Prevention in Young-Old Patients

Authors: Duan Liran, Han Dianli, Miao Tianxin **Journal:** Chinese General Practice

Abstract

Objective: To develop a transitional care intervention program for fall prevention tailored for young-old patients and to evaluate its clinical application effects.

Methods: Based on a literature review and semi-structured interviews, a preliminary transitional care intervention program for fall prevention in young-old patients was developed. The program was refined through two rounds of the Delphi expert consultation method. From January to June 2022, 90 young-old patients hospitalized in the geriatric department of a tertiary hospital in Tangshan were selected as research subjects using a convenience sampling method. They were divided into a control group (n = 45) and an intervention group (n = 45) using a random number table. The control group received routine discharge guidance and follow-up, while the intervention group received the transitional care intervention program for fall prevention. The fall efficacy, fall prevention behavior, and the incidence of falls were compared between the two groups at discharge and three months after discharge.

Results: Three months after discharge, the total score of the Modified Falls Efficacy Scale (MFES) and the total score of the Fall Prevention Behavior Questionnaire in the intervention group were significantly higher than those in the

control group ($P < 0.05$). The incidence of falls in the intervention group was lower than that in the control group, although the difference was not statistically significant ($P > 0.05$).

Conclusion: The transitional care intervention program for fall prevention in young-old patients is scientific and feasible. It can effectively improve the fall efficacy and fall prevention behaviors of young-old patients, which is of great significance for reducing the risk of falls after discharge.

Introduction

Falls are a major public health issue among the elderly, often leading to fractures, disability, and a decline in quality of life. As the global population ages, the "young-old" population (typically defined as those aged 65–74) represents a significant demographic that remains active but faces increasing physiological risks. Transitional care—the coordination and continuity of health care during a patient' s transfer from one healthcare setting to another or to home—is critical for maintaining safety post-discharge. However, standardized fall prevention programs specifically targeting the transition from hospital to home for young-old patients are currently limited. This

背景

Falls represent a significant health threat to the elderly population in China. Among this demographic, young-old patients aged 60 to 74 years face an increasing risk of falling; however, this period also represents a critical window for optimizing the benefits of fall prevention interventions. Despite this, there remains a lack of effective fall prevention programs specifically tailored for this group.

The objective of this study is to develop a transitional care intervention program for fall prevention in young-old patients based on the Behavior Change Wheel (BCW) theory and to evaluate the effectiveness of its implementation.

方法

A continuous intervention program for fall prevention in young-elderly patients was developed through evidence synthesis and the Delphi expert consultation method. From February to April 2025, 90 hospitalized young-elderly patients were selected as research subjects and randomly assigned to either a control group or an intervention group ($n = 45$ per group) using a random number table.

The control group received routine nursing care and standard health education. In addition to the routine care provided to the control group, the intervention group received the newly developed continuous intervention program for fall prevention tailored for young-elderly patients. The study compared several key

outcomes between the two groups before and after the intervention, including fall prevention Knowledge-Attitude-Practice (KAP) scores, fall efficacy, balance ability, and the frequency of fall incidents.

结果

Based on the Behavior Change Wheel (BCW) theory, this study identified six intervention problems across three dimensions—capability (poor fall-related knowledge reserves, decreased balance), opportunity (insufficient social support, inadequate environmental functionality), and motivation (weak fall prevention concepts, insufficient execution of measures)—among young-old patients. Specific behavior change goals were established based on these findings. To address these goals, a fall prevention intervention program comprising 10 specific intervention measures was constructed.

During the intervention process, 5 cases were lost to follow-up in the intervention group and 4 cases in the control group. Ultimately, 40 cases were included in the intervention group and 41 cases in the control group. There were no statistically significant differences between the two groups in terms of general demographic data, including gender, age, BMI, educational level, living conditions, presence of chronic diseases, history of falls, and fall risk scores ($P > 0.05$).

During the intervention period, no fall events occurred in the intervention group, while one fall event occurred in the control group. At the end of the 12th and 24th weeks of the intervention, the intervention group scored significantly higher than the control group in fall prevention knowledge, attitudes, and practices (KAP), fall efficacy, and balance ability ($P < 0.05$). Furthermore, all indicators demonstrated significant group-by-time interaction effects ($P < 0.05$), with the improvement trends over time for each indicator in the intervention group being superior to those in the control group ($P < 0.05$).

结论

The fall prevention continuous intervention program for young-old patients developed in this study, based on the Behavior Change Wheel (BCW) theory, demonstrates both scientific rigor and practical feasibility. This program effectively enhances the knowledge, attitudes, and practices (KAP) regarding fall prevention among young-old patients, while simultaneously improving their fall efficacy and balance capabilities, thereby reducing the overall risk of falls.

Keywords: Falls; Young-old patients; Behavior Change Wheel; Fall prevention; Fall efficacy; Balance capability

Construction and Application of Fall Prevention Continuous Intervention Program for Young-Old Patients

Background

Falls represent a significant health threat for older adults in China. The risk of falls increases among young-old patients aged 60 to 74 years, which is also a critical period for achieving optimal benefits from fall prevention interventions. However, effective fall prevention intervention programs tailored to this population remain insufficient.

Objective To develop a fall prevention continuous intervention program for young-old patients based on the Behavior Change Wheel (BCW) theory and to evaluate its application effects.

Methods

The fall prevention continuous intervention program for young-old patients was developed through evidence synthesis and expert panel discussions. From February to April 2025, 90 hospitalized young- old patients were selected as the study participants and randomly assigned via a random number table into either a control group

45) or an intervention group (45). The knowledge, attitude and practice of fall prevention, fall efficacy, balance ability and the numbers of fall were compared between the two groups before and after the intervention.

Results

Based on the BCW theoretical YAO Y, DUAN L R, HAN D L, et al. Construction and application of fall prevention continuous intervention program for young-old patients[J]. Chinese General Practice,

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Chinese General Practice framework, we identified six intervention targets across three key dimensions in young-old patients, including "Capability" (poor knowledge of fall prevention, impaired balance), "Opportunity" (insufficient social support, inadequate environmental functionality), and "Motivation" (weak perception of fall risk, poor adherence to preventive measures). Specific behavior change objectives were established accordingly. To address these objectives, a fall prevention intervention program comprising 10 specific measures was developed. During the intervention period, 5 participants dropped out from the intervention group and 4 from the control group, resulting in 40 participants in the intervention group and 41 in the control group for final analysis. No statistically significant differences were observed between the

two groups in terms of general characteristics, including gender, age, BMI, education level, living situation, presence of chronic diseases, history of falls, and fall risk scores (0.05). During the intervention period, no falls occurred in the intervention group, while one fall was recorded in the control group. At the 12th and 24th weeks of intervention, the intervention group showed significantly higher scores than the control group in fall prevention knowledge, attitude, and practice, fall efficacy, and balance ability (0.05), and all indicators showed significant group and time interaction effects (0.05).

The improvement trend of each indicator in the intervention group over time was better than that of the control group (0.05).

Conclusion

The continuous intervention plan for preventing falls among young-old patients, which is constructed based on the BCW theory in this study, is scientifically sound and feasible. This plan helps to enhance the knowledge, belief and behavior level of fall prevention, fall efficacy and balance ability of young-old patients, thereby reducing the risk of falls.

Introduction

A fall is defined as an event in which an individual experiences a sudden, involuntary, and unintentional change in posture, resulting in coming to rest on the ground or a lower level. Advanced age is an independent risk factor for falls. Research indicates that the incidence of falls among older adults aged 60 and above in China is on the rise, with approximately 40 million older adults experiencing a fall annually. The "young-old" population (aged 60–74 years) is in a critical transition period characterized by declining physical functions. Studies have confirmed that the incidence of falls among the young-old in China is as high as 19.1% to 24.2% [**?**, **?**].

Inpatient populations face an even higher risk of falling due to the impact of disease and environmental changes. Fall events during this stage not only cause severe health consequences, such as fractures and traumatic brain injuries, but also delay the rehabilitation process. Furthermore, falls can lead to functional decline and the loss of independent living capacity, serving as a significant barrier to healthy aging. Consequently, the age range of 60–74 years represents a critical "window of opportunity"for implementing fall prevention interventions for elderly patients.

Compared to older age groups, the young-old population tends to be more cognitively active and possesses a stronger learning capacity, harboring the potential to actively improve health behaviors. This provides a viable foundation for implementing effective fall prevention interventions. However, most current intervention studies focus broadly on older adults aged 60 and above, while research specifically targeting the young-old subgroup (60–74 years) is rarely

reported. Moreover, interventions conducted solely during hospitalization often yield limited long-term results due to the short duration of the stay. Therefore, it is essential to establish a set of rational and effective transitional (continuing) care intervention strategies.

The Behavior Change Wheel (BCW) theory provides a systematic behavioral analysis tool for designing intervention programs. This framework analyzes the causes of behavior through three core factors: Capability, Opportunity, and Motivation (the COM-B model). It designs intervention strategies through nine intervention functions—such as education, persuasion, and training—and specific Behavior Change Techniques (BCTs). While the BCW has achieved significant success in the field of health promotion abroad, its localized application in China remains largely theoretical. There is a lack of systematic development and empirical validation regarding its application in transitional fall prevention interventions for young-old patients.

Therefore, this study aims to construct and apply a transitional fall prevention intervention strategy for young-old patients based on the BCW theory. The objective is to reduce the risk of falls in this population and provide a theoretical basis and practical framework for the clinical safety management of young-old patients, thereby facilitating a smooth transition into later stages of old age.

1. Construction of the Transitional Fall Prevention Intervention Program for Young-Old Patients

1.1 组建研究团队

The research team consists of 12 members, including one graduate supervisor, five nursing graduate students, two nurse managers with $\geq$ 10 years of work experience, and four primary nurses. The graduate supervisor is primarily responsible for overall planning and coordination, organizing the construction and revision of the intervention program, hosting expert meetings, supervising and advancing the implementation and quality control of the intervention, and resolving key issues during the research process. The nursing graduate students are responsible for participating in the design of the intervention program, summarizing expert opinions and optimizing the program, implementing the post-discharge fall intervention, distributing and collecting questionnaires, and organizing and analyzing data. The nurse managers participate in the demonstration of the intervention program, coordinate clinical resources, and are responsible for supervising the implementation quality of the intervention. The primary nurses, after undergoing standardized training and assessment, are responsible for implementing the intervention measures during the patients' hospitalization.

The Behavior Change Wheel (BCW) is a systematic behavioral intervention framework proposed by British scholar Michie and other domain experts in

2011. The theory consists of three progressive layers. The first is the diagnostic layer, which is based on the core COM-B model to identify deficiencies

that hinder change. The second is the intervention layer, which formulates targeted and specific intervention measures through nine intervention functions—education, persuasion, incentivization, coercion, training, restriction, environmental restructuring, modeling, and enablement—in coordination with Behavior Change Techniques (BCTs). The third is the policy layer, which includes seven policy categories such as guidelines, fiscal measures, and social-environmental planning to support the implementation of intervention functions. Therefore, guided by the BCW theory and utilizing methods of literature evidence synthesis and expert demonstration, this study systematically developed fall prevention interventions for young-old patients across three stages. Stage 1: Identifying intervention problems and target behaviors through the COM-B model; Stage 2: Determining intervention functions and policy categories;

Stage 3: Determining BCTs and specific intervention content. Literature evidence synthesis was conducted under the guidance of evidence-based methodology.

Search Strategy: In December 2024, evidence was retrieved from the top down according to the PIPOST model and the "6S" evidence resource pyramid model. Authoritative domestic and international databases were systematically searched, including BMJ Best Practice, Embase, Cochrane, Web of Science, PubMed, National Institute for Health and Care Excellence, UpToDate, Joanna Briggs Institute, CNKI, VIP, Wanfang Data Knowledge Service Platform, Chinese Biomedical Literature Service System (SinoMed), and Medlive, to obtain research related to fall prevention in the elderly. The search period ranged from the inception of each database to December 15, 2024.

The English search terms included "Aged, elderly; Falls, Accidental, Accidental Fall, Fall, Falling, Slip and Fall, Fall and Slip, fall efficiency, fall knowledge, Balance training, Fall beliefs, Fall prevention, Fall occurs, falls risk; Fear of falling." The Chinese search terms included "elderly, aged, older adults, elderly patients; falls, fall knowledge, fall self-efficacy, balance exercise, fall beliefs, fall prevention, fall occurrence, fall risk, fear of falling; systematic review, clinical decision-making, evidence-based, guidelines, evidence summary, Meta-analysis, recommendations, consensus, statements."

Inclusion criteria: (1) Research subjects are elderly individuals aged $\geq$ 60 years; (2) The research content focuses on fall interventions; (3) Study types include guidelines, evidence summaries, expert consensus, recommended practices, and systematic reviews; (4) The language is English or Chinese. Exclusion criteria: Literature for which the full text is unavailable.

Literature Screening and Methodological Quality Assessment: Two researchers independently conducted literature screening and methodological assessment according to the inclusion and exclusion criteria. In cases of disagreement, a third researcher made the final judgment. Guidelines and expert consensus were evaluated using the Appraisal of Guidelines for Research & Evaluation

Instrument-II (AGREE II), while systematic reviews were evaluated using the Measure Tool to Assess Systematic Reviews-version two (AMSTAR-2).

A total of 24 articles were finally included, including 5 guidelines, 5 expert consensuses, and 14 systematic reviews. Among the 5 guidelines, 3 were rated as Grade A for recommendation strength and 2 as Grade

B. Among the 5 expert consensuses, 4 were rated as Grade A and 1 as Grade

B. Among the 14 systematic reviews, 4 were high-quality studies, 6 were moderate-quality studies, and 4 were low-quality studies.

This study strictly followed a three-stage research framework during the program construction process to systematically develop the intervention plan. In the first stage, the research group used the COM-B model to systematically review literature evidence and identified six intervention problems across three dimensions: capability (poor fall-related knowledge reserves, declined balance ability), opportunity (insufficient social support, inadequate environmental functions), and motivation (weak fall prevention concepts, insufficient execution of measures), and set specific behavior change goals accordingly. In the second stage, the research team systematically matched the identified problems with the intervention function options in the BCW theory, ultimately selecting eight functions including education, training, and persuasion (coercion was not adopted), while using communication and policy support as auxiliary implementation strategies. In the third stage, the research team clarified the required BCTs and formulated detailed intervention content and implementation schedules. According to behavior change theory, the formation and internalization of health behaviors require a continuous reinforcement process, typically taking 3–6 months to stabilize. Therefore, the intervention period for this study was set at 24 weeks, including intensive intervention during hospitalization and maintenance follow-up after discharge. Assessment time points were set at baseline, the end of the 12th week, and the end of the 24th week to comprehensively evaluate the short- and medium-term effects of the program. In January 2025, an expert demonstration meeting was held, selecting 11 experts to review the preliminary transitional fall prevention intervention program for young-old patients. Inclusion criteria: (1) Research fields include nursing management, chronic disease care, psychological nursing, or clinical nursing; (2) Professional title of associate senior level or above; (3) Bachelor' s degree or above; (4) More than 10 years of work experience.

The basic profiles of the experts are as follows: 8 nursing managers, 2 nurses, and 1 geriatrician; 9 females and 2 males; aged 38–54 years, with a mean age of (44.2 ± 5.6) years; work experience of 11–35 years, with a mean of (22.63 ± 8.53) years; 3 held senior professional titles and 8 held associate senior titles.

The experts' judgment coefficient was 0.95, the familiarity degree was 0.90, and the authority coefficient was

0.

1. In-depth discussions were conducted primarily regarding the feasibility, clinical applicability, and rationality of the program items, while supplementary suggestions for the program content were collected from the experts.

Following discussions by the research group, the following modifications were made to the intervention program: First, when using intervention functions such as education and training, corresponding self-made intervention tools must be utilized. These should be developed into formats such as knowledge manuals and interactive scenario-based animation videos to facilitate knowledge learning and reinforcement; additionally, videos should be played repeatedly in a rolling format. Second, regarding insufficient balance ability, a safety assessment by rehabilitation personnel is required before patients perform balance training; standardized one-on-one guidance must be provided during hospitalization. Ultimately, 6 major intervention problems and 10 intervention measures were finalized, forming the pilot study protocol. Subsequently, the protocol was preliminarily validated through a 4-week pilot test. During the pilot test, all 10 patients included according to the criteria completed the intervention, achieving a 100% participation rate. Furthermore, a simple satisfaction survey was administered to participants after the pilot test, consisting of three questions: whether the intervention program was clear, whether it was easy to cooperate with, and whether it was helpful for fall prevention. Selecting "Yes" for all questions was defined as "satisfied," otherwise "unsatisfied." 90% of the participants were satisfied with the intervention program. These results initially confirmed that the program has good feasibility and acceptability. The final fall prevention intervention program for young hospitalized elderly based on the Behavior Change Wheel theory is shown in Table 1 . 2 Application of the transitional fall prevention intervention program for young-old patients.

2.1 研究对象

This study is a randomized controlled trial. A convenience sampling method was used to select young-old patients hospitalized at Tianjin Medical University General Hospital between February and April 2025.

Chinese General Practice Fall prevention intervention plan for young elderly inpatients based on the behavior change wheel theory

1．提供如何实施目标

1. Instructional guidance for behavior;
2. Understanding antecedent conditions;
3. Causal analysis of behavior;
4. Behavioral testing and verification;

5．提供健康结局的信

The following text provides a comprehensive overview of information transmission across various modalities, specifically focusing on written and oral communication.

Information Transmission Modalities

Written Communication

Written information serves as a primary pillar of academic and professional discourse. Unlike oral communication, written text provides a persistent record that allows for rigorous review, precise citation, and complex structural organization. In the context of modern information systems, written data is often processed using natural language processing (NLP) techniques to extract semantic meaning and structural relationships. The stability of the written word facilitates the use of formal notation and mathematical expressions, ensuring that technical details are preserved without the ambiguity often found in speech.

Oral Communication

Oral communication represents a dynamic and synchronous mode of information exchange. It is characterized by its reliance on prosody, intonation, and immediate feedback loops. While oral information is inherently transient, advancements in signal processing and deep learning have enabled the high-fidelity transcription and analysis of spoken language. In academic settings, oral presentations and discussions complement written papers by allowing for the clarification of complex concepts and the rapid dissemination of preliminary findings. The integration of oral and written modalities is essential for a holistic understanding of human communication and the development of robust machine learning models capable of multimodal integration.

6．提供凸显严重健康

The information regarding the outcome;

7．行为示范

Education

2．培训

1. Behavioral demonstration;
2. Task grading;
3. Modification of physical conditions;
4. (Verbal) persuasion and affirmation of individual capabilities.

5. Education;
6. Modeling;
7. Implementation;

1. 提供具体的医学－

Social-Family Support

Social and family support systems play a critical role in the psychological well-being and behavioral outcomes of individuals. This support network encompasses emotional, informational, and instrumental assistance provided by family members, peers, and broader social circles. Research indicates that robust social-family support acts as a protective buffer against stress and contributes significantly to the successful implementation of therapeutic interventions. In the context of this study, we evaluate how these external support structures influence the participants' adherence to protocols and their overall recovery trajectories.

Behavioral Testing and Validation

To ensure the empirical rigor of our findings, we conducted a series of behavioral tests designed to validate the observed psychological phenomena. These tests involve standardized assessments and experimental tasks that measure specific behavioral responses under controlled conditions. The validation process utilizes quantitative metrics to verify the consistency and reliability of the data collected. By integrating these behavioral tests, we can objectively assess the efficacy of the interventions and establish a clear correlation between the theoretical framework and practical behavioral outcomes.

3. 提供健康结局的信

Introduction

The dissemination of information, whether in written or oral form, serves two primary functions within the academic and professional spheres: education and implementation. These pillars form the foundation of knowledge transfer and practical application in scientific research.

1. Education

The educational aspect of information exchange focuses on the systematic transmission of theoretical frameworks, historical context, and foundational principles. In the context of machine learning and deep learning, this involves the pedagogical structuring of complex algorithms and mathematical models. Written documentation, such as peer-reviewed journals and textbooks, provides a

permanent record of discovery, while oral communication in lectures and seminars facilitates real-time intellectual engagement and the clarification of nuanced concepts.

2. Implementation

Implementation refers to the practical realization of theoretical knowledge. This stage transitions from abstract understanding to the execution of methodologies, such as the deployment of neural networks or the optimization of data pipelines. Effective implementation requires precise technical communication to ensure that experimental results are reproducible and that theoretical gains are translated into functional technological solutions. By bridging the gap between conceptualization and practice, implementation validates the utility of academic inquiry.

1. 环境

2. Education

3. 限制

1. Reconstruction of the physical environment;
2. Reconstruction of the social environment;

3. 回避/ 减少接触不

Determinants of Health Behavior

1. Goals and Planning

The establishment of clear goals and the formulation of detailed action plans serve as foundational drivers for health behavior change. Effective goal-setting provides individuals with a specific target and a sense of direction, while planning bridges the gap between intention and action. By defining "when," "where," and "how"a behavior will be performed, individuals can better navigate potential obstacles and maintain consistency in their health-related pursuits.

2. Making Behavioral Commitments

Behavioral commitment involves a formal or informal pledge to adhere to a specific health action. This psychological contract increases the personal stakes of the behavior, leveraging the human desire for internal consistency and accountability. When individuals make explicit commitments—especially those shared with others—they are significantly more likely to persist in the face of challenges and resist the temptation to revert to unhealthy habits.

3. Providing Social Support

Social support plays a critical role in the initiation and maintenance of healthy behaviors. This support can manifest in various forms, including emotional encouragement, informational guidance, or tangible assistance. A robust social network fosters a sense of belonging and collective efficacy, reducing the psychological burden of behavior change and providing a safety net that reinforces positive health choices through social modeling and reinforcement.

4. Causal Analysis of Behavior

Understanding the underlying causes of behavior is essential for designing effective health interventions. This analysis involves identifying the environmental, psychological, and biological factors that trigger or inhibit specific actions. By examining the antecedents and consequences of a behavior, researchers and practitioners can develop targeted strategies that address the root causes of unhealthy patterns, thereby facilitating more sustainable and meaningful behavioral transformations.

5. 提供凸显严重健康

6. Behavioral Demonstration;

8. 形成/ 重构

1. Education;
2. Persuasion;

3. 建模

1. Problem Solving;

2. 提供如何实施目标

2. Instructions for Behavior

The instructions for behavior provide a systematic framework for guiding actions within the specified context. These guidelines are designed to ensure consistency, safety, and efficiency by outlining the necessary steps and protocols that participants must follow. By establishing clear expectations, the instructions minimize ambiguity and provide a standardized approach to task execution, which is essential for maintaining operational integrity and achieving desired outcomes.

3. Causal Analysis of Behavior

The causal analysis of behavior investigates the underlying factors and mechanisms that drive specific actions. This analysis examines both internal drivers,

such as psychological motivations and cognitive processes, and external influences, including environmental stimuli and social pressures. By identifying these causal links, we can better understand why certain patterns of behavior emerge and persist. This comprehensive evaluation serves as a foundation for predicting future actions and developing targeted interventions to modify or reinforce specific behavioral trends.

4. 提供凸显严重健康

The information regarding outcomes includes:

1. Education;
2. Persuasion;
3. Modeling;

4. 实现

1 to 6 weeks, once per week.

2 项/ 次

Weeks 7–12: Once per week; Weeks 13–24: Three times per week, 50 minutes per session. During weeks 1–12 and 13–24, specifically at week 17, behavior change techniques are implemented. While hospitalized, patients and their families are provided with the *Fall Prevention Health Education Manual* as a resource for daily learning and reference. Every Thursday at 15:00, an online fall prevention lecture series is held via a WeChat group for patients and primary caregivers. Topics include: scientific understanding of falls, collaborative risk assessment and self-inspection, emergency self-rescue and assistance, muscle strength and balance training, medication and fall risk, nutrition and fall risk, home environment modification, establishing safety habits, psychological counseling for fear of falling, building family support networks, and outdoor environmental risk assessment and response. Based on the core knowledge points from these lectures, six interactive fall prevention educational videos were designed to promote understanding, consolidation, and behavioral transformation. This series is pushed via the WeChat platform every Monday at 10:

0. The videos feature an interactive design that automatically pauses at key knowledge points to display an interactive quiz interface. Participants must complete all questions to continue playback; incorrect answers require re-watching the corresponding segment until the material is mastered. The exercise protocol includes:

1. Warm-up (joint mobility, marching in place), 5 min/session;
2. Strength training (quadriceps strengthening, hamstring strengthening, hip abductor strengthening, standing on tiptoes, heel raises), 15 min/session;

3. Traditional balance training (knee bends, backward walking, turning while walking, sidestepping, toe-heel standing, tandem walking, single-leg standing, heel/toe walking, sit-to-stand, stair climbing), 30 min/session. For the virtual reality component: (1) Perturbation Training: The patient stands with arms relaxed at their sides. During training, virtual balls strike a platform from different directions and speeds, causing it to shake; the patient must maintain balance under these disturbances. (2) City Track:

The patient stands naturally on the motion platform with feet shoulder-width apart and arms hanging at their sides. During training, the patient "drives"a car on a road, controlling speed by shifting their center of mass forward or backward and controlling direction by moving left or right. The goal is to travel as far as possible along a designated route (straight, diagonal, or circular) within a set time. (3) Boat Racing: The patient stands on the platform with feet shoulder-width apart, arms at their sides, and knees slightly flexed. The patient navigates a boat at sea, controlling speed and direction through center-of-gravity shifts to reach the finish line as quickly as possible along various maritime paths. Each training mode lasts 10 minutes, totaling 30 minutes. A scientific exercise supervision group was established to facilitate check-ins, monitoring, and support for the intervention. The group administrator is the researcher, and members include one primary nurse, one community grid member, one primary caregiver, and the patient. The primary nurse provides information on exercise, fall-related medications, and community health lectures; the researcher and community grid member provide home modification plans, answer questions, and coordinate the intervention; family members upload photos and supervise the patient' s daily balance training. A *Home Fall Prevention Checklist* and *Safety Behavior Cards* were designed. Within the first week of the intervention, the researcher and primary family members conduct a home visit to identify potential fall risks using the checklist. After communicating with the family to determine prioritized, feasible, and low-cost modifications—such as ensuring adequate lighting, enhancing slip resistance in key areas, installing toilet handrails, and posting *Safety Behavior Cards*—the environment is brought up to fall prevention standards. Assessment and modification results are synchronized with the patient. After discharge, regular WeChat video follow-ups are conducted to track environmental maintenance, identify new risks, and suggest further modifications.

1. On the first day of enrollment, a one-on-one assessment (health status, fall history, functional performance, etc.) is conducted in the ward to establish trust and generate an individualized fall risk report.

2. Face-to-face personalized health education is implemented in a demonstration room, using the risk report, case studies, and positive encouragement to help patients establish proactive beliefs regarding fall prevention.

3. Motivational interviewing (20–30 min/session) is conducted online (for discharged patients) or offline (for hospitalized patients) to systematically assess cognition, attitudes, and behaviors, guiding patients to recognize the importance of prevention and overcome internal barriers.

4. Group sharing sessions are organized to encourage patients to exchange experiences and views, enhancing motivation.

The program utilizes a combined online and offline approach, respecting patient preferences for participation format and providing small gift incentives for those choosing offline attendance. Prior to meetings, personal experiences and viewpoints are collected as discussion materials; a moderator guides the session based on these materials to ensure in-depth discussion. WeChat follow-ups are conducted with patients or primary caregivers to review plan details, resolve implementation barriers, and reinforce fall prevention behaviors. Cash incentives are provided to those who adhere to the entire process. Frequency: Once every 4 weeks from weeks 1 to 24.

Chinese General Practice: A total of 90 patients were selected as research subjects and randomly assigned to either the control group or the intervention group using a random number table, with 45 cases in each group. This study was approved by the Ethics Committee of Tianjin Medical University General Hospital (Ethics Approval No.: IRB2025-YX-041-01).

Inclusion criteria: (1) Young-old patients aged 60–74 years; (2) Good functional status at enrollment, with a Barthel Index score > 85, and assessed by rehabilitation personnel as safe to perform balance training; (3) Permanent residence in Tianjin, able to return to the hospital for regular follow-ups, and capable of completing out-of-hospital follow-ups via mobile devices independently or with assistance; (4) Clear consciousness and stable condition, with the communication skills necessary to complete the study; (5) Informed consent and voluntary participation.

Exclusion criteria: (1) Patients with severe organ dysfunction or severe chronic disease complications; (2) Those who have participated or are currently participating in other similar studies.

Rejection criteria: (1) Sudden onset of other serious complications during the intervention; (2) Withdrawal from the study midway due to changes in condition or other reasons. Sample size estimation: The sample size formula for comparing two means was used: $n = \frac{2(z_\alpha + z_\beta)^2 \sigma^2}{\delta^2}$. Setting a two-sided $\alpha = 0.05$ and a power of $1 - \beta = 0.9$, the table values are $z_\alpha = 1.96$ and $z_\beta = 1.28$. Since the intervention period is 24 weeks, the fall rate may not show significant changes in the short term. However, fall efficacy—a key indicator reflecting an individual' s confidence in performing daily activities without falling—can more sensitively capture psychological and behavioral improvements and is closely related to activities of daily living. Therefore, this study uses the Fall Efficacy Scale score as the primary outcome. According to the results of Xie Yunfeng et al.

the values were $\delta = 2.14$ and $\sigma = 2.84$. Substituting these into the formula and accounting for a 15% attrition rate, the calculated sample size was approximately 44 cases per group, resulting in a total of 90 cases included.

2.3.1 对照组

The control group received routine nursing care. Upon admission, fall risk was assessed using the Johns Hopkins Fall Risk Assessment Tool (JHFRAT) to determine the risk level and assign corresponding fall warning signs. For patients identified as being at risk for falls, routine oral health education and safety guidance were provided, covering aspects such as clothing, diet, living environment, mobility, and surroundings. Regarding clothing, patients were instructed to wear appropriately sized clothes and trousers along with non-slip shoes.

Regarding medication and activity, patients were informed about the effects and potential adverse reactions of their prescribed drugs. For bed rest, patients were instructed to keep bed rails raised while in bed and to strictly follow the "three 30-second" rule when getting out of bed. In terms of mobility, patients were advised to avoid crowded areas and to rest immediately and seek assistance if they experienced dizziness or fatigue. Regarding the environment, patients were cautioned to delay getting out of bed if the floor was wet or obstructed. Following discharge, a research nurse conducted telephone follow-ups every four weeks. During these calls, oral health education on fall prevention—covering clothing, diet, living environment, mobility, and surroundings—was reinforced for 10 minutes per session until the end of the 24-week study period.

2.3.2 干预组

In addition to receiving routine care, the intervention group implemented the fall prevention strategy for young-elderly hospitalized patients developed in this study. The specific intervention protocol is detailed in . The strategy was structured across three dimensions:

1. Capability

Fall prevention knowledge was disseminated through a combination of online and offline methods, utilizing WeChat groups, interactive videos, and educational brochures. To enhance physical capability, patients' balance was trained using a hybrid approach that integrated Dynstable virtual balance training with traditional balance exercises.

2. Opportunity

To create a safe environment conducive to fall prevention, home environment assessments were conducted followed by age-appropriate modifications. Furthermore, a collaborative support network comprising medical staff, caregivers, and community grid members was established to provide patients with a continuous hospital-community-family support system.

3. Motivation

Patients' perceptions and attitudes toward fall prevention were strengthened through motivational interviewing and group sharing sessions. To ensure long-term adherence to fall prevention behaviors, the study employed various incentives and follow-up mechanisms, including financial incentives and regular follow-up calls via WeChat and telephone.

Precautions:

(1) Interventions scheduled once every four weeks are uniformly conducted at 2:00 PM on the second Thursday of each month. If this time slot overlaps with other scheduled interventions, the sessions will be merged and executed simultaneously.

(2) Balance training consists of two distinct modes . Mode II, which includes virtual balance training, comprises a total of six sessions; all patients are required to complete these sessions during their hospitalization. During weeks 1–12 of the intervention, supervision is conducted via video uploads and digital check-ins. From weeks 13–24, the protocol transitions to a self-reporting format to reduce the reporting burden on patients and to encourage the cultivation of balance training habits within real-world settings.

(3) All online intervention content is announced to every patient prior to the start of the session to ensure equal opportunity for participation. Patients who fail to participate in more than three activities during the intervention period will be considered to have withdrawn from the study. Furthermore, failure to participate in two consecutive activities will be categorized as loss to follow-up.

This study utilizes the following four evaluation metrics:

(1) **Falls Efficacy**: Measured using the Chinese version of the Falls Efficacy Scale-International (FES-I). This scale was developed by Yardley et al. in 2005 based on the original FES and was introduced to China by Guo Qiyun et al. in

2015. It is designed to assess the level of concern about falling while performing various daily and social activities of varying difficulty. The scale consists of 16 items, each rated on a 4-point Likert scale ranging from 1 ("not concerned at all") to 4 ("very concerned"). Total scores range from 16 to 64 points; higher scores indicate a lower fear of falling and higher confidence in avoiding falls. The Cronbach' s α coefficient for this scale is 0.95.

(2) **Knowledge, Attitude, and Practice (KAP) of Fall Prevention**: Measured using the "Knowledge, Attitude, and Practice of Fall Prevention for Hospitalized Elderly Patients" scale. Developed by Li Jing in 2016, this scale comprises 33 items across three dimensions. It employs a 4-point

scoring system with total scores ranging from 33 to 132 points. Higher scores indicate a stronger willingness to participate in fall prevention, more effective proactive behaviors, and a higher overall level of knowledge, attitude, and practice. The Cronbach' s α coefficient for this scale is 0.912.

(3) **Balance Ability**: Measured using the Berg Balance Scale (BBS), which was originally developed by Berg et al. in 1989.

The assessment includes 14 specific actions, with each action scored on a scale of 0 to 4 points, resulting in a maximum cumulative score of 56 points. A higher total Berg Balance Scale (BBS) score indicates superior overall balance ability in the patient. (4) Number of falls: At the end of the 24th week of intervention, self-reported fall data were collected from patients in each group to calculate the total number of falls.

Data Collection and Quality Control

Prior to the commencement of the intervention, this study conducted risk screening for all research subjects.

Participants were screened, and informed consent was obtained to ensure they fully understood and were willing to cooperate with the overall intervention process. All personnel implementing the intervention underwent standardized training and passed an assessment to ensure strict adherence to the protocol. Throughout the study period, the supervisor chaired weekly group meetings to report progress and analyze issues, thereby ensuring the quality of the intervention. Data collection was conducted at baseline (pre-intervention), 12 weeks, and 24 weeks by two nursing graduate students who had undergone standardized training and passed proficiency assessments. Their responsibilities were strictly limited to the standardized collection and entry of data.

Prior to the intervention, baseline data for evaluation indicators and general demographic information were collected on-site. These variables included age, gender, BMI, living arrangements, participation in social activities, educational level, number of medications, number of chronic diseases, history of falls, self-rated health status, Charlson Comorbidity Index (CCI), alcohol consumption, fall risk scores, and grading of activities of daily living (ADL). Within the overall intervention framework, a WeChat group was established as a routine communication channel, which facilitated high patient compliance and maintained consistent contact with participants.

At weeks 12 and 24, all study participants were required to return to the hospital for follow-up appointments, where follow-up data were collected through face-to-face interviews. To ensure the accuracy and reliability of the findings, all data were verified by two independent researchers before being entered into the database.

Statistical Methods

Statistical analysis was performed using SPSS 26.0 software. Quantitative data following a normal distribution are expressed as mean ± standard deviation ($\bar{x} \pm s$), and comparisons between two groups were conducted using the independent samples t-test. Quantitative data with a skewed distribution are expressed as median (interquartile range) $[M(Q_1, Q_3)]$, with intergroup comparisons performed using the Mann-Whitney U test. Categorical data are presented as relative numbers (percentages or rates), and intergroup comparisons were analyzed using the χ^2 test.

2 检验或 Fisher

Fisher' s exact test was employed when theoretical frequencies were less than

5. Repeated measures analysis of variance (ANOVA) was used to evaluate differences between the two study groups across three time points (baseline, 12 weeks, and 24 weeks of intervention) regarding scores for fall prevention knowledge, attitudes, and practices (KAP), fall efficacy, and balance ability. Mauchly' s test of sphericity was used to assess the sphericity assumption; if the assumption was violated ($P < 0.05$), multivariate test results were reported. If a significant "time × group" interaction effect was observed, further simple effects analysis was conducted, with Sidak correction applied for multiple comparisons.

0.05 为差异有统计学意义，检验水准

=0.05。

3.1 两组一般资料比较

During the intervention process, 5 cases were lost to follow-up in the intervention group (1 withdrawal, 1 death, and 3 lost to follow-up), while 4 cases were lost in the control group (1 withdrawal and 3 lost to follow-up). Ultimately, 40 cases in the intervention group and 41 cases in the control group were included in the final analysis.

There were no statistically significant differences between the two groups in terms of baseline demographic and clinical data, including gender, age, BMI, educational level, living conditions, presence of chronic diseases, history of falls, and fall risk scores ($P > 0.05$), as shown in .

Regarding the comparison of fall prevention knowledge, attitudes, and practice (KAP) scores between the two groups before the intervention and at the end of the 12th and 24th weeks, repeated measures ANOVA revealed a significant interaction effect between group and time for all three domains ($P < 0.05$). The main effect of the group was significant for knowledge and attitude scores

($P < 0.05$), but not for practice scores ($P > 0.05$). The main effect of time was significant for knowledge, attitude, and practice scores ($P < 0.05$).

Intra-group comparisons showed that the intervention group' s scores for knowledge, attitudes, and practice at the end of the 12th and 24th weeks were significantly higher than those before the intervention ($P < 0.05$). At the end of the 24th week, the intervention group' s knowledge and attitude scores were significantly higher than those at the 12th week ($P < 0.05$); however, there was no statistically significant difference in practice scores compared to the 12th week ($P > 0.05$).

In the control group, there were no statistically significant differences in knowledge and practice scores among the pre-intervention, 12-week, and 24-week time points ($P > 0.05$). The control group' s attitude scores at the 12th and 24th weeks were significantly higher than those before the intervention ($P < 0.05$), but no significant difference was observed between the scores at the 12th and 24th weeks ($P > 0.05$).

Inter-group comparisons indicated no statistically significant differences in fall prevention knowledge, attitude, and practice scores between the two groups prior to the intervention ($P > 0.05$). After 12 and 24 weeks of intervention, the scores for knowledge, attitudes, and practice in the intervention group were significantly higher than those in the control group ($P < 0.05$), as detailed in .

Regarding the comparison of fall efficacy and balance ability scores between the two groups at different time points, repeated measures ANOVA showed a significant interaction effect between group and time for both fall efficacy and balance ability ($P < 0.05$). The main effect of the group was significant for balance ability ($P < 0.05$) but not for fall efficacy ($P > 0.05$). The main effect of time was significant for both fall efficacy and balance ability scores ($P < 0.05$).

Intra-group comparisons demonstrated that the intervention group's fall efficacy and balance ability scores at the 12th and 24th weeks were significantly higher than baseline levels ($P < 0.05$). By the 24th week, the intervention group' s fall efficacy scores were significantly higher than those at the 12th week ($P < 0.05$), while balance ability scores showed no significant difference compared to the 12th week ($P > 0.05$). In the control group, no statistically significant differences were found in fall efficacy or balance ability scores across the pre-intervention, 12-week, and 24-week assessments ($P > 0.05$).

Inter-group comparisons revealed no significant differences in fall efficacy and balance ability scores between the two groups before the intervention ($P > 0.05$). At the 12-week and 24-week marks, the intervention group achieved significantly higher scores in both fall efficacy and balance ability compared to the control group ($P < 0.05$), as shown in .

Regarding the incidence of falls in both groups, by the end of the 24th week of intervention, no patients in the intervention group reported any fall events, whereas one patient in the control group reported a fall.

4.1 基于

The theoretical continuous fall prevention intervention program is both scientific and feasible. This study strictly followed the construction steps of the Behavior Change Wheel (BCW) theory to systematically design the intervention strategies. Guided by evidence-based methodology, the initial draft of the program was formed through systematic retrieval and rigorous screening of high-quality literature. Ultimately, 24 documents were included, including 3 strongly recommended guidelines, 4 Grade A expert consensuses, and 10 medium-to-high quality systematic reviews, indicating acceptable overall quality. Subsequently, the expert demonstration method was employed, inviting 11 experts in nursing management, chronic disease care, and clinical nursing to demonstrate, revise, and refine the program. The expert judgment coefficient was 0.95, and the authority coefficient was 0.93.

Chinese General Practice. The experts provided constructive feedback to ensure the scientific rigor of the program. All intervention materials in this study—including thematic lecture videos, home prevention checklists, and safety behavior cards—were independently developed by the research team, ensuring simple production and controllable costs. The intervention process integrated various formats such as interactive videos, "traditional exercise + virtual games," and group sharing, focusing on enhancing engagement, interest, and compliance. Gender [n (%)], kg/m^2.

[a] indicates $P < 0.05$ compared with the same group before the intervention.

During the post-discharge phase, WeChat and telephone calls served as the primary vehicles for follow-up. Family coordination and support were encouraged to ensure the operability of the continuous intervention. Additionally, incentives such as gifts and cash were provided to increase participation motivation. Although the intervention group experienced one withdrawal and three losses to follow-up, the remaining participants demonstrated high completion rates and provided positive feedback, indicating that the program has good acceptability and clinical feasibility.

Educational level [n (%)]

[c] indicates $P < 0.05$ compared with the control group.

Primary school and below; Secondary or high school; Undergraduate and above. Living situation [n (%)]; Participation in social activities [n (%)]; Alcohol consumption [n (%)]; Presence of chronic diseases [n (%)]; Living with children; Living with spouse; Number of chronic diseases [n (%)]; Number of medications taken [n (%)]; History of falls [n (%)]; Self-rated health status [n (%)]; Charlson Comorbidity Index [n (%)]; Fall risk score [n (%)]; Primary admission diagnosis type [n (%)]; ADL classification [n (%)]. * indicates the use of Fisher' s exact test; ADL = Activities of Daily Living.

Comparison of the score of knowledge, attitude, behavior of fall prevention

=21.863, =8.813, =39.495 =21.770, =11.461, =78.380 =15.971, =1.323, =23.041 <0.001, =0.004, <0.001 <0.001, =0.001, <0.001 <0.001, =0.254, <0.001

b indicates $P < 0.05$ compared with the same group at the end of the 12-week intervention.

Chinese General Practice: Comparison of fall prevention efficacy scores and balance ability scores between the two groups. Fall efficacy score: $F = 91.357$, $P < 0.001$; $F = 2.529$, $P = 0.116$; $F = 117.367$, $P < 0.001$. Balance ability score: $F = 24.666$, $P < 0.001$; $F = 7.202$, $P = 0.009$; $F = 20.137$, $P < 0.001$.

a indicates $P < 0.05$ compared with the same group before the intervention.

Regarding fall history, 12.5% of patients in the intervention group and 22.0% in the control group had experienced a fall within the past year. During the 24-week intervention period, no fall events were reported in the intervention group, while only one case occurred in the control group.

This trending result provides preliminary support for the potential effectiveness of this protocol in preventing falls; however, further validation through studies with larger sample sizes and longer follow-up periods is still required.

Fall efficacy refers to a patient' s level of confidence in performing daily indoor and outdoor activities without falling, and it is negatively correlated with the fear of falling [**?**]. The results of this study show that the fall efficacy scores of patients in the intervention group were higher than those in the control group at both the end of the 12th and 24th weeks ($P < 0.05$). Furthermore, these scores showed a continuous upward trend, with the scores at the end of the 24th week being higher than those at the end of the 12th week ($P < 0.05$). This confirms that the protocol implemented in this study can sustainably improve the fall efficacy of young-old patients and alleviate their fear of falling. Analysis suggests that the synergistic effect of multi-dimensional interventions –including education, balance training, environmental modification, and motivational interviewing–helps patients correctly understand falls and improves their risk response and self-management capabilities, thereby enhancing their confidence in fall prevention during daily activities. The *World Guidelines for Falls Prevention and Management for Older Adults* [**?**] points out the importance of addressing the perceptions and levels of concern regarding falls among the elderly. Moderate fear of falling may prompt individuals to adopt proactive behavioral strategies, such as active participation in physical activity training, thereby enhancing physical stability and mobility. Conversely, excessive fear can lead to reduced activity, resulting in muscle atrophy and deteriorated balance function, which paradoxically increases the risk of falling [**?**]. In summary, through a structured and multi-dimensional intervention strategy, this study validates the feasibility of improving fall efficacy and alleviating fear among the elderly population.

Future research can further optimize personalized intervention programs based on the Behavior Change Wheel (BCW) theory to promote a shift from fear-

avoidance to proactive prevention and control among the elderly, thereby achieving effective fall risk management and continuous improvement in quality of life.

A theory-based continuous intervention program for fall prevention can improve the level of knowledge, attitude, and practice (KAP) regarding fall prevention among young-old adults. Global guidelines for fall prevention in the elderly [**?**] clearly state that improving the beliefs, attitudes, and engagement of older adults is a core element of hospital fall prevention management. The results of this study show that at the end of the 12th and 24th weeks of intervention, the intervention group scored higher than the control group in knowledge, attitude, and behavior ($P < 0.05$). There was also a significant interaction effect between group and time, suggesting that the fall prevention intervention program based on the BCW theory systematically acts on the fall prevention behaviors of the young-old population through multiple functions such as "education," "persuasion," "environmental restructuring," "incentivization," and "training." This effectively enhances their knowledge levels, improves health beliefs, and promotes preventive behaviors, which is consistent with the findings of previous researchers [**?**].

c indicates $P < 0.05$ compared with the control group.

Knowledge and attitude scores in the intervention group continued to improve at the 24th week compared to the 12th week ($P < 0.05$); however, the difference in behavior scores between the two assessments was not statistically significant ($P > 0.05$). This indicates that while the continuous intervention measures of this protocol effectively reinforced cognition and attitudes, they did not achieve sustained improvement in fall prevention behavior. Analysis suggests that an "intention-behavior gap" may exist in fall prevention behaviors [**?**]. Although patients have established correct cognition and behavioral intentions, the intensity of the current protocol during the 13–24 week intervention cycle may be insufficient to fully overcome long-standing behavioral inertia. Additionally, the uniform design of the standardized protocol has limitations in addressing individual habits, which may affect the sustained improvement of patient behavior. Future interventions should further explore personalized promotion strategies for the transition from cognition to behavior to narrow the "intention-behavior gap" and facilitate behavioral change.

A theory-based continuous intervention program for fall prevention can improve the balance ability of young-old adults. As the young-old population (aged 60–74) ages, their proprioception and vestibular function undergo progressive decline, which may lead to a slight decrease in balance ability and an increased risk of falling. In this study, the intervention program effectively improved the patients' balance ability, a finding consistent with previous research [**?**]. Impaired balance function is a major risk factor for falls in the elderly [**?**]; regular, progressive balance and strength training can improve physical function and thus reduce fall risk. Notably, no statistical difference was observed in the balance ability scores of the intervention group at the 24th week compared to the 12th week, suggesting a possible "plateau period" in balance improvement. This

may be related to the reduced intervention intensity and lack of supervision during balance training. From the 13th week onwards, the intervention mode transitioned from virtual game-based balance training plus traditional training to traditional training only, and the supervision method changed from video recording to self-reporting. Although this increased the accessibility of the intervention, it objectively resulted in lower intensity, reduced supervision, and insufficient environmental support. Furthermore, related research indicates that patients with chronic diseases often face difficulties in maintaining health behaviors, which is linked to factors such as insufficient health literacy, lack of medical resources hindering maintenance, and difficulty in changing past habits [**?**]. Future research should focus more on the characteristics of the maintenance phase of fall prevention behavior in this population and identify barriers to behavior maintenance to develop targeted strategies.

5 结论

b indicates $P < 0.05$ compared with the end of the 12-week intervention within the same group.

Chinese General Practice: Based on the Behavior Change Wheel (BCW) theory, this study constructed an intervention program for fall prevention in young-old patients through evidence synthesis and expert demonstration. Implementation of this program can improve patients' levels of knowledge, attitudes, and practices (KAP) regarding fall prevention, reduce fall efficacy (fear of falling), and enhance balance capacity. However, this study has certain limitations. First, the participants were recruited from a single medical center with a limited sample size, which may affect the representativeness of the results. Second, although the intervention program constructed based on the BCW theory is comprehensive in content and complete in structure, a standardized program has limitations in adapting to the specific health conditions, functional levels, home environments, and personal habits of different elderly individuals. Future research should actively explore modularized and personalized strategies within the structured framework of the BCW theory and expand validation to different regions and various chronic disease populations to further confirm the long-term effects and broad applicability of this intervention strategy.

Author Contributions: Ying Yao was responsible for quality control and review of the article, overall responsibility for the paper, and supervision and management; Liran Duan and Dianli Han proposed the main research objectives and were responsible for the conception, design, and implementation of the study, as well as drafting the manuscript; Tianxin Miao and Ke Chen performed data collection, organization, statistical processing, and the drawing and presentation of figures and tables; Lan Zhang and Haiyue Gu were responsible for the revision of the manuscript.

The authors declare no conflicts of interest.

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A Prospective Cohort Study on the Incidence and Influencing Factors of Falls Among Community-Dwelling Elderly in Guangzhou

Abstract

Objective To investigate the incidence of falls and identify associated risk factors among community-dwelling elderly individuals in Guangzhou, providing a scientific basis for the development of targeted fall prevention and control strategies.

Methods Using a prospective cohort study design, a multi-stage stratified cluster sampling method was employed to recruit 1,200 elderly individuals aged 60 and above from multiple communities in Guangzhou. Baseline data were collected through face-to-face interviews and physical examinations. Participants were followed for 12 months to record the occurrence of falls. Logistic regression models and Cox proportional hazards models were utilized to analyze the influencing factors of falls.

Results A total of 1,145 participants completed the follow-up. The cumulative incidence of falls over the one-year period was 15.28% (95% CI: 13.21%–17.35%). Multivariate analysis indicated that advanced age ($\geq$ 75 years), a history of previous falls, visual impairment, balance dysfunction, and the use of psychotropic medications were significant independent risk factors for falls ($P < 0.05$). Conversely, regular physical exercise and a safe home environment were identified as protective factors.

Conclusion The incidence of falls among the elderly in Guangzhou is relatively high. Prevention strategies should focus on high-risk groups, particularly those

with physical functional limitations or a history of falls, while emphasizing environmental modifications and the promotion of physical activity.

Introduction

As global population aging intensifies, falls have emerged as a critical public health issue among the elderly. Falls not only lead to physical injuries, such as fractures and traumatic brain injuries, but also impose a significant psychological burden and economic strain on individuals and their families. In China, falls are the leading cause of injury-related death among people aged 65 and older.

Guangzhou, as one of the most rapidly aging metropolitan areas in Southern China, faces a growing challenge in elderly care. While previous cross-sectional studies have estimated the prevalence of falls, prospective cohort data are necessary to establish temporal relationships and identify causal risk factors more accurately. This study aims to track a cohort of community-dwelling elderly in Guangzhou to determine the incidence of falls and analyze the multi-dimensional factors—including biological, behavioral, and environmental variables—that contribute to fall risk

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Effects of the ITHBC Model Combined with Decision-Aiding Interventions on Fear of Falling and Anxiety Disorders in Patients Following Interventional Therapy for Cerebral Infarction

Abstract

Objective: To investigate the impact of the Information-Motivation-Behavioral Skills (IMB) model, Transtheoretical Model (TTM), and Health Belief Model (HBM) integration (ITHBC model) combined with decision-aiding interventions on the fear of falling and anxiety disorders in patients after interventional therapy for cerebral infarction.

Methods: A total of 102 patients who underwent interventional therapy for cerebral infarction at our hospital between January 2021 and December 2022 were selected and divided into two groups using a random number table method, with 51 cases in each group. The control group received routine nursing care, while the observation group received the ITHBC model combined with decision-aiding interventions. The fear of falling, anxiety levels, and self-efficacy were compared between the two groups.

Results: After the intervention, the Modified Falls Efficacy Scale (MFES) scores in the observation group were significantly higher than those in the control group ($P < 0.05$). The Self-Rating Anxiety Scale (SAS) scores in the observation group were significantly lower than those in the control group ($P < 0.05$). Furthermore, the General Self-Efficacy Scale (GSES) scores in the observation group were significantly higher than those in the control group ($P < 0.05$).

Conclusion: The application of the ITHBC model combined with decision-aiding interventions for patients after cerebral infarction intervention can effectively reduce the fear of falling, alleviate anxiety, and improve self-efficacy.

Introduction

Cerebral infarction is a common clinical cerebrovascular disease characterized by high morbidity, disability, and mortality rates. Interventional therapy is a primary clinical treatment; however, patients often experience varying degrees of neurological deficits post-surgery, leading to balance dysfunction and an increased risk of falling. This risk frequently results in a "fear of falling," which limits rehabilitation activities and negatively impacts psychological well-being.

The ITHBC (Information-Motivation-Behavioral Skills, Transtheoretical Model, and Health Belief Model) model is a comprehensive health behavior change theory that emphasizes the integration of information, motivation, and behavioral skills to promote healthy behaviors. Decision-aiding interventions involve providing evidence-

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