NR
Japan Society of Nursing Research

JINR

Journal of International Nursing Research

An International Journal
Published by the Japan Society of Nursing Research, Japan

Volume 3 | Number 2

August 2024

Journal of International Nursing Research

Contents

Editorial

A paper conveys a story based on a consistent storyline

Naohiro Hohashi, PhD, RN, PHN, FAAN[1, 2] iD

[1]Editor-in-Chief, *Journal of International Nursing Research*, and [2]Graduate School of Health Sciences, Kobe University, Kobe, Japan

The quality of research is largely determined by the research implementation plan, that is, the basic concept and design of the research. It begins with settling on a research question to solve a problem, expanding on the theory, and generating evidence that will be useful in nursing practice. Because research cannot be conducted alone, it is particularly important to have colleagues with skills at managing research, in an environment that will assist you in developing your research skills.

When preparing to write a paper, first consider the development of the argument, consistency, and its overall structure. In many cases, the title and abstract will be the only portions disseminated, so they will need to convey sufficient information. The title should clearly indicate the content, and the abstract should summarize the paper as a whole. Keywords should avoid terms that are overly general. Also note that "affiliation" refers to the institution where the research was conducted, not the authors' affiliations at the time the manuscript is submitted.

The standardized structure for papers is the so-called IMRAD (Introduction, Methods, Results And Discussion) format. The Introduction is the section that writes "What was researched?" "Why was it researched?" It clearly explains the originality and novelty, and objectives of the research, cites related research, and briefly describes what is known and what is not known. The Methods section covers "What did you do specifically?" and "Why can you trust your results?" and describes in detail what research you undertook to ensure reproducibility. The Results section is where you write "What did you find out?" describing what you discovered and demonstrate the results that correspond to the research objectives. The Discussion section is where you write "What do the results signify?" "What can you do with this?" explaining how the research contributes to the advancement of scientific knowledge while noting possible applications to nursing practice while acknowledging the limitations of the research. Note that what you wrote in the Introduction and Results should not be repeated in the Discussion section. Finally, the Conclusion is where you indicate "What was learned from conducting the research?" and provide answers to the questions based on what you verified and examined in the research. The Conclusion is not a summary of the paper, so its content should avoid overlap with the Abstract.

By applying the IMRAD format you are able to spell out the process of scientific discovery in an orderly manner, effectively communicate your thoughts to the reader, and improve the reader's understanding. During the peer review, the Abstract, Introduction, and Conclusion are particularly important for helping reviewers understand the value of your paper. Structure your paper to clarify what was the problem, what actions you undertook, and what impactful results you obtained, composing a story that unfolds chronologically. A successful paper will be a story with a consistent storyline that will be easy for readers to understand and be interesting.

Because the general content of the research can often be grasped just by viewing the figures and tables, it is also important to create convincing figures and tables. Then, thoroughly review and revise your paper before submitting it. Editorial boards and peer reviewers of top journals are perennially busy. Therefore, write the Abstract, Introduction, and Conclusion so that it is easy for readers to understand the findings. The journey from conducting research, composing a paper, and submitting it for publication is a long one, but winning acceptance after going through rejections and revisions promises a sense of exhilaration and genuine feeling of accomplishment.

Correspondence: N. Hohashi. Email: naohiro@hohashi.org

Review Article

Older Chinese people's experiences of relocation to long-term care facilities: A literature review of qualitative studies

Li Yao, PhD, RN⬛, and Harue Masaki, PhD, RN, PHN⬛

Graduate School of Nursing, Chiba University, Chiba, Japan

Abstract

An aging population in China has made long-term care a prominent issue. Long-term facilities are accommodating an increasing number of older people. However, relocating to such facilities can be a stressful experience and may affect the quality of life there. Thus, this review study aimed to comprehensively determine the relocation experiences and perspectives from pre- to post-institutionalization in long-term care facilities. Six databases were examined to find pertinent research published between 2000 and 2022. The search terms were "Chinese," "aged," "long-term care facility," and "experience" for qualitative research published in English and Chinese. Meta-ethnography was applied to synthesize results from the included studies. Of the initial 2,114 studies retrieved, 25 studies were included. Seven core categories were identified as relocation experiences and perspectives: (i) decision-making and preparation for relocation, (ii) physical and psychological burden, (iii) attitude change toward relocation, (iv) self-efforts for adaptation, (v) care needs during admission, (vi) daily life becomes affluent through participation, and (vii) concerns about the future. This review study provided insights into the characteristics of subjective condition changes of relocation experiences among older Chinese people from pre- to post-institutionalization. Our results indicate that relocation support should start before admission and be smoothly delivered during the whole relocation period because of the transition concerns and subjective conditions that are connected and interrelated.

Keywords
aged, Chinese, experience, relocation, review

Introduction

Along with the global aging population, older Chinese people aged 60 years or above are increasing rapidly (National Bureau of Statistics of China, 2021). Furthermore, the number of disabled older people is predicted to rise substantially faster than the overall older population (Zeng et al., 2015); they are estimated to have experienced 7.44 years of living with a disability in 2030, which will increase to 11.45 years in 2050 (Luo et al., 2021). With the rising need for long-term care, the challenge of the aging population has become a prominent issue in China. Furthermore, family structures have changed due to the one-child policy and socioeconomic development, and the average number of family members decreased from 3.10 in 2010 to 2.62 in 2020 (National Bureau of Statistics of China, 2021). These modifications directly impacted conventional family support (Cheung & Kwan, 2009; Lu et al., 2021; Qian et al., 2018).

In mainland China, as well as in Hong Kong, Macao, and Taiwan society, filial piety is an important social value that includes respecting and taking care of the old parents at home, and this affects older people's care preferences and

decision-making regarding relocation (Lu et al., 2021). However, the perceptions about filial piety and care preferences shifted in the twenty-first century (Lu et al., 2021; Ng et al., 2002), resulting in an increasing number of older Chinese people living in long-term care facilities since they can no longer care for themselves at home (Lin et al., 2018; Shi & Hu, 2020). Therefore, different types of long-term care facilities with diverse functions have rapidly increased to care for older people (National Bureau of Statistics of China, 2021). In this study, we define a long-term care facility as one that offers health and/or personal care services for older people to residents instead of living at home, including all types of nursing homes, long-term care, and residential institutions.

However, relocating to a long-term care facility has been reported as a stressful experience for older people, possibly leading to physiologic and psychosocial disorders (Chen et al., 2020; Kao et al., 2004; Walker et al., 2007; Wang et al., 2021; Yang et al., 2021) and affecting adaptations and quality of life in the facility (Koppitz et al., 2017; O'Neill & Ryan, 2020; Yong et al., 2021). Travie and McAuley (1998) and McAuley et al. (1997) identified older people's relocation process into three stages, pre-institutionalization, immediately after institutionalization, and post-institutionalization, and the threat of relocation stress syndrome can occur multiple times during the course of older people's long-term care stay (Kao et al., 2004). Moreover, planned and voluntary admission and involvement during decision-making were related to a sense of self-control and autonomy, which markedly contributed to psychological adjustment and acceptance of relocation (Brownie et al., 2014; Koppitz et al., 2017; Polacsek & Woolford, 2022). Staffing, hardware facility, elderly service guarantee, and environment are key elements that influence facility quality and satisfaction (Wan et al., 2019). The relocation experiences and perspectives were also influenced by the length of stay (Sun et al., 2020).

In this study, the relocation experiences and perspectives focused on the three stages of the relocation process as defined by Travie and McAuley (1998) and McAuley et al. (1997). To integratively clarify the relocation experiences and perspectives in pre-institutionalization, immediately after institutionalization, and post-institutionalization stages, older Chinese people who lived at home in a community or living in long-term care facilities were included.

Varying experiences and viewpoints have been reported in qualitative research, because of the variable focal points connected to facility adjustment, acceptance, and satisfaction (Brownie et al., 2014; Koppitz et al., 2017; Wan et al., 2019; Sun et al., 2020; Polacsek & Woolford, 2022). These primary qualitative studies were conducted individually, and the findings of such studies are limited in scope by themselves. To the best of our knowledge, little is known regarding relocation experiences from pre- to post-institu-

tionalization in the Chinese context. To help older Chinese people successfully adjust to the new environment after moving from home to a long-term care facility, it is necessary to surmise a body of knowledge related to relocation experiences and characteristics throughout the entire relocation process.

Meta-ethnography is the synthesis of primary interpretive studies. This approach seeks to go beyond single studies to reveal the analogies between the studies and develop an inductive and interpretive form of knowledge synthesis, which can be used to understand the nature of interpretive explanations of relocation experiences through a narrative literature review (Noblit & Hare, 1988).

Therefore, in this study, we intended to clarify the relocation experiences and perspectives of older Chinese people by evaluating primary qualitative research focusing on the relocation process from pre- and post-institutionalization to long-term care facilities. For this review study, PICo was constructed as follows:

P: Older Chinese people aged 60 years or above without cognitive impairment living at home in a community or a long-term care facility, based on the definition of older people in mainland China.

I: Relocation experiences and perspectives in pre-institutionalization, immediately after institutionalization, and post-institutionalization stages.

Co: Long-term care facilities for older people to reside in and provide health and/or personal care services in the Chinese context, including mainland China, Hong Kong, Macao, and Taiwan.

Methods

This narrative review study was conducted and reported following the eMERGe guidance (France et al., 2019), including search strategy, data extraction, and meta-ethnography synthesis as specified by Noblit and Hare (1988).

Search Strategy

The search strategy was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) 2020 statement (Page et al., 2021). With China becoming an aging society in 2000, issues of long-term care for older people arose rapidly and studies focusing on these issues increased. We searched and retrieved studies published between January 1, 2000, and August 31, 2022, from electronic databases including MEDLINE, CINAHL, Web of Science, CNKI (China National Knowledge Infrastructure) Database, CSTJ (China Science and Technology Journal) Database, and China Wanfang Digital Database. The search strategies were identified (using the contributing author's knowledge and discussions, along with advice from a specialist health science librarian) as follows:

Table 1. Eligibility criteria for study selection.

Inclusion criteria	Exclusion criteria
- Chinese older people aged 60 years or above	- Chinese older people who were living overseas or with cognitive impairment
- Raw data including older people's narratives about their perceptions and experiences of relocating to a long-term facility	- Primary studies without narratives of Chinese older people themselves
- Peer-reviewed primary qualitative research	- Published as conferences, reviews, case studies, or intervention studies
- Published in English and Chinese after January 2000	

(1) aged, (2) experience, (3) long-term care facility, and (4) Chinese, including synonyms and related terms. Supplementary File 1 lists the search strategies of CINAHL. The studies were selected according to the inclusion and exclusion criteria (Table 1). References of the included studies that meet the inclusion criteria are also included.

Data Extraction and Synthesis

This review study used the reciprocal translation approach of meta-ethnography to inductively synthesize the findings of included studies, following the sequential process of phases 3-6 of meta-ethnography (Noblit & Hare, 1988).

Initially, the reviewer repeatedly read the included studies and extracted the data. The following data were extracted to describe the characteristics of the included studies: authors, date, country, aim, methods, setting and sampling, and findings. Synthesis data consisted of the first- and second-order constructs from the findings of the included studies. The first-order constructs are raw data assertions from older Chinese people. The second-order constructs are interpretations identified from primary data by the authors of the included studies. The first- and second-order constructs that reflected the same meaning of perspectives or experiences related to relocation were extracted as a single-meaning unit. The meaning units list was then constructed.

Next, included studies with common objectives or focuses on examining the experiences and perceptions of relocation were grouped to determine the relevance of included studies.

Then, the third-order constructs were synthesized by grouping the common concepts of each meaning unit to interpret the included studies' findings further. The third-order constructs were synthesized after the following procedures sequentially: identifying subcategories, categories, and core categories from meaning units. Subcategories were synthesized within formed groups to translate one study into another. Categories and core categories were synthesized across the formed groups to develop new interpretations from subcategories.

This review study utilized Microsoft Excel to handle the data. Additionally, EndNote Basic was utilized to manage the included studies. From searching to synthesis, the coauthor rechecked, discussed, and refined the content to reach a consensus.

Results

A total of 2114 studies were found during the first search. Following the removal of duplicates ($n = 342$), the title and abstract of 1772 studies were screened. Thirty-nine studies were selected for full-text review, of which 20 were included in the review. Furthermore, five studies were included through a citation search (Figure 1).

Characteristics of the Included Studies

The aim of the included studies focused on the perspectives and decision-making of relocation [$n = 5$] (Chen, 2011, 2015; Cheng et al., 2012; Tao et al., 2016; Zhang, 2019), relocation reaction [$n = 7$] (Jin et al., 2021; Lan et al., 2020; Lee, 2001; Sun et al., 2021; Wu & Rong, 2020; Xing et al., 2020; Zhan et al., 2008), perspectives and experiences of living in long-term care facility [$n = 5$] (Han et al., 2017; Jing et al., 2016; Song et al., 2018; Tse, 2007; Wang et al., 2017), care needs during admission [$n = 4$] (Chen et al., 2017; Chen et al., 2021; Chuang et al., 2015; Shen et al., 2021), perception about the quality of care [$n = 1$] (Chao & Roth, 2005), social participation [$n = 1$] (Pan et al., 2020), and family members' involvement [$n = 2$] (Lao et al., 2019; Wang et al., 2020) in the facility. The research field was conducted in Hong Kong [$n = 2$] (Lee, 2001; Tse, 2007), Macao [$n = 1$] (Lao et al., 2019), Taiwan [$n = 3$] (Chao & Roth, 2005; Chuang et al., 2015; Wu & Rong, 2020), and mainland China [$n = 19$] (Chen, 2011, 2015; Chen et al., 2017; Chen et al., 2021; Cheng et al., 2012; Han et al., 2017; Jin et al., 2021; Jing et al., 2016; Lan et al., 2020; Pan et al., 2020; Shen et al., 2021; Song et al., 2018; Sun et al., 2021; Tao et al., 2016; Wang et al., 2017; Wang et al., 2020; Xing et al., 2020; Zhan et al., 2008; Zhang, 2019).

Participants of two studies lived at home in a community (Tao et al.,2016; Tse, 2007), whereas others lived in long-term care facilities. The studies comprised 665 older people, including independent and dependent older people. The length of residency was more than 1 month. Several studies did not describe the sampling gender [$n = 1$] (Zhang, 2019), active daily living [$n = 14$] (Chao & Roth, 2005; Chen, 2011, 2015; Chen et al., 2021; Cheng et al., 2012; Chuang et al., 2015; Jin et al.,2021; Lee, 2001; Pan et al., 2020; Sun et al., 2021; Tao et al., 2016; Tse, 2007; Zhan et al., 2008;
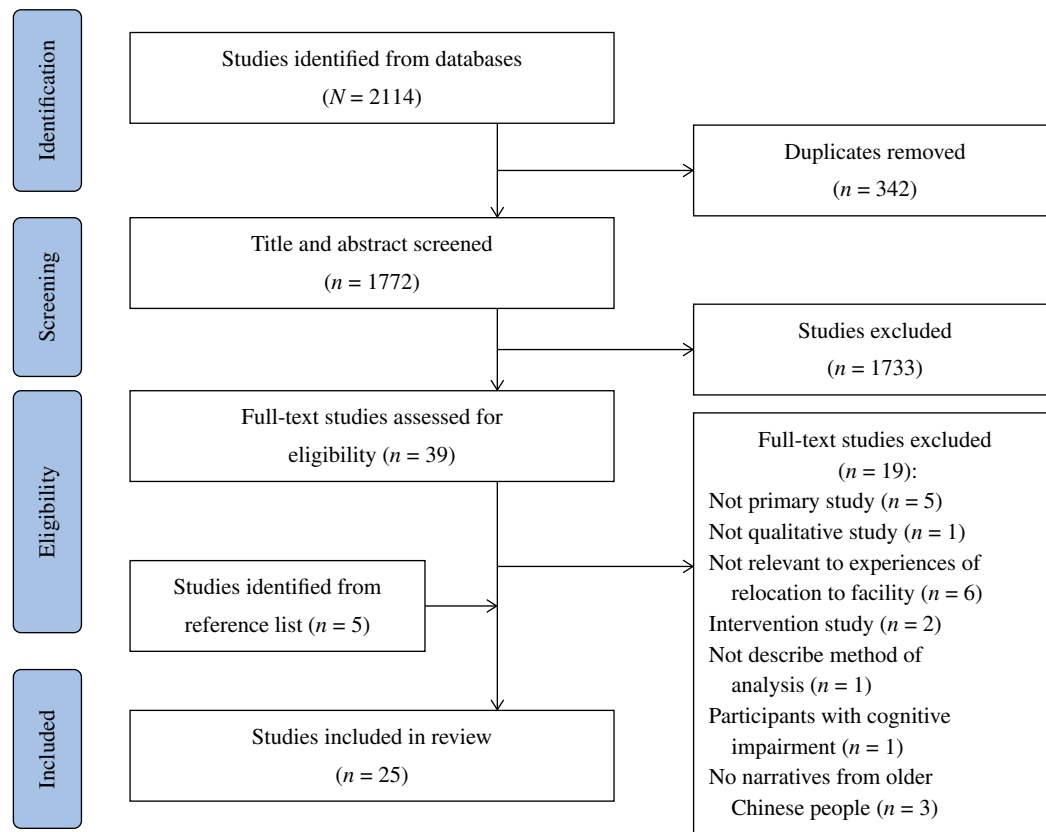
Figure 1. The process of searching strategies conducted according to preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram.

Zhang, 2019), or length of residency [$n = 3$] (Cheng et al., 2012; Lan et al., 2020; Lee, 2001).

Methods of data collection of included studies included individual interviews and group interviews. Content analysis, Colaizzi's analysis, thematic analysis, grounded theory, category analysis, and qualitative and inductive analysis were utilized to analyze the data (Table 2).

Synthesis Findings

Our research clarified the relocation experiences and perspectives of older Chinese people from pre- to post-institutionalization. Seven core categories were identified (Table 3). Core categories were (i) decision-making and preparation for relocation, (ii) physical and psychological burden, (iii) attitude change toward relocation, (iv) care needs during admission, (v) self-efforts for adaptation, (vi) daily life becomes affluent through participation, and (vii) concerns about the future.

(i) Decision-making and Preparation for Relocation

Three studies (Chen, 2011; Cheng et al., 2012; Tao et al., 2016) discussed the "attitude toward relocation." Older people voluntarily relocated to facilities because of the expectation of more personal time, self-control, and perceived change in filial piety. However, some older people still resisted admission to facilities because of negative preconcep-

tions and the stress of being regarded as unfilial or having poor family relationships.

Eight studies (Chen 2011, 2015; Cheng et al., 2012; Jin et al., 2021; Lan et al., 2020; Wu & Rong, 2020; Xing et al., 2020; Zhang, 2019) explained the "reason for relocation." Several reasons prompted the decision to relocate. Not only were care needs unmet at home because of deterioration in physical condition, poor family relationships, insecurity, and difficulty living alone, but they were also related to a sense of control and reduced care burden on family members.

Ten studies (Chao & Roth, 2005; Chen, 2011; Chen et al., 2017; Chen et al., 2021; Cheng et al., 2012; Chuang et al., 2015; Jing et al., 2016; Shen et al., 2021; Wang et al., 2017; Wu & Rong, 2020) covered the "facility selection criteria." Older people prioritized a secure environment, including constant availability of professional care workers and building designs tailored to older people (like barrier-free areas). In addition, they preferred facilities close to or with easy access to their adult children's homes. Additionally, clean, warm, and homey facilities were more welcoming.

One study (Tse, 2007) described the "preparation before relocation," including consultation with family members about the decision to relocate, requests after admission, and preparation of personal possessions and admission fees.

Table 2. Characteristics of included studies.

Author(s). Year. Location	Aim	Methods	Setting and sampling	Findings
Lee (2001). Hong Kong, China	– To explore the process through which Chinese elders adjust following residential care placement	– Semi-structured interview – Constant analysis of the grounded theory	– Setting: ($n = 1$) Residential care home – Older participants: ($n = 18$) – Gender: M = 9, F = 9 – Mean age: 79.2 years (range = 70–86 years)	– Two topics were identified: 1. The process of adjustment 2. The normalizing experiences
Chao & Roth (2005). Taipei, Taiwan	– To determine residents' perceptions of quality of care in nursing homes in Taiwan	– Semi-structured interview – Content analysis	– Setting: ($n = 4$) Public nursing homes = 1 Private nursing homes = 3 – Older participants: ($n = 22$) – Gender: M=10, F=12 – Mean age: 72 years (range = 61–86 years) – Average length of residency: 1.36 years (range = 6 months to 2 years)	– Six major dimensions of quality care were identified: 1. A caring attitude 2. Respect for individual preferences 3. Emotional support 4. Social interaction 5. Supportive environment 6. Accessible care
Tse (2007). Hong Kong, China	– To explore nursing home-related beliefs of Hong Kong Chinese older persons	– Semi-structured group interview – Content analysis	– Setting: Community day center – Older participants: ($n = 118$) – Gender: M = 57, F = 61 – Mean age: 75 years (range = 60–89 years)	– Two themes and 3 subthemes were identified: 1. Perceptions of nursing home admission: impressions of and feelings about personal life in a nursing home, facilities in the nursing home, positive impressions of nursing home placement 2. Making the nursing home a better place
Zhan et al. (2008). Nanjing, China	– To examine the changing attitudes toward institutional care in China, using Nanjing as an example	– Semi-structured interviews – Constant analysis of the grounded theory	– Setting: ($n = 6$) Government institution = 2 Community institution = 2 Privately owned institution = 2 – Older participants: ($n = 20$) – Gender: F = 13, M = 7 – Mean age: 81 years (range = 68–97 years) – Range of residency = 1 month to 4 years	– Acceptance of institutional care was commonly demonstrated, interpretation of "xiao" as below: 1. High level of satisfaction with elder care homes and frequent visit of adult children shaped the elderly residents' understanding of filial piety 2. Care institutions provided better care than family members 3. Care institutions provided a place for same stage of life and health status to elderly to communicate and share life experiences 4. Elderly prefer living at home; decision of placement was made by children 5. Reticent about telling friends and neighbors that they moved to a nursing home

Table 2. Characteristics of included studies (continued).

Author(s). Year. Location	Aim	Methods	Setting and sampling	Findings
Chen (2011). Shanghai, China	– To understand elder residents' perspectives on decision-making processes around institutionalization and the evolving concepts of filial piety during this process	– Semi-structured interview – Category analysis	– Setting: (*n* = 1) Government-supported institution – Older participants: (*n* = 11) – Gender: F = 9, M = 2 – Age range: 70–92 years – Average length of residency: 6 months to 9 years	– Decision-making process 1. Caregiving crises occurred 2. Residents' suggestions 3. Children's reactions and negotiations 4. Filial piety redefined
Cheng et al. (2012). Beijing, China	– To discuss how a sample of older people and their family members made the decision to move to a specific RCF and what factors influenced the decision-making process in the socioeconomic and cultural context of Beijing	– Semi-structured interview – Constant comparative method (Grounded Theory)	– Setting: (*n* = 6) Private RCF = 1 Community RCF = 3 Public-owned private-run RCF = 2 – Elderly participants: (*n* = 27) – Gender: F = 17, M = 10 – Average age = 80 years	– Five components were identified about accessibility to a resident facility: 1. Geographical access 2. Information access 3. Economic access 4. Sociocultural access 5. Socio-managerial environment
Chuang et al. (2015). Taiwan	– To explore the care needs of older nursing home residents from their own viewpoints	– Unstructured in-depth interview – Thematic analysis	– Setting: (*n* = 2) Public nursing home = 1 Private nursing home = 1 – Older participants: (*n* = 18) – Gender: F = 3, M = 15 – Mean age: 80.7 years – Average length of residency: 32.5 (±20.5) months	– Six themes and ten subthemes relating to the care needs were identified: 1. Body: assistance for ADLs; skilled nursing care 2. Economics: financial support 3. Environment: environmental hygiene, space 4. Mind: emotional support care needs; psychological care needs 5. Preparation for death: discussion and arrangement of matters related to death 6. Social support: activities; relationships
Chen (2015). Shanghai, China	– To describe Shanghai elders' and their children's experiences of deciding to institutionalize	– Semi-structured interview – Qualitative and inductive analyses	– Setting: (*n* = 1) Government-sponsored institution – Older participant: (*n* = 12) – Gender: F = 9, M = 3 – Age: 80 years + – Length of residency: 3 years +	– Four themes and seven subthemes were identified: 1. Etiology of family caregiving: the unexpected reality of family caregiving, familial discordance regarding the caregiving tradition 2. Two players in one game: seizing the remaining decision-making autonomy, preempting caregiving depletion 3. The last straw 4. Spatially situated decision-making: proactive decision to meet psychosocial needs, proactive decision to meet instrumental needs, reactive decision to meet instrumental needs

Table 2. Characteristics of included studies (continued).

Author(s). Year. Location	Aim	Methods	Setting and sampling	Findings
Tao et al. (2016). Liaoning, China	– To identify the perception and inclination about elderly care among empty nesters in the community	– In-depth interview – Colaizzi's method	– Setting: Community – Older participants: ($n = 23$) – Gender: F = 10, M = 13 – Age range: 62–86 years	– Six themes were identified: 1. Satisfaction with self-esteem needs 2. Cost-effectiveness issues 3. Convenience and privacy protection 4. Quality of care services 5. Family burden 6. Emotional care needs
Wang et al. (2016), Shanghai, China	– To explore residents' perspectives of LTC facilities in China	– Semi-structured interview – Conventional content analysis	– Setting: ($n = 4$) Government-run LTC facility = 1 Community-run LTC facility = 1 Privately-run LTC facility = 2 – Older participants: ($n = 25$) – Gender: F = 9, M = 16 – Age range: 63–94 years – ADL status: Dependent = 6, independent = 5, semi-dependence = 14 – Range of residency: 6 months to 11 years	– Three themes and nine subthemes were identified: 1. Influences of cultural beliefs 2. Basic care needs fulfilled in LTC facilities: basic living guarantee, promoted sense of security, more social opportunities, a sense of relief 3. Lack of quality care in LTC facilities: lack of autonomy and control, lack of self-belonging, affecting sense of dignity, loss of self-worth, threats to religious belief
Han et al. (2017). Shijiazhuang, China	– To investigate the life experience of aged residents living in private rest homes in Shijiazhuang	– Semi-structured interview – Colaizzi's method	– Setting: ($n = 3$) Private rest home = 3 – Older participants: ($n = 12$) – Gender: F = 6, M = 6 – Age range: 69–87 years – ADL range: 35–95 (Barthel index) – Length of residency: 6 months +	– Four themes and eight subthemes were identified: 1. High-quality experiences: daily life security, spiritual and cultural life enrichment, diversification of social support systems 2. Life adaptation 3. Conflicts: health condition, nutritional status of catering, group living, rules and regulations, emotional care needs 4. Expectations
Wang et al. (2017). Wuhan, China	– To explore the experience of the elderly living in medical–nursing combined pension institutions to provide a reference for nursing quality improvements	– Semi-structured in-depth interview – Category analysis	– Setting: ($n = 4$) Public institution = 1 Private-owned institution = 3 – Older participants: ($n = 21$) – Gender: F = 14, M = 7 – Age range: 65–92 years – ADL range: 10–100 (Barthel index) – Range of residency: 1 month to 10 years	– Six domains and 16 themes were identified: 1. Tangibility: hardware equipment, barrier-free design, demand for fitness and rehabilitation areas, healthcare resources 2. Reliability: care worker competency, care efficiency 3. Assurance: daily life security, protection of rights 4. Empathy: basic life care, dignified and privacy care, spiritual belonging care 5. Continuity: care continuity, treatment continuity, end-of-life care continuity 6. Fairness: disparity in quality of care, dispute handling bias

Table 2. Characteristics of included studies (continued).

Author(s). Year. Location	Aim	Methods	Setting and sampling	Findings
Chen et al. (2017). Liaoning, China	– To explore the demands of long-term care for elderly people with semi-self-care in economically undeveloped regions	– Semi-structured interview – Colaizzi's method	– Setting: (n = 10) Public + private nursing home – Older participants: (n = 17) – Gender: F = 8, M = 9 – Age range: 62–82 years – ADL range: 45–60 (Barthel index) – Length of residency: 1.5 years +	– Five themes and 12 subthemes were identified: 1. Low level of social participation: partial loss of self-care ability, high activity barriers, gender differences, unfulfilled personal values, decline in self-identity 2. No timely healthcare and medical and health services: shortage of rehabilitation and exercise equipment, far away from hospital, poor transportation, shortage of healthcare staff, inadequate medical facilities 3. Difficulties with making breakthrough in nursing service: competency of care staff, lack of professional skills 4. Backward cultural services for the elderly 5. Limited support from government and volunteer services
Song et al. (2018). Jinan, China	– To describe residents' experiences in LTC facilities, particularly as it related to physical function	– Semi-structured interview – Content analysis	– Setting: (n = 2) Government-run LTC facility = 1 Privately run LTC facility = 1 – Older participants: (n = 5) – Gender: F = 4, M = 1 – Average age: 82.6 years – ADL status: dependent = 1, independent = 3, semi-dependent = 1 – Length of residency: 14 months to 13 years	– Five themes were identified: 1. Staff care 2. Care from family members 3. Physical environment 4. Coresidents in the facility 5. Resident-developed strategies
Zhang (2019). Chengdu, China	– To find the relationship between institutional elder care and filial piety	– Semi-structured interview – Thematic analysis	– Setting: (n = 7) Government-run nursing home = 3 Collectively run nursing home = 3 Privately run = 1 – Older participants: (n = 18) – Length of residency: 3 months +	– Four main themes were identified: 1. Compelling reasons to settle in nursing homes 2. Mixed feelings for settling in nursing homes 3. Disagreement with the viewpoint that "sending parents to nursing homes is unfilial" 4. Recognition of various manifestation modes of filial piety
Lao et al. (2019). Macao, China	– To explore the Chinese older people's perceptions regarding family involvement and specific factors influencing family involvement in residential care homes	– Semi-structured interview – Content analysis	– Setting: (n = 2) Governmental-sponsored residential care homes – Older participants: (n = 10) – Gender: F = 2, M = 8 – Mean age: 78.2 years (range = 68–94 years) – Average length of residency: 27.9 months (range = 3 months to 12 years) – ADL range: 15–100 (Barthel index)	– Four themes and seven subthemes were identified: 1. Components of family involvement: social companionship, physiological care and support, advocator for better care 2. Factors influencing family involvement 3. Impact of family involvement on elders' lives: being there and supportive, staying connected with the outside world, regarding (nursing) home as a homelike ambience 4. Promoting family involvement strategies

Table 2. Characteristics of included studies (continued).

Author(s). Year. Location	Aim	Methods	Setting and sampling	Findings
Xing et al. (2020). Dongguan, China	– To explore the stress and experiences of relocation among elderly in nursing homes	– Semi-structured in-depth interview – Colaizzi's method	– Setting: (*n* = 1) Nursing home – Older participants: (*n* = 16) – Gender: F = 9, M = 7 – Age range: 68–84 years – ADL range: 45–60 (Barthel index) – Length of residency: 6 months to 1 year	– Four domains and 15 themes were identified: 1. Experiences before admission: content and happy, distressing experience, relocation reason 2. Experiences after admission: depression and escape, loneliness, confusion and behavior disorganization, anxiety, physical symptoms 3. Current experiences: unaffected by symptomatic relief, face up to aging, understanding and acceptance, behavior modification 4. Looking forward: active adaptation, passive acceptance, concerns and fears
Wu & Rong (2020). Tainan, Taiwan	– To explore the relocation experiences of the elderly to LTC facilities in Taiwan to inform policy and practice to address the needs effectively	– Semi-structured interview – Continuous comparative method of grounded theory	– Setting: (*n* = 2) Nursing home = 1, assisted living facility = 1 – Older participants: (*n* = 16) – Gender: F = 11, M = 5 – Mean age: 81.9 years – Range of residency: 2–11 months	– Four themes were identified: 1. Wish to minimize the burden but stay connected with the family 2. Perceived barriers to adaptation 3. Valuing tailored care 4. Acceptance and engagement
Wang et al. (2020). Zhengzhou, China	– To understand the real thoughts of cognition, behavior, and needs for family support among old-age care institution elderly	– Observation and semi-structured interview – Colaizzi's method	– Setting: (*n* = 4) Government aged care institution = 2 Public aged care institution = 2 – Older participants: (*n* = 15) – Gender: F = 7, M = 8 – Age range: 66–88 years – Dependence: Dependent = 3, Independent = 4, formal = 4, semi-dependent = 4 – Length of residency: 1.5–10 years	– Three themes and nine subthemes were identified: 1. Cognition of family support: vague understanding of the meaning and content of family support after entering the institution, confusion about division of responsibilities between children and institutional caregivers 2. Status of family support: low quality of family support and unmet needs of older people for affection; desire for adult children to be involved in their care; the honor of Chinese older people who suppress their need for affection from children 3. Family needs: material support, behavior support needs, emotional comfort needs, information support needs

Table 2. Characteristics of included studies (continued).

Author(s). Year. Location	Aim	Methods	Setting and sampling	Findings
Lan et al. (2020). Fuzhou, China	– To describe the psychosocial reactions to relocation to a nursing home from the perspective of older adults	– Semi-structured interview – Content analysis	– Setting: (*n* = 4) Private nursing home = 2 Public nursing home = 2 – Older participants: (*n* = 23) – Gender: F = 14, M = 9 – Mean age: 83.7 years (± 6.9 years) – Self-care ability: dependent = 2, independent = 21	– Five key stages of reaction to relocation to a nursing home were identified: 1. Fear: negative labels attached to nursing homes, disconnection to society, difficulties in establishing new relationships, fears of being abandoned by their families 2. Struggle: complaints about family members, thinking of returning home, praying for change, taking action to leave 3. Compromise 4. Acceptance: accepting life albeit with worries, affirming benefits of living in a nursing home, embracing nursing home life 5. Contribution: sense of ownership, bringing their self-worth into full play
Pan et al. (2020). Suzhou and Beijing, China	– To explore older adults' perspectives and experiences of social participation in long-term care institutions	– Focus group interview – Thematic analysis	– Setting: (*n* = 2) Private LTC = 1, public LTC = 1 – Older participants: (*n* = 40) – Gender: F = 25, M = 15 – Average age: 86.6 years – Average length of residency: 5.72 years	– Three themes were identified: 1. Increased spare time 2. Increased presence of peers for social participation 3. New participation opportunities with lost old hobbies
Sun et al. (2021). Nanjing, China	– To explore older adults' experience and the need for the transition to the nursing home in China	– Semi-structured interview – Content analysis approach	– Setting: (*n* = 2) Nursing home – Older participants: (*n* = 11) – Gender: F = 5, M = 6 – Mean age: 84 years (range = 76–93 years) – Average length of residency: 9.2 months (range = 3–12 months)	– Three themes and ten subthemes were identified: 1. Chinese culture, policy, and adaptation: staying modest and prudent, feeling shy to speak with males, familism suppressing the inner voice, the new policy "Combination of Medical Service and Care" bringing benefits 2. Adaptation to nursing homes: poor quality of sleep and catering, relationship development, emotional reactions 3. Needs of residents: emotional support, more interactions, self-realization

Table 2. Characteristics of included studies (continued).

Author(s). Year. Location	Aim	Methods	Setting and sampling	Findings
Chen et al. (2021). Zhengzhou, China	– To describe the desired caring behaviors from the perspective of elderly residents	– Semi-structured interview – Thematic analyses	– Setting: Private and public nursing home – Older participants: (n = 14) – Gender: F = 9, M = 5 – Age range: 68–83 years – Range of residency: 1–12 years	– Two domains and 5 themes and 14 subthemes were identified: 1. Caring behaviors perceived by elderly residents (1) Health services: disease monitoring, psychological counseling, health promotion and health preservation (2) Livable environment: facilities distribution, daily life services (3) Social interaction: interpersonal relationship, family care, volunteer activities 2. Factors associated with elderly residents' perceptions of caring behaviors (1) Nursing assistant factors: insufficient human resources, lack of professional guidance, caring literacy deficiency (2) Resident factors: educational level, physical and psychological status, financial situation
Shen et al. (2021). Chongqing, China	– To explore the new care needs of nursing home disabled residents from their perspectives to help healthcare professionals understand these needs to ensure the provisions of high quality of care to meet their needs	– Unstructured interview – Thematic analysis	– Setting: (n = 2) Public nursing home = 1 Private nursing home = 1 – Older participants: (n = 23) – Gender: F = 15, M = 8 – Mean age: 80.7 years – Degree of disability: Moderate = 6, mild = 14, severe = 3 – Average length of residency: 32.5 years	– Four dimensions and 12 aspects of the new needs among the disabled elderly in nursing homes were identified: 1. Intelligent technology: intelligent health management, intelligent life care, intelligent psychological care 2. Security: air and food safety, network cost and security, protection of privacy 3. Participation: social relations, team activities, self-regulated learning 4. Spirituality: religious belief needs, maintaining dignity, self-determination
Jin et al. (2021). Zhengzhou, China	– To understand the migration stress and adjustment experiences of the elderly in elderly care institutions	– Semi-structured interview – Colaizzi's method	– Setting: (n = 3) Aged care institution – Older participants: (n = 14) – Gender: F = 8, M = 6 – Age range: 72–88 years – Length of residency: 3 months +	– Three themes and six subthemes were identified: 1. Stress and challenge of relocation: passive decision-making, concerns 2. Adjustment and adaptation after admission: compromise, acceptance, and coping strategy 3. Needs and expectations for the future: improve relocation transition, enhance social support

Table 3. Synthesis findings of relocation experiences.

Core category	Category	Supporting raw data from included studies
Decision-making and preparation of relocation	Attitude toward relocation	"My family is quite open to these relatively new ideas of moving into an institution to stay for the rest of our lives. You should know that there are not so many people open to such an idea. But it's becoming increasingly popular. My children found me this place." (Chen, 2011)
	Reason for relocation	"Two years ago, I was hospitalized because of cerebral infarction. After I left the hospital, I needed someone to take care of me. My son was abroad, and my daughter was still working. Later, my daughter suggested finding a good nursing home for me. Thus, I am here now." (Zhang, 2019)
	Facility selection criteria	"I don't want to make a quick decision … I first lived here in spring for a month, and I came back in winter for another month. I'd like to try and experience the differences in various seasons … then I will know if I can adapt to the life here and make my final decision." (Cheng et al., 2012)
		"My daughter works nearby. She chose this place so she could visit me easily, even during her break at noon." (Wu & Rong, 2020)
	Preparation before relocation	"Bringing along my favorite belongings into the nursing homes … such as … pictures, a vase … and my own eating utensils …" "I would invite more visits from family members and friends … I hope so … " (Tse, 2007)
Physical and psychological burden	Physical burden	"I cannot help but get up at night … One room has 3 to 5 people … When you sleep, he begins to yell and shout." (Chuang et al., 2015)
		"Some people here moan and make noise. Sometimes it is so noisy, I can't sleep at night. The caregivers don't have good manners. They chat loudly, even at night." (Wu & Rong, 2020)
	Psychological burden	"I am a college graduate from the 1940s in Shanghai. I can speak English and French, but all is gone. I am just an old man living in a nursing home. We are the sunset now, wasting resources." (Jing et al., 2016)
Attitude change toward relocation	Sense of security related to care needs fulfillment	"My daughter is busy with her work, but when I was living alone, she insisted on visiting me every other day to bring me some food and help me with bathing. I cannot allow myself to be such a burden to her any longer, so I insisted on moving here. Now I am here, she can take off some load and I feel much better." (Jing et al., 2016)
	Satisfactions with facility life	"Environment is very safe, room, bathroom, any place is all flat, there are fence on the side that you can support on. I haven't [had a] fall here, safety is what I think done very good in this place." (Wu & Rong, 2020)
Care needs during admission	Health promotion support	"I hope for a health forum, held once a month for us to get together and give us some health knowledge about diabetes diet, high blood pressure medication, or other knowledge about health promotion. Last time there was a doctor who told us how to identify stroke, taught us how to do a self-check to prevent stroke, which was very useful." (Chen et al., 2021)
	Self-esteem and privacy respect	"In the beginning, the NA (nursing aides) would respect your privacy, but this just lasted a short time." (Chao & Roth, 2005)
		"Some caregivers are not very friendly to the elderly in wheelchairs. And sometimes they insult us, we are not treated as human beings." (Shen et al., 2021)
	Spirituality care needs	"I considered it would be useless to tell the care provider my problems. I read the Buddhist Bible to calm my mood." (Chao & Roth, 2005)
		"When I was praying, the staff looked at me as if I were crazy." (Jing et al., 2016)
	Tailored care for individual needs	"They are good, they take care of me, bathing me, changing my diapers, but … I sometimes feel I were already dead, they have their plans, but they do not really care what works better for me." "All the dos and don'ts, I'm fed up with them. I get up early at five in the morning and I am hungry, but nothing is prepared for me to eat because breakfast is to be served at 6:30 am. It is planned and that's it." (Jing et al., 2016)
	Emotional support	"The living space is constricted. Life is monotonous and lacks companionship. For a month, no one cared about my personal life; no one cared about you; no one cared about your family life; no one talked to me. I miss my grandchildren and feel sad." (Sun et al., 2021)

Table 3. Synthesis findings of relocation experiences (continued).

Core category	Category	Supporting raw data from included studies
Self-efforts for adaptation	Continuity of family involvement	"He (nephew) does not visit often. But he'd phone me. That's fine! He needn't come. If I phone him to come to see me, it seems that I don't understand him—they should have their own lives!" (Lao et al., 2019)
		"I am thinking that, if my wife comes and lives with me after she retires a few years from now, we can live here together as couple. I really wish my wife can live with me in the future so I can have company." (Wu & Rong, 2020)
	Efforts for developing relationships	"My roommate sleeps earlier before 7 pm. However, I usually watch TV shows after 8 pm at home. When she sleeps, I have to give up my lifestyle and choose to sleep. In fact, I feel unhappy. The reason is that she is much older than me, and I should do what suits my roommate for harmony. My nursing staff often comforts me like this." (Sun et al., 2021)
		"I have made friends here! That old friend is really nice; everyone is very happy. Those elderly that been through pain, will then cherish the blessing, and can be nice with others." (Wu & Rong, 2020)
Daily life becomes affluent through participation	Creating connections with the society	"I feel that social activity is really important for the residents to participate in. It may help them prevent from undergoing physical and/or psychological degeneration, but there are few available here … I hope they (care providers) can arrange some activities outside the institution, as I believe it would be helpful for our mood." (Chao & Roth, 2005)
	Happiness with living in the facility	"We all live here and we have good relationships. I try my best to help them … I am always here for them. They always say 'Thanks, old man' to me. (laughing) I think we are family; I have nothing to lose. I do as much as I can to help them." (Lan et al., 2020)
		"Sometimes, we cooked and made dumplings. It was nice to do it." "They gave us some small gifts during the monthly birthday party … It was nice." (Chuang et al., 2015)
Concerns about future	Concerns about finances	"My retirement pay is just 5,000 RMB monthly, which did not cover all the fees here. My husband (78 years old) still works for my expenses. We do not want to encumber our sons. I am guilty about what they have done for me." (Sun et al., 2021)
	Concerns about death	"I have told my daughter (about my death) and wanted to say a nice goodbye. She doesn't want to listen to me. She becomes angry when I mention it. I want to talk, but she doesn't want to listen." (Chuang et al., 2015)

(ii) Physical and Psychological Burden

Five studies (Chuang et al., 2015; Jing et al., 2016; Sun et al., 2021; Wu & Rong, 2020; Xing et al., 2020) described "physical burden." Newly admitted older people were maladapted to the new surroundings, displaying physical signs including insomnia.

Eleven studies (Chen et al., 2017; Han et al., 2017; Jin et al., 2021; Jing et al., 2016; Lan et al., 2020; Sun et al., 2021; Tao et al., 2016; Tse, 2007; Wang et al., 2017; Wu & Rong, 2020; Xing et al., 2020) described "psychological burden." Most older people relocate to a facility because of dependence or difficulty in performing daily life activities. They have experienced the loss of health and social roles, felt worthless, and had difficulty accepting being cared for by others, and as a result, they started to lose the meaning of life and hope for the future. Moreover, they not only felt loneliness and isolation because of the closed-off management of facilities but also the sense of anxiety and fear that resulted from a lack of confidence to create new relationships and adapt to the new environment. These feelings led to the regret of relocating, even in older people who voluntarily relocated. Furthermore, some older people were likely to feel angry and abandoned, resented family members,

were worried about the quality of care, and had a strong desire to return home.

(iii) Attitude Change Toward Relocation

Twelve studies (Chao & Roth, 2005; Chen et al., 2021; Chuang et al., 2015; Han et al., 2017; Jing et al., 2016; Lan et al., 2020; Lao et al., 2019; Tao et al., 2016; Wang et al., 2017; Wang et al., 2020; Zhan et al., 2008; Zhang, 2019) described the "sense of security related to care needs fulfillment." Most older people and their families felt secure because medical and daily life care needs were fulfilled after admission. Furthermore, most older people experienced relief in reducing the care burden on family members. These experiences promoted older people to develop a renewed recognition of the meaning of filial piety and how to practice it. They either no longer thought that relocation to a facility represented being unfilial or no longer felt ashamed of being cared for in a facility.

Seven studies (Chen et al., 2021; Jin et al., 2021; Lan et al., 2020; Song et al., 2018; Wu & Rong, 2020; Xing et al., 2020; Zhang, 2019) described "satisfaction with facility life." Older people were satisfied with care and life after admission and gained the confidence to adapt, particularly those who felt secure after admission. Conversely, some

older people, who were dissatisfied with the quality of care or had passively accepted their admission, negatively cognized facility life.

(iv) Care Needs during Admission

Ten studies (Chuang et al., 2015; Han et al., 2017; Lao et al., 2019; Shen et al., 2021; Song et al., 2018; Sun et al., 2021; Wang et al., 2017; Wang et al., 2020; Wu & Rong, 2020; Xing et al., 2020) detailed "emotional support." Older people felt lonely because of being away from their families. Loneliness increased the desire for emotional support from family members and care staff, particularly during times of traditional Chinese festivals or health deterioration.

Three studies (Chao & Roth, 2005; Jing et al., 2016; Shen et al., 2021) defined "spirituality care needs." Some older people preferred to pray to calm down and maintain relief when they felt lonely and depressed. However, it was challenging to practice spiritual activities because of facility regulations, lack of space, or being misunderstood by care staff and peer residents.

Nine studies (Chao & Roth, 2005; Chen et al., 2017; Chuang et al., 2015; Han et al., 2017; Jing et al., 2016; Lee, 2001; Shen et al., 2021; Wang et al., 2017; Wu & Rong, 2020) described "tailored care for individual needs." This was related to the care provided in the group-living setting that influenced the personal care needs, including diet considerations related to disease or preferences, concerns of personal life rhythm, and autonomy of self-care in the facility.

Four studies (Chao & Roth, 2005; Chen et al., 2021; Shen et al., 2021; Wang et al., 2017) described "self-esteem and privacy respect." This was related to the expectation that care staff respected and assisted with the older person's privacy and provided care with a respectful attitude, including personal care for bathing and toileting.

Seven studies (Chao, 2005; Chen et al., 2017; Chen et al., 2021; Chuang et al., 2015; Han et al., 2017; Song et al., 2018; Wang et al., 2017) described "health promotion support." Older people were interested in health promotion because of aging or health deterioration. They anticipated information from medical professionals through health promotion forms related to self-management and avoidance of chronic illnesses and falls. Additionally, the availability of mental health consultation, exercise space, and a supportive environment was expected.

(v) Self-efforts for Adaptation

Five studies (Lao et al., 2019; Wu & Rong, 2020; Zhan et al., 2008; Zhang, 2019; Wang et al., 202) described "continuity of family involvement." Older individuals still wanted family members to oversee their lives in the facility and offer emotional and material support post-admission. However, this was influenced by family members' schedules, health statuses, financial statuses, and relationships. Therefore, older people changed how they connected with family mem-

bers, for instance, by substituting in-person visits with tele-communication; they also applied for family activities and private spaces to meet family in the facility.

Four studies (Chao & Roth, 2005; Lee, 2001; Sun et al., 2021; Wu & Rong, 2020) described "efforts for developing relationships." Older people realized the importance of relationships with peer residents and care staff. They cultivated relationships by actively engaging in activities. Moreover, to maintain good relationships, they were in harmony with other residents and cooperated with and appreciated care staff.

(vi) Daily Life Becomes Affluent through Participation

Fourteen studies (Chen et al., 2017; Chuang et al., 2015; Han et al., 2017; Jing et al., 2016; Lan et al., 2020; Pan et al., 2020; Shen et al., 2021; Sun et al., 2021; Tao et al., 2016; Tse, 2007; Wang et al., 2017; Wu & Rong, 2020; Xing et al., 2020; Zhan et al., 2008) described "happiness with living in the facility." Many older people felt happy to have additional opportunities to have contact with peers other than at home, discovered a sense of self-worth in the facility by supporting one another, and realized self-achievements through engaging in leisure activities.

Three studies (Chao & Roth, 2005; Chen et al., 2017; Wang et al., 2017) described "creating connections with the society." Older people reestablished connections with the world outside the facility, including through voluntary activities. Such interaction with the outside can increase the feeling of novelty and lessen the sense of isolation.

(vii) Concerns about Future

Three studies (Chen, 2015; Chuang et al., 2015; Sun et al., 2021) described "concerns about finances" related to the long-term usage of admission and were afraid of the increasing financial burden on their adult children.

Four studies (Chuang et al., 2015; Lan et al., 2020; Wang et al., 2017; Xing et al., 2020) described "concerns about death." Some older people worried experiencing the agony of a serious disease and anticipated to pass away peacefully. Moreover, some were concerned about their passing away and wanted to consult with family members or professional workers about the preparation and preferences for death.

Discussion

In this review study, we identified seven experiences of relocating to a long-term care facility from pre- to post-institutionalization. These experiences reflected older Chinese people's subjective condition changes in the following areas: decision-making, relocation stress, attitude and behavior shift, and adaptation.

Decision-making

We found that reasons and attitudes toward relocation and facility selection preferences influenced older people's

decision-making. The primary motivation for considering relocation is consistent with that of previous research (Chen, 2017; Zhu, 2015), which is to receive quality care to relieve family caregiving pressure and address unmet care needs at home. Treating filial piety within the parameters of caring for family elders was common and remains potent in the three societies of mainland China, Hong Kong, and Taiwan (Yeh et al., 2013). Chen (2017) reported filial piety as a "natural attitude" toward relocation decision-making among older Chinese people. With industrialization and urbanization, social structure and cultural values have gradually changed in recent years. Some older Chinese people are aware of adjusting to these changes (Ruiz, 2007). In the present study, attitudes toward relocation were impacted by the recognition of filial piety. However, older people living in large cities (such as Hong Kong, Shanghai, and Taipei), where family structure changed and impacted the traditional family care assistance, were likely to shift their expectations of filial piety, and they willingly relocated to a facility. This is consistent with Lin and Yen (2018) findings that older Chinese people voluntarily relocate to facilities as a new way of aging to deal with the decline of filial piety of being cared for at home.

Contrastingly, O'Neill et al. (2020) and Brownie et al. (2014) found that autonomy and control in older people's decision to move and choice of the facility were important determinants of their relocation experiences. In this study, consideration of facility relocation was assumed as a means to preserve a sense of self-control. Older Chinese people with involuntary admission were more prone to feel abandonment, resent families, and withdraw. Additionally, they had different selection criterion preferences and attached importance to a comfortable and secure living environment pre- and post-admission. Thus, it is crucial to respect the perceptions of older Chinese people and include them in the entire decision-making process to support autonomy and control by evaluating their self-consideration during this period.

Relocation Stress

Relocation to a facility is a stressful experience for older people since it is frequently precipitated by life events outside their control and choice (Brownie et al., 2014; O'Neill et al., 2020). Our research revealed that older Chinese people had a significant sense of loss, lifestyle disruption, and fear of adapting to the new surroundings, even in those after voluntary admission. These feelings produced physical and psychological stress and led to the perception of regretting relocation and a desire to return home. Brooke (1989) identified older people in this condition as being in a disorganization phase of adapting to facility existence. Furthermore, relocation stress was regarded as a risk factor for depression and anxiety (Costlow & Parmelee, 2020) that both impact

adaptation and life satisfaction of long-term care residents (Park & Sok, 2020). Our research suggested that older Chinese people and their families should be aware of the risk of relocation stress before admission and prepare for coping strategies early, for instance, by allowing older people to visit facilities and understand facility life before decision-making. Meanwhile, care providers should evaluate older people's mental health status and listen to their thoughts and experiences about relocation. It is beneficial to provide circumstances to reduce physical and psychological stress and customize care for individual needs (Polacsek & Woolford, 2022).

Attitude and Behavior Change

Perception of relocation to a new environment may influence reactions and responses to such transition (Meleis, 2010; Walker et al., 2007). Our results clarified the favorable shift in perception and behavior post-admission, which is consistent with the reorganization and relationship-building phases, respectively, of adaptation phases identified by Brooke (1989). We discovered that the most important change factor was the fulfillment of care demands in the facility, which was the main driver for relocation; it promoted older Chinese people to feel relief and gain a fresh insight into filial piety. These feelings lessened the psychological load and enabled them to modify their perspective to gain confidence to adjust to facility life.

Conversely, older people dissatisfied with the quality of care or life in the facility post-admission were likely to feel self-abandonment and negatively perceive the facility life. Moreover, to maintain personality while adhering to facility regulations, they still require various care needs connected to the satisfaction of life and care in the facility, including health promotion, self-esteem respect, spirituality care, and individually tailored care during admission. Our research suggested that the facility's fulfillment of care needs can be considered a critical component of relocation adaptation. Moreover, this fulfillment may motivate the modification of perception and behavior. Thus, evaluating individual care needs and obtaining feedback from older people is essential to raise the quality of care and satisfaction with facility life and care and promote adaptation.

Ongoing communication with families helps to maintain a sense of connectedness between their past life at home and life in a care home (O'Neill & Ryan, 2020). Moreover, forming new connections, engaging in activities (Koppitz et al., 2017; Polacsek & Woolford, 2022), and accepting peer residents and staff support (Park & Sok, 2020) could be tactics to help foster a sense of place and belonging and establish a new identity with the institution (Brownie et al., 2014). In this study, to adapt to facility life, older Chinese people made self-efforts to continue family participation to establish links with their previous life and preserve harmony

with staff and other residents to develop new relationships.

Adaptation

Brooke (1989) identified the final stage of relocation to a facility as stabilization, in which older people reach out to help newly admitted residents make friends and adjust. The nursing role during this stage is one of support as residents reestablish their sense of self in a new setting. Our research revealed that older Chinese people recreated their self-worth and self-achievement in facilities, reestablished their social connections through engagement, and felt relief and variation in their lives. These feelings overcame the relocation problems that resulted in a psychological burden immediately before and after admission, and life has returned to being stable.

Simultaneously, along with the adaptation, some older Chinese people are also concerned about the next life stage. They started to have worries about dying and had new care needs related to their future and death preparation. Older Chinese people in nursing homes have different beliefs and attitudes toward end-of-life communication and death-related topics (Chan & Pang, 2011; He et al., 2021; Xu et al., 2021). Care providers should be aware that older Chinese people in this phase have care needs connected to death consultation or preparation and should also individually evaluate the care needs because of the different beliefs and attitudes.

Implication for Clinic Practice

Our research clarified the characteristics of subjective condition shifts and the factors that led to these changes from pre-institutionalization to the entire relocation procedure. It can contribute to developing a care guideline for the entire relocation process that reflects the perspectives of older people. Simultaneously, the results can be utilized to create an education program related to preparing long-term care for older Chinese people starting from an early period to help them relocate to a long-term care facility with dignity, lessen relocation stress, and adjust well.

Limitations and Future Research

This review has several limitations. Firstly, we did not include older Chinese people residing abroad, and the generalizability of the relocation experiences and viewpoints may be limited to the Chinese context, including mainland China, Hong Kong, Macao, and Taiwan. With the aging world population, older Chinese migrants residing abroad have been increasing. In the future, it is necessary to clarify the relocation experiences and care needs of older Chinese migrants. However, one strength of this study is that it can be useful for studies focusing on older Chinese people or Chinese culture. Secondly, our findings were restricted to elucidating the relocation experiences that were influenced by the disparate policies, long-term care systems, and facility functions and types among these four societies. These factors could be considered in future research. Thirdly, the quality appraisal was not performed for the included studies. However, to ensure the quality of included studies, only peer-reviewed primary studies were included, and only academic research databases were searched to eliminate gray literature during the search strategy. Lastly, our research lacked insight into the experiences of older Chinese people with cognitive impairment. The health effects of the relocation of older people with dementia have been reported to be negative, including a reduction in physical, mental, behavioral, and functional well-being; additionally, they were reported to have higher stress levels (Ryman, F. V. M., et al., 2019). Therefore, it would be crucial to clarify their relocation experiences throughout the entire relocation procedure going forward.

Conclusions

This review study provided insights into the characteristics of subjective condition changes of relocation experiences among older Chinese people from pre- to post-institutionalization. Furthermore, decision-making involvement, fulfillment of care needs, reestablishing connections to previous life, and a new identity within the facility can overcome relocation stress and promote adaptation. Our findings indicate that relocation support should begin pre-institutionalization and be smoothly supplied during the whole relocation period because of the transition problems and subjective conditions that are linked and interconnected.

Author Contributions
Li Yao and Harue Masaki contributed to the conception and design of this study, conducted the analysis, drafted the manuscript, and approved the final manuscript.

Declaration of Conflicting Interests
We have no conflict of interest to disclose.

References
Brooke, V. (1989). How elders adjust. *Geriatric Nursing*, *10*(2), 66-68. https://doi.org/10.1016/S0197-4572(89)80054-0
Brownie, S., Horstmanshof, L., & Garbutt, R. (2014). Factors that impact residents' transition and psychological adjustment to long-term aged care: A systematic literature review. *International Journal of Nursing Studies*, *51*(12), 1654-1666. https://doi.org/10.1016/j.ijnurstu.2014.04.011

Chan, H. Y. L., & Pang, S. M. C. (2011). Readiness of Chinese frail old age home residents towards end-of-life care decision making. *Journal of Clinical Nursing*, *20*(9-10), 1454-1461. https://doi.org/10.1111/j.1365-2702.2010.03670.x

Chao, S. Y., & Roth, P. (2005). Dimensions of quality in long-term care facilities in Taiwan. *Journal of Advanced Nursing*, *52*(6), 609-618. https://doi.org/10.1111/j.1365-2648.2005.03632.x

Chen, L. (2011). Elderly residents' perspectives on filial piety and institutionalization in Shanghai. *Journal of Intergenerational Relationships*, *9*(1), 53-68. https://doi.org/10.1080/15350770.2010.544209

Chen, L. (2015). Decisions for institutionalization among nursing home residents and their children in Shanghai. *Qualitative Health Research*, *25*(4), 458-469. https://doi.org/10.1177/1049732314551990

Chen, L. (2017). Power and ambivalence in intergenerational communication: Deciding to institutionalize in Shanghai. *Journal of Aging Studies*, *41*, 44-51. https://doi.org/10.1016/j.jaging.2017.03.004

Chen, R., Dai, F., Yang, H., Zhang, X., Zhang, H., & Liu, M. (2021). Caring behaviours perceived by elderly residents and their associated factors in nursing homes in Zhengzhou City of China: A qualitative study. *Health and Social Care in the Community*, *29*(5), e126-e134. https://doi.org/10.1111/hsc.13252

Chen, S. M., Lin, H. S., Atherton, J. J., MacIsaac, R. J., & Wu, C. J. (2020). Effect of a mindfulness programme for long-term care residents with type 2 diabetes: A cluster randomised controlled trial measuring outcomes of glycaemic control, relocation stress and depression. *International Journal of Older People Nursing*, *15*(3), e12312. https://doi.org/10.1111/opn.12312

Cheng, Y., Rosenberg, M. W., Wang, W., Yang, L., & Li, H. (2012). Access to residential care in Beijing, China: Making the decision to relocate to a residential care facility. *Ageing and Society*, *32*(8), 1277-1299. https://doi.org/10.1017/S0144686X11000870

Cheng, S. D., Wang, B. Y., Zhang, H. J., Lu, C. H., Lou, Y. W., & Bi, T. (2017). Qualitative research on lng-term care demands of elderly people with semi-self care in economically undeveloped regions. *Journal Jinzhou Medical Universit*, *38*(5), 79-83. https://doi.org/10.13847/j.cnki.lnmu.2017.05.026 (in Chinese).

Cheung, C. K., & Kwan, A. Y. (2009). The erosion of filial piety by modernisation in Chinese cities. *Ageing and Society*, *29*(2), 179-198. https://doi.org/10.1017/S0144686X08007836

Chuang, Y. H., Abbey, J. A., Yeh, Y. C., Tseng, I. J., & Liu, M. F. (2015). As they see it: A qualitative study of how older residents in nursing homes perceive their care needs. *Collegian*, *22*(1), 43-51. https://doi.org/10.1016/j.colegn.2013.11.001

Costlow, K., & Parmelee, P. A. (2020). The impact of relocation stress on cognitively impaired and cognitively unimpaired long-term care residents. *Aging and Mental Health*, *24*(10), 1589-1595. https://doi.org/10.1080/13607863.2019.1660855

France, E. F., Cunningham, M., Ring, N., Uny, I., Duncan, E. A. S., Jepson, R. G., Maxwell, M., Roberts, R. J., Turley, R. L., Booth, A., Britten, N., Flemming, K., Gallagher, I., Garside, R., Hannes, K., Lewin, S., Noblit, G. W., Pope, C., . . . Noyes, J. (2019). Improving reporting of meta-ethnography: The eMERGe reporting guidance. *BMC Medical Research Methodology*, *19*(1), 25. https://doi.org/10.1186/s12874-018-0600-0

Han, S. Q., Li, G. X., Yuan, S. Y., Zhang, Z., He, X. C., & Tian, S. Z. (2017). Qualitative research on life experience of aged residents living in private rest homes in Shijiazhuang. *Chinese Journal of Modern Nursing*, *23*(1), 52-56. https://doi.org/10.3760/cma.j.issn.1674-2907.2017.01.013 (in Chinese).

He, F. X., Geng, X., & Johnson, A. (2021). The experience of palliative care among older Chinese people in nursing homes: A scoping review. *International Journal of Nursing Studies*, *117*, 103878. https://doi.org/10.1016/j.ijnurstu.2021.103878

Jin, P. L., Zhao, M. L., Han, M. D., Wang, M. N., Wu, X. T., & Shen, Y. J. (2021). A qualitative study on the migration stress and adjustment experience of the elderly in elderly care institutions. *Chinese Nursing Research*, *35*(19), 3546-3549. https://doi.org/10.12102/j. issn.1009-6493.2021.19.037 (in Chinese)

Wang, J., Wang, J., Cao, Y., Jia, S., & Wu, B. (2016). Older residents' perspectives of long-term care facilities in China. *Journal of Gerontological Nursing*, *42*(8), 34-43. https://doi.org/10.3928/00989134-20160615-05

Kao, H. F., Travis, S. S., & Acton, G. J. (2004). Relocation to a long-term care facility: Working with patients and families before, during, and after. *Journal of Psychosocial Nursing and Mental Health Services*, *42*(3), 10-16. https://doi.org/10.3928/02793695-20040315-04

Koppitz, A. L., Dreizler, J., Altherr, J., Bosshard, G., Naef, R., & Imhof, L. (2017). Relocation experiences with unplanned admission to a nursing home: A qualitative study. *International Psychogeriatrics*, *29*(3), 517-527. https://doi.org/10.1017/S1041610216001964

Lan, X., Xiao, H., & Chen, Y. (2020). Psychosocial reactions to relocation to a nursing home among Chinese older adults. *Archives of Gerontology and Geriatrics*, *91*, 104230. https://doi.org/10.1016/j.archger.2020.104230

Lao, S. S. W., Low, L. P. L., & Wong, K. K. Y. (2019). Older residents' perceptions of family involvement in residential care. *International Journal of Qualitative Studies on Health and Well-Being*, *14*(1), 1611298. https://doi.org/10.1080/17482631.2019.1611298

Lee, D. T. F. (2001). Perceptions of Hong Kong Chinese elders on adjustment to residential care. *Journal of Interprofessional Care*, *15*(3), 235-244. https://doi.org/10.1080/13561820120063129

Lee, D. T., Woo, J., & Mackenzie, A. E. (2002). A review of older people's experiences with residential care placement. *Journal of Advanced Nursing*, *37*(1), 19-27. https://doi.org/10.1046/j.1365-2648.2002.02060.x

Lee, D. T. F., Woo, J., & Mackenzie, A. E. (2002). The cultural context of adjusting to nursing home life: Chinese elders' perspectives. *The Gerontologist*, *42*(5), 667-675. https://doi.org/10.1093/geront/42.5.667

Lin, L. J., & Yen, H. Y. (2018). The benefits of continuous leisure participation in relocation adjustment among residents of long-term care facilities. *The Journal of Nursing Research*, *26*(6), 427-437.

https://doi.org/10.1097/jnr.0000000000000263

Lu, J., Zhang, L., & Zhang, K. (2021). Care preferences among Chinese older adults with daily care needs: Individual and community factors. *Research on Aging*, *43*(3-4), 166-176. https://doi.org/10.1177/0164027520939321

Luo, Y., Su, B., & Zheng, X. (2021). Trends and challenges for population and health during population aging - China, 2015-2050. *China CDC Weekly*, *3*(28), 593-598. https://doi.org/10.46234/ccdcw2021.158

McAuley, W. J., Pecchioni, L., & Grant, J. A. (1999). Admission-related migration by older nursing home residents. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *54*(3), S125-S135. https://doi.org/10.1093/geronb/54B.3.S125

Meleis, A. I. (2010). *Transitions theory: Middle-range and situation-specific theories in nursing research and practice* (pp. 25-27). Springer Publishing.

Melrose, S. (2004). Reducing relocation stress syndrome in long-term care facilities. *The Journal of Practical Nursing*, *54*(4), 15-17.

Ng, A. C. Y., Phillips, D. R., & Lee, W. K. (2002). Persistence and challenges to filial piety and informal support of older persons in a modern Chinese society: A case study in Tuen Mun, Hong Kong. *Journal of Aging Studies*, *16*(2), 135-153. https://doi.org/10.1016/S0890-4065(02)00040-3

National Bureau of Statistics of China. (2021). Communiqué of the seventh national population census (1) (No. 2). *Basic Information of the National Population* [Cited 18 September 2022]. http://www.stats.gov.cn/english/PressRelease/202105/t20210510_1817187.html

National Bureau of Statistics of China. (2021). Communiqué of the seventh national population census (1) (No. 5) [Cited 18 September 2022]. http://www.stats.gov.cn/english/PressRelease/202105/t20210510_1817190.html

National Bureau of Statistics of China. (2021). Statistical communiqué of the people's republic of china on the 2020 national economic and social development (1) [Cited 18 September 2022]. http://www.stats.gov.cn/english/PressRelease/202102/t20210228_1814177.html

Noblit, G. W., & Hare, R. D. (1988). *Meta-ethnography: Synthesizing qualitative studies (Vol. 11 Qualitative research methods)*. Sage Publications.

O'Neill, M., Ryan, A., Tracey, A., & Laird, L. (2020). 'You're at their mercy': Older peoples' experiences of moving from home to a care home: A grounded theory study. *International Journal of Older People Nursing*, *15*(2), e12305. https://doi.org/10.1111/opn.12305

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., . . . Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. *BMJ*, *372*, n71. https://doi.org/10.1136/bmj.n71

Pan, H., Dury, S., Duppen, D., Lehto, V., Wang, R., & De Donder, L. (2020). Social participation in older adults after relocation to long-term care institutions in China: A qualitative study. *Journal of Community Health Nursing*, *37*(3), 164-176.

https://doi.org/10.1080/07370016.2020.1780046

Park, S., & Sok, S. R. (2020). Relation modeling of factors influencing life satisfaction and adaptation of Korean older adults in long-term care facilities. *International Journal of Environmental Research and Public Health*, *17*(1), 317. https://doi.org/10.3390/ijerph17010317

Perry, T. E., Andersen, T. C., & Kaplan, D. B. (2014). Relocation remembered: Perspectives on senior transitions in the living environment. *The Gerontologist*, *54*(1), 75-81. https://doi.org/10.1093/geront/gnt070

Polacsek, M., & Woolford, M. (2022). Strategies to support older adults' mental health during the transition into residential aged care: A qualitative study of multiple stakeholder perspectives. *BMC Geriatrics*, *22*(1), 151. https://doi.org/10.1186/s12877-022-02859-1

Qian, Y., Qin, W., Zhou, C., Ge, D., Zhang, L., & Sun, L. (2018). Utilisation willingness for institutional care by the elderly: A comparative study of empty nesters and non-empty nesters in Shandong, China. *BMJ Open*, *8*(8), e022324. https://doi.org/10.1136/bmjopen-2018-022324

Ruiz, M. E. (2007). Familismo and filial piety among latino and Asian elders: Reevaluating family and social support. *Hispanic Health Care International*, *5*(2), 81-89. https://doi.org/10.1891/154041507780978897

Ryman, F. V. M., Erisman, J. C., Darvey, L. M., Osborne, J., Swartsenburg, E., & Syurina, E. V. (2019). Health effects of the relocation of patients with dementia: A scoping review to inform medical and policy decision-making. *The Gerontologist*, *59*(6), e674-e682. https://doi.org/10.1093/geront/gny031

Shen, J., Xiao, L. D., Liu, Y., Zhang, H., & Wu, L. (2021). A phenomenological study on new care needs of Maslow's need-hierarchy among disabled residents at nursing homes in modern Chinese society. *Journal of Transcultural Nursing*, *32*(5), 501-507. https://doi.org/10.1177/1043659620967426

Shi, C., & Hu, B. (2020). Preferences for formal social care in rural and Urban China: Evidence from a national survey. *Journal of Gerontological Social Work*, *63*(1-2), 19-40. https://doi.org/10.1080/01634372.2019.1709246

Song, Y., Scales, K., Anderson, R. A., Wu, B., & Corazzini, K. N. (2018). Resident challenges with daily life in Chinese long-term care facilities: A qualitative pilot study. *Geriatric Nursing*, *39*(1), 18-23. https://doi.org/10.1016/j.gerinurse.2017.05.001

Sun, C., Yu, Y., Li, X., Cui, Y., Ding, Y., Zhu, S., Li, X. W., Chen, S., & Zhou, R. (2020). The factors of adaptation to nursing homes in mainland China: A cross-sectional study. *BMC Geriatrics*, *20*(1), 517. https://doi.org/10.1186/s12877-020-01916-x

Sun, C., Zhou, R., Cui, Y., Ding, Y., Li, X., Li, X., Zhang, Y., Chen, S., & Xing, Y. (2021). The adaptation of older adults' transition to nursing homes in Mainland China: A qualitative study. *Journal of Transcultural Nursing*, *32*(4), 318-325. https://doi.org/10.1177/1043659620923387

Tao, W. W., Yuan, C., Zhou, Y. N., Wang, C., Ma, D. X., & Sha, L. Y. (2016). Qualitative research on the perception and inclination about elderly care among empty nesters in the community. *Journal of Nursing Science*, *31*(2), 98-101.

https://doi.org/10.3870/.issn.10014152.2016.02.098 (in Chinese).

Travis, S. S., & McAuley, W. J. (1998). Searches for a nursing home: Personal and situational factors. *Journal of Applied Gerontology*, *17*(3), 352-370. https://doi.org/10.1177/073346489801700305

Tse, M. M. Y. (2007). Nursing home placement: Perspectives of community-dwelling older persons. *Journal of Clinical Nursing*, *16*(5), 911-917. https://doi.org/10.1111/j.1365-2702.2006.01833.x

Walker, C. A., Curry, L. C., & Hogstel, M. O. (2007). Relocation stress syndrome in older adults transitioning from home to a long-term care facility: Myth or reality?. *Journal of Psychosocial Nursing and Mental Health Services*, *45*(1), 38-45. https://doi.org/10.3928/02793695-20070101-09

Wan, G., Shieh, C.-J., Pu, G., & Huang, G. (2019). Factors in residence satisfaction of elderly from nursing homes: Evidence from China. *Revista de Cercetare si Interventie Sociala*, *65*, 26-35. https://doi.org/10.33788/rcis.65.2

Wang, C. S., Wu, M. L. Y., & Zeng, T. Y. (2017). Experience of the elderly living in medical-nursing combined pension institutions: A qualitative study. *Chinese Nursing Management*, *17*(5), 605-609. https://doi.org/10.3969/j.issn.1672-1756.2017.05.009 (in Chinese)

Wang, F., Liu, S., Zhang, Q., Ng, C. H., Cui, X., Zhang, D., & Xiang, Y. T. (2021). Prevalence of depression in older nursing home residents in high and low altitude regions: A comparative study. *Frontiers in Psychiatry*, *12*, 669234. https://doi.org/10.3389/fpsyt.2021.669234

Wang, M. N., Zhao, M. L., Zhang, L. F., Zhang, X. W., Han, M. D., Jin, P. L., & Zhang, Z. X. (2020). Qualitative research on cognition, current situation and needs of family support among elderly in old-age care institutions. *Occupation and Health*, *36*(7), 939-947. https://doi.org/10.13329/j.cnki.zyyjk.2020.0287 (in Chinese).

Wu, C. S., & Rong, J. R. (2020). Relocation experiences of the elderly to a long-term care facility in Taiwan: A qualitative study. *BMC Geriatrics*, *20*(1), 280. https://doi.org/10.1186/s12877-020-01679-5

Xing, Q. Y., Lin, L., Zhang, H., & Sun, X. H. (2020). Qualitative study on stress experience of relocation among elderly in nursing home. *Chinese Nursing Research*, *34*(8), 1457-1461. https://doi.org/10.12102/j.issn.1009-6493.2020.08.033 (in Chinese).

Xu, X. Y., Tu, S. W., & Lin, C. C. (2021). Advance care planning preferences in Chinese nursing home residents: Results from two cross-sectional studies in Hong Kong and Taiwan. *BMC Palliative Care*, *20*(1), 123. https://doi.org/10.1186/s12904-021-00820-4

Yang, J. J., Cai, H., Xia, L., Nie, W., Zhang, Y., Wang, S., Shi, Y., Ng, C. H., Liu, H., & Xiang, Y. T. (2021). The prevalence of depressive and insomnia symptoms, and their association with quality of life among older adults in rural areas in China. *Frontiers in Psychiatry*, *12*, 727939. https://doi.org/10.3389/fpsyt.2021.727939

Yeh, K. H., Yi, C. C., Tsao, W. C., & Wan, P. S. (2013). Filial piety in contemporary Chinese societies: A comparative study of Taiwan, Hong Kong, and China. *International Sociology*, *28*(3), 277-296. https://doi.org/10.1177/0268580913484345

Yong, B., Lin, R., & Xiao, H. (2021). Factors associated with nursing home adjustment in older adults: A systematic review. *International Journal of Nursing Studies*, *113*, 103790. https://doi.org/10.1016/j.ijnurstu.2020.103790

Zeng, Y., Chen, H., Wang, Z., & Land, K. C. (2015). Implications of changes in households and living arrangements for future home-based care needs and costs for disabled elders in China. *Journal of Aging and Health*, *27*(3), 519-550. https://doi.org/10.1177/0898264314552690

Zhan, H. J., Feng, X., & Luo, B. (2008). Placing elderly parents in institutions in urban China A reinterpretation of filial piety. *Research on Aging*, *30*(5), 543-571. https://doi.org/10.1177/0164027508319471

Zhang, H. (2019). Sending parents to nursing homes is unfilial? An exploratory study on institutional elder care in China. *International Social Work*, *62*(1), 351-362. https://doi.org/10.1177/0020872817725137

Zhu, H. (2015). Unmet needs in long-term care and their associated factors among the oldest old in China. *BMC Geriatrics*, *15*, 46. https://doi.org/10.1186/s12877-015-0045-9

Original Research

The relationship between sense of coherence and cross-cultural adjustment among Chinese nurses in Japan

Tsubasa Mori, MSN, RN[1] iD, and Xiaodong Cardenas, PhD, RN[2] iD

[1]Department of Chronic Nursing, Graduate School of Osaka Medical and Pharmaceutical University, Osaka, Japan, and [2]Department of Adult Nursing, Faculty of Nursing, Japanese Red Cross Toyota College of Nursing, Aichi, Japan

Abstract

Objective: Nurses from China have attracted attention as a new talent in Japan's aging population. However, cross-cultural adjustment could cause psychological stress. This study investigated the relationship between stress-coping skills among Chinese nurses working in Japan and their cross-cultural adjustment as professionals. **Methods:** This study employed a quantitative research design and used questionnaires. Thirty-nine Chinese nurses who had graduated from universities in mainland China and were currently employed in Japanese medical institutions participated. Scores on the sense of coherence (SOC) and the Three Dimensions of Cross-cultural Adjustment Scales were collected from the Chinese nurses. The average SOC-13 scores were dichotomized. Then, the two groups were compared using the Mann-Whitney U test. The significance level was set at $p < .05$. **Results:** The average value of SOC-13 scores revealed a significant difference in the overall score for the Three Dimensions of Cross-cultural Adjustment Scale ($p = .001$). Significant differences were also found for psychological adjustment ($p = .041$), sociocultural adjustment ($p = .024$), and the subscale of "affinity relationships" ($p = .044$). However, "job performance," "empathic care," "workplace adaptation," "self-realization adjustment," and the length of nursing experience in Japan did not significantly differ. **Conclusions:** The stress-coping skills of Chinese nurses in Japan may be related to their professional cross-cultural adjustment. Additionally, a significant difference was found in "affinity relationships" between groups with high and low SOC-13 scores. Culturally favorable interpersonal behavior is important for nurses' roles. Furthermore, encouraging and supportive interpersonal relationships can enhance stress-coping skills. Support for relationships may contribute to their successful migration.

Keywords

Chinese nurses, Japan, Sense of Coherence, Cross-cultural Adjustment

Introduction

The recent demographic shift in Japan, marked by a declining birth rate and an increasingly aging population, has caused a decline in the working-age population. In this context, family-work conflicts and the intention to leave due to burnout affected retention and led to a shortage of nurses. (Fukuzaki et al., 2021; Yamaguchi et al., 2016). This shortage has necessitated overseas recruitment to meet healthcare demands. Since 2008, nurses from Indonesia, the Philippines, and Vietnam have been recruited under the Economic Partnership Agreements (EPAs). However, these foreign nurses often find it difficult to pass the Japanese National Nursing Examination (NNE), which comprises multiple-

choice questions presented in Japanese. Additionally, their unfamiliarity with "kanji"-Chinese characters used in the Japanese language-further compounds the challenge. The Japanese language comprises three scripts: *hiragana*, *katakana*, and *kanji*. The Japanese written language primarily uses *kanji*, the pictographic characters based on Chinese characters called "hanzi" in China. In Japan, students must learn 2,136 common *kanji* characters before graduating high school. EPA nurses find writing and reading Japanese to be the most challenging part. (Hatanaka & Tanaka, 2014; Nagae et al., 2013).

However, nurses from China have gained recognition as a new source of healthcare professionals within Japanese healthcare settings. Japan and China share cultural roots, such as Chinese characters and Confucianism (Shimizu, 1983). Although the pronunciation in Chinese differs from that in Japanese, Chinese nurses understand kanji and can interpret Japanese writings. Therefore, Chinese nurses successfully clear N1, the highest level of the Japanese Language Proficiency Test, measuring Japanese proficiency among non-native speakers (Gong, 2018; Han, 2013; The Japan Foundation and Japan Educational Exchanges and Services, 2022). On average, over 90% of Chinese nurses pass the Japanese NNE, nearly equivalent to the average pass rate of native Japanese nursing students (International Nurse Support, 2021). In addition, Confucius-based ethics emphasize ancestral worship and devotion to parents, family, and friends. This culture, originating in ancient China, has greatly influenced the spiritual and cultural lives of the Japanese people.

Owing to the cultural similarities, there have been fewer studies on Chinese nurses in Japan than in Western countries. Xu et al. (2008) found that Chinese nurses took longer to adjust in the United States than nurses from other Asian countries, like India and the Philippines, where education is generally provided in English. In Singapore, where Chinese is an official language, students tend to experience cognitive fatigue, mental fatigue, and burnout when required to communicate in English (Goh & Lopez, 2016). Language differences pose a problem in Western countries (O'Neill, 2011; Walker & Clendon, 2015). In contrast, since Chinese characters are widely used in Japan, it could become an attractive employment destination for Chinese nurses.

However, little is known about the acculturation stress that Chinese nurses experience owing to cultural differences between Japan and China. Chinese nurses working in Japan often perceive interpersonal conflicts caused by these differences as stressors (Bu, 2017; Ishihara, 2012). They also face difficulties managing homesickness and adapting to unfamiliar Japanese customs, such as strict hierarchical relationships (Tuo et al., 2021). Adjusting to a new culture is a complex, multidimensional, and bidirectional process that involves behavioral and psychological changes (Berry, 1992; Ea, 2007).

Cross-cultural adjustment often entails psychological stress and coping with perceived cultural differences (Berry, 1992; Ma et al., 2020).

Shimizu (1983) found that communal living in a closed environment and shared ownership of property influence the Japanese to converse in ways that minimize conflicts in the community. In Japan, the typical communication style involves using "indirect expressions" and relying on "reading between the lines" (Makino, 2005). In contrast, Chinese individuals prefer direct communication (Wang, 2003) and must overcome arising interpersonal conflicts due to these differences.

Furthermore, nurses have different roles in Japan and China. In Japan, their primary role is to provide personal care, while in China, their primary role is to assist with medical treatment. Additionally, Chinese culture emphasizes caring for aging parents (Chen et al., 2017). This role discrepancy may also act as a stressor while adjusting to the workplace. To successfully adapt to a new culture, coping with acculturative stress is essential (Makino, 2005). Therefore, Chinese nurses working in Japan must overcome the psychological stress caused by cultural differences.

A sense of coherence (SOC) reflects an individual's ability to cope with everyday stressors. SOC comprises three elements: comprehensibility, manageability, and meaningfulness. Comprehensibility refers to the structure, predictability, and explainability of stimuli from internal and external environments throughout one's life. Manageability means having access to resources to meet the demands posed by these stimuli. Lastly, meaningfulness refers to perceiving these demands as challenges worthy of investment and engagement (Antonovsky, 1987). Antonovsky (1987) found that individuals possessing these elements could maintain good health even in harsh conditions. Therefore, an SOC is crucial for Chinese nurses navigating various stressors in a cross-cultural environment.

Antonovsky (1993) developed a questionnaire to measure SOC, and it has been used in studies of individuals with diverse attributes. In a study of Chinese individuals, He et al. (2012) found that nursing students studying abroad with a specific goal had higher SOC scores than college students living in China (Yu & Watanabe, 2016). Han (2013) also noted that Chinese nurses were motivated to pursue nursing studies in Japan. As a result, Chinese nurses working in Japan are expected to have a high SOC and clearly defined goals. Understanding the current status of Chinese nurses' SOC and its related factors in cross-cultural adjustment can guide the development of supportive measures for cross-cultural adjustment. Therefore, this study aimed to explore the relationship between SOC and cross-cultural adjustment among Chinese nurses working in Japan.

Materials and Methods

Design

This study employed a quantitative research design and used a self-administered questionnaire.

Participants

The inclusion criteria for this study were as follows: 1) holding Chinese citizenship, 2) graduation from a college nursing program in mainland China, 3) possession of a national nursing license in China and Japan, and 4) employment in a medical facility in Japan during the survey.

Research Period

The study was conducted from August 2, 2021, to March 31, 2022, after obtaining approval from the Committee of Research Ethics at Osaka Medical and Pharmaceutical University.

Eligibility Criteria

A list of medical institutions in Japan employing Chinese nurses was compiled based on referrals from the researcher's acquaintances, announcements by Not-for-Profit Organizations helping Chinese nurses find employment, and public announcements on websites or blogs. Duplicate entries were removed to ensure accuracy. Outside of mainland China, such as in Taiwan, nursing regulations, education, and nursing care delivery systems generally differ (Yoshioka & Inagaki, 2017). Therefore, nurses identified in the aforementioned list and received their education in mainland China were eligible. There were no exclusions based on participants' age or length of nursing experience.

Data Collection Method

A questionnaire survey was conducted using the postal method. The questionnaire, explanatory notes, and research plan were sent to the nursing department's director at the participants' facility. Directors were informed of the survey's purpose in writing, and consent to participate was obtained. Then, the directors were asked to distribute questionnaires, explanatory notes, and return envelopes to the nursing participants. To protect the participants' identities, the questionnaires were collected anonymously by mail.

Survey Contents

Participants' Demographic Characteristics
We gathered data on participants' age, sex, and length of nursing experience in Japan.
Three Dimensions of Cross-cultural Adjustment
Hatanaka and Tanaka (2014; 2015; 2016) developed the "Three-layered Structural Model" for cross-cultural adjustment among foreign care workers. The model has three stages representing the consecutive stages of cross-cultural
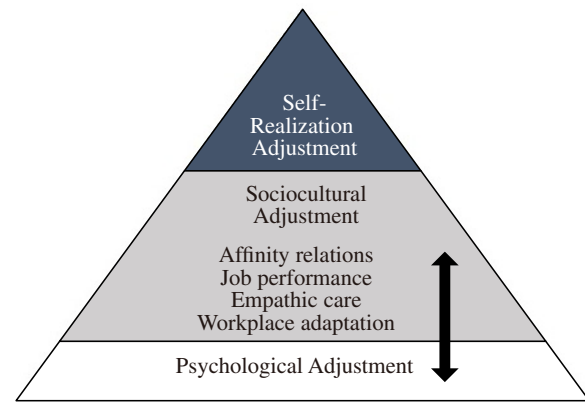
Figure 1. Hatanaka and Tanaka's three-layered structural model for cross-cultural adjustment.
Note: description: Cross-cultural adjustment proceeds in stages, from the lower to the upper levels.
Promoting the sociocultural adjustment in the middle layer reinforces the psychological adjustment of the lower and the upper layers.

adaptation (Figure 1). The first stage is psychological adjustment, which ensures the worker's physical and mental well-being. Successfully overcoming this stage leads to the second stage, sociocultural adjustment, which provides nursing care according to the patient's needs, adheres to workplace practices, and fosters friendly relationships with colleagues. This stage comprises four factors: "empathetic care," "affinity relations," "job performance," and "workplace adaptation." The final stage is self-realization adjustment, where the worker recognizes the meaningfulness of life in Japan and engages in self-improvement. This model suggests that improvement in sociocultural adjustment enhances psychological and self-realization adjustment. Therefore, sociocultural adjustment is the most crucial factor for professional adjustment.

Hatanaka and Tanaka (2015; 2016) developed the "Three Dimensions of Cross-cultural Adjustment Scale" to assess the level of cross-cultural adjustment among foreign healthcare workers in Japan. The scale comprises 19 items, each rated on a 5-point Likert scale. High scores indicate a great degree of cross-cultural adjustment. The items correspond to the elements of each stage in the "Three-layered Structural Model." To determine the extent of adjustment, the developers established a criterion of a minimum of four points per question or a total score of at least 80% for each category.
SOC-13
Two scales have been developed to assess the SOC (Antonovsky, 1987; 1993): one with 29 items and a shortened version with 13 items. These scales are referred to as SOC-29 and SOC-13, respectively, based on the number of items. Togari and Yamazaki (2005) confirmed the reliability and factor validity of the Japanese version of SOC-13. In this

Table 1. Items in the SOC-13 Scale.

1	Do you have the feeling that you really don't care about what is going on around you?
2	Has it happened in the past that you were surprised by the behaviour of people whom you thought you knew well?
3	Has it happened that people whom you counted on disappointed you?
4	Until now your life has had no clear goals - very clear goals and purpose
5	Do you have the feeling that you are being treated unfairly?
6	Do you have the feeling that you are in an unfamiliar situation and don't know what to do?
7	Doing the things you do every day is: a source of deep pleasure and satisfaction - a source of pain and boredom
8	Do you have very mixed-up feelings and ideas?
9	Does it happen that you experience feelings that you would rather not have to endure?
10	Many people, even those with a strong character, sometimes feel like losers in certain situations. How often have you felt this way in the past?
11	When certain events occurred, have you generally found that: you overestimated or underestimated their importance - you assessed the situation correctly?
12	How often do you have the feeling that there is little meaning in the things you do in your daily life?
13	How often do you have feelings that you are not sure you can control?

study, the SOC-13 was employed to measure the SOC, specifically the stress-coping abilities of Chinese nurses in Japan.

The SOC-13 scale includes the following subscales (Table 1): comprehensibility (5 items: 2, 6, 8, 9, and 11), manageability (4 items: 3, 5, 10, and 13), and meaningfulness (4 items: 1, 4, 7, and 12). Each item is scored 1-7 points. Items 1, 2, 3, 7, and 10 are reverse-scored. Total scores range from 13 to 91, with high scores indicating a strong SOC.

Data Analysis

First, we determined the participants' characteristics by tabulating age, sex, length of nursing experience in Japan, SOC-13 scores, total scores on the Three Dimensions of Cross-cultural Adjustment Scale, and scores on each subscale of the two scales. Then, we calculated the average scores on these scales. Second, we divided the data into high and low groups based on the average SOC-13 total scores to examine the association of SOC with cross-cultural adjustment. We confirmed a skewed data distribution on the Three Dimensions of Cross-cultural Adjustment Scale, with each of its subscales using the Shapiro-Wilk test. Finally, we used the Mann-Whitney U test to compare the data from the high- and low-score groups. The significance level was set at $p < .05$. The data were analyzed using Statistical Package for Social Sciences version 27.0.

Ethical Approval

Permission to conduct this study was obtained from the Research Ethics Committee of Osaka Medical and Pharmaceutical University [No. 2021-041].

Results

Characteristics of the Participants

Of the 140 participating nurses, 46 (33.1%) responded. One participant was excluded because she was from Taiwan. Six participants with missing responses to the scales were also excluded. After exclusion, 39 valid responses were obtained, with a final valid response rate of 27.9%.

Table 2 presents the demographic characteristics and scores for each scale. Most participants were women aged 25-34 years, with an average of 4.6 (standard deviation [*SD*] = 2.0) years of nursing experience in Japan. The average time spent learning Japanese before passing the Japanese NNE was 2.5 (*SD* = 1.0) years. Eleven (28.2%) participants worked in internal medicine wards but had diverse affiliations.

Table 3 presents the scores on each scale. The total SOC-13 score had large individual differences, with a minimum score of 34, a maximum score of 77, and a mean score of 57.7 (*SD* = 9.6). The mean total score on the Three Dimensions of Cross-cultural Adjustment Scale was 67.7 (*SD* = 5.5).

Comparison of Groups with High and Low SOC-13 Scores

Considering the skewed data distribution, the Mann-Whitney U test was used for analysis. Dichotomous comparisons by SOC-13 scores (Table 4) showed a significant difference in the overall score on the Three Dimensions of Cross-cultural Adjustment Scale ($p = .001$). Furthermore, significant differences were observed in psychological adjustment ($p = .041$), sociocultural adjustment ($p = .024$), and the subscale of "affinity relations" ($p = .044$).

"Empathic care," "job performance," "workplace adaptation," and "self-realization adjustment" did not differ significantly between groups with high and low SOC-13 scores.

Table 2. Participants' demographic characteristics.

N = 39

Age group (years)	Sex		
	Female	Male	Total
20–24	1	1	2
25–29	20	2	22
30–34	13	1	14
35–39	1	0	1
Total	35	4	39

	Min.	Max.	Mean	SD
Duration of learning Japanese before clearing the Japanese NNE (years)	1	6	2.5	1.0
Length of nursing experience in Japan (years)	1	8	4.6	2.0

Timepoint of obtaining N1	*n*	%
Before shifting to Japan	15	38.5
After shifting to Japan	24	61.5

Current affiliation	*n*	%
Internal medicine wards	11	28.2
Mixed wards	7	17.9
Surgical wards	5	12.8
Intensive care units	3	7.7
Home-visit nursing services	3	7.7
Dialysis units	1	2.6
Obstetrics and gynecology clinic	1	2.6
Others (surgery/endoscopy rooms/ long-term medical care wards)	8	21.1

Discussion

The average total score on the Three Dimensions of Cross-cultural Adjustment Scale was below the criterion value of 80%, indicating that Chinese nurses still face challenges in achieving cross-cultural adjustment in Japan. The study explored the relationships between cross-cultural adjustment, SOC (the driving force for dealing with stress due to cross-cultural adjustment), and the Three Dimensions of Cross-cultural Adjustment Scale.

Participants had a mean total score of 57.7 (*SD* = 9.6) on the SOC-13 scale. Their mean SOC-13 scores were higher than those previously reported in studies of Japanese nurses (Yoshida et al., 2013) and Chinese university students (Yu, 2016). He et al. (2012) revealed that the mean SOC score of Chinese nursing students in Australia was negatively correlated with acculturative stress. Migration stress is related to the reason for migration and is high when motivated by extrinsic factors (Makino, 2005). The participants' tendency to have a higher SOC than the other groups may be attributed to their spontaneous motivation to challenge themselves by moving to a new country. Supporting Chinese nurses in improving their SOC and cross-cultural adjustment to the pro-

fession (sociocultural adjustment) may facilitate their self-realization.

These results suggest an association between SOC and cross-cultural adjustment. The Three Dimensions of Cross-cultural Adjustment Scale measures people's behavior and task achievement in different cultures. This study examined cross-cultural adjustment factors that helped nurses overcome acculturation stress.

Psychological adjustment forms the basis of cross-cultural adjustment, encompassing mental and physical aspects of well-being. This initial adjustment stage is crucial to advance to the subsequent stage of sociocultural adjustment. SOC, which refers to an individual's ability to preserve physical and mental health amid challenging circumstances, is a prevalent trait among Chinese nurses. Consequently, it is vital to implement strategies that promote SOC, such as improving their work environment and offering social support, to aid in their cross-cultural adjustment as nursing professionals.

Sociocultural adjustment measures whether foreign-educated nurses have the necessary language skills to perform their duties in the Japanese workplace and whether they behave in a culturally appropriate manner. It also involves understanding patient needs and practical nursing skills. The highest-scoring aspect of the scale is the cornerstone of cross-cultural adjustment among Chinese nurses. Since this aspect is related to SOC, Chinese nurses who can overcome acculturative stress are likely to perform well in Japanese healthcare settings. Hatanaka and Tanaka (2016) analyzed the sociocultural adjustment components when examining the Three Dimensions of Cross-cultural Adjustment.

"Affinity relations" encompass trusting workplace relationships, personal friendships, and adherence to punctuality according to Japanese workplace customs. Chinese nurses in the high-SOC group could establish a great rapport in their workplace. To establish relationships with Japanese individuals, the characteristics of Japanese interpersonal behavior must be considered. Japanese individuals generally avoid using direct and explicit language to avoid interpersonal conflicts. In Japan, even in medical institutions where accurate information transmission is crucial, "tacit understanding" is used (Davis, 1999). In contrast, clear and explicit verbal communication is favored in China (Wang, 2003). Japanese individuals use ambiguous language and leave the interpretation to the receiver. Therefore, communication with Japanese individuals requires the ability to deduce their true intentions. This skill is essential for fostering relationships with Japanese nurses in the workplace and collaborating with physicians and other professionals. Furthermore, deducing true intentions is also valuable when caring for patients with physical or psychological conditions who cannot articulate their needs clearly.

According to Hatanaka and Tanaka (2014), cultural learn-

Table 3. Scores on SOC-13 and three dimensions of cross-cultural adjustment.

N = 39

	Score range	*Min.*	*Max.*	*Mean.*	*SD*
SOC-13 total	13–91	34	77	57.7	9.6
Comprehensibility	5–35	13	29	21.8	4.5
Manageability	4–28	8	26	17.4	3.8
Meaningfulness	4–28	9	28	18.5	4.2
Three Dimensions of Cross-Cultural Adjustment total	19–95	56	81	67.7	5.5
Psychological Adjustment	4–20	4	19	13.1	2.9
1. Have you have a lot of energy?	1–5	1	5	3.3	0.87
2. Have you felt and calm and peace?	1–5	1	5	3.7	0.76
3. Have you felt tired? *	1–5	1	4	2.6	0.9
4. Have you been feeling unhappy and depressed? *	1–5	1	5	3.4	1.02
Sociocultural Adjustment	13–65	38	57	47.0	4.0
Empathic care	3–15	6	15	10.1	1.6
5. I adopt the care method of my home country when I work.	1–5	1	5	2.7	0.9
6. I understand (Japanese) familial background	1–5	2	5	3.8	0.6
7. I can offer care thet suits the needs of Japanese patients.	1–5	2	5	3.9	0.6
Job performance	4–20	11	18	15.0	1.4
8. The patient does not talk about their true feelings and personal matters. *	1–5	1	5	3.4	0.9
9. I cannot follow instructions collectly. *	1–5	2	5	3.8	0.6
10. I can write and speak medical termsnecessary for work.	1–5	3	5	3.7	0.5
11. I cannot understand the patient's words; thus, I cannot provide appropriate care. *	1–5	2	5	4.0	0.6
Affinity relations	3–15	6	13	11.1	1.5
12. I participate in events at the workplace.	1–5	2	5	3.7	0.5
13. When I work, I keep promices and time like the Japanese do.	1–5	2	5	4.1	0.6
14. There are Japanese people at the work with whom I can talk honestly about work.	1–5	1	5	3.3	0.9
Workplace adaptation	3–15	8	15	10.9	1.8
15. I do not have a good relationship with the Japanese people in the workplace. *	1–5	1	5	3.6	0.8
16. I cannot understand the Japanese medical system. *	1–5	2	5	3.6	0.8
17. I work easily like the Japanese working pattern (over work, day off, vacation).	1–5	2	5	3.6	0.9
Self-Realization Adjustment	2–10	5	10	7.5	1.2
18. I feel life is meaningful in Japan.	1–5	2	5	3.7	0.7
19. I feel challanged in studying Japanese.	1–5	3	5	3.9	0.6

Note: * Reversed scoring items.

ing improves when individuals have interpersonal interactions in the host country during cross-cultural adjustment. By developing personal friendships with Japanese colleagues, they can excellently understand Japanese lifestyles and seek advice regarding workplace challenges. Therefore, focusing on the interaction between their "affinity relationship" and SOC would be effective. SOC among Chinese nurses in Japan is associated with positive workplace relationships.

Similarly, favorable relationships have been found to enhance workers' SOC (Antonovski, 1987). Moyce et al. (2015) proposed that effective workplace transition can be facilitated through meet-and-greet activities. Adeniran et al. (2008) developed a support program model for foreign-educated nurses, which includes the provision of escorts by senior nurses for grocery shopping and local community gatherings. Teaching them how to engage with Japanese individuals and offering them opportunities to meet outside of work could help mitigate the negative effects of social isolation. Furthermore, being knowledgeable about Japanese customs of interpersonal consideration, such as preservation and socialization, might alleviate feelings of alienation caused by distance from Japanese people. These findings suggest that instructing students on the characteristics of Japanese interpersonal behavior and providing them with opportunities to interact with Japanese individuals will effectively promote

Table 4. Comparison of high and low soc-13 scores.

N = 39

	Score range	Low-score group (*n* = 19) SOC ≦ 57	High-score group (*n* = 20) SOC ≧ 58	
		Median (25–75 perentile)	*Median (25–75 percentile)*	*p-value*
SOC-13 total	13–91	51.0 (49.0–54.0)	64.0 (60.0–68.0)	
Three dimensions of cross-cultural adjustmant total	19–95	65.0 (61.0–69.0)	70.0 (67.0–72.8)	.001**
Psychological adjustment	4–20	12.0 (10.5–14.0)	14.0 (12.5–15.0)	.041**
Socio-cultural adjustment	13–65	45.0 (43.0–47.5)	48.0 (46.0–50.5)	.024**
Empathic care	3–15	10.0 (8.5–11.0)	10.0 (9.0–11.0)	.309
Job performance	4–20	15.0 (14.0–15.5)	15.0 (14.0–16.0)	.478
Affinity relations	3–15	11.0 (10.0–12.0)	12.0 (11.5–12.0)	.044**
Workplace adaptation	3–15	10.0 (9.0–11.5)	12.0 (10.5–12.0)	.065
Self-realization Adjustment	2–10	7.0 (7.0–8.0)	8.0 (7.0–8.0)	.351
Length of nursing experience in Japan (year)		5.0 (2.5–6.0)	4.0 (3.5–5.0)	.989

Note: Mann-Whitney's U test

**p<.05

their cross-cultural adjustment.

High and low scores on SOC had no association with "empathic care," "job performance," or "workplace adaptation." "Empathic care" means understanding the care needs of Japanese patients with different cultural backgrounds and practices to meet their needs. This suggests that the participants are attentive to their patients' needs, regardless of their ability to tolerate stress. The same can be said for "job performance," indicating that Chinese nurses can read and write Japanese and fulfill their duties as directed at work, regardless of their stress-coping abilities. However, one possible explanation for the lack of association with certain factors may be that the scale was designed for foreign caregivers and did not consider the specific characteristics of Chinese nurses.

The collectivist Chinese citizens are known for actively helping loved ones and respecting the status of others (Mao & Daibo, 2012; Pang et al., 2009). Considering this cultural context, it can be inferred that empathic care for patients does not significantly differ, regardless of stress. Additionally, Pang et al. (2009) found that Chinese nurses highly valued dedicating themselves to their patients out of altruism. Considering their values, practical training experience working under full-time nurses (Wang et al., 2016), and high proficiency in the Japanese language, it is reasonable to infer that their SOC was not related to "empathic care" and "job performance." "Workplace adaptation" refers to adapting to the workplace rules as a member of the organization. In a comparative study of organizational commitment among nurses in Japan and China, Guo et al. (2012) found that Chinese nurses had high organizational and disciplinary commitment levels.

These results suggest that support should be provided to

enhance Chinese nurses' coping ability with acculturative stress. This support should focus on building favorable workplace relationships. It is important for Chinese nurses to understand the cultural aspects related to Japanese interpersonal behavior and for their Japanese colleagues to understand the characteristics of Chinese interpersonal behavior.

Conclusion

This study found that SOC was associated with cross-cultural adjustment among Chinese nurses in Japan. Furthermore, assisting them is necessary to build positive relationships rooted in cultural understanding to enhance their SOC. A circular correlation indicated that favorable relationships strengthened their SOC. Chinese nurses will likely feel increasingly isolated as their time in Japan prolongs unless they familiarize themselves with the underlying factors of Japanese interpersonal behaviors. Therefore, proactive support is needed instead of passive observations.

Limitations

The study's contribution is limited because of the small sample size. Hence, it is necessary to reach many participants using the Internet and surveys. By focusing on Chinese nurses, it will be possible to develop support measures well-suited to their needs instead of foreign care workers. Additionally, the cross-cultural adjustment of Chinese nurses in Japan was assessed using self-reporting methods, which may have been insufficient for evaluating their adaptation to Japanese healthcare settings. Further evaluations by Japanese nurses working alongside them would be beneficial in devel-

oping appropriate support measures.

Acknowledgments

Author Contributions

Tsubasa Mori contributed to the conception and design of the study, data acquisition, analysis, and writing the original draft. Xiadong Cardenas provided advice and critically revised the paper to enhance its intellectual content. Both authors reviewed and accepted the final manuscript.

Declaration of Conflicting Interests

We have no conflicts of interest to disclose.

Ethical Approval

This study was approved by the Committee of the Research Ethics of Osaka Medical and Pharmaceutical University [No.2021-041].

Informed Consent

Informed consent was obtained from all participants involved in this study.

References

Adeniran, R. K., Rich, V. L., Gonzalez, E., Peterson, C., Jost, S., & Gabriel, M. (2008). Transitioning internationally educated nurses for success: A model program. *The Online Journal of Issues in Nursing*, *13*(2). https://doi.org/10.3912/OJIN.Vol13No02Man03

Antonovski, A. (1987). *Unraveling the mystery of health: How people manage stress and stay well*. San Francisco: Jossey-Bass Publishers.

Antonovsky, A. (1993). The structure and properties of the sense of coherence scale. *Social Science and Medicine*, *36*(6), 725-733. https://doi.org/10.1016/0277-9536(93)90033-Z

Berry, J. W. (1992). Acculturation and adaptation in a new society. *International Migration*, *30*(s1), 69-85. https://doi.org/10.1111/j.1468-2435.1992.tb00776.x

Bu, Y. (2017). Zainichi chugokujin kangoshi no ibunka tekiou mondai ni kanshite: Genba chousa no deta bunseki yori [Cross-cultural adjustment issues of Chinese nurses in Japan: an analysis of the data of a field survey]. *Chiba [Shukutoku University Bulletin]. Faculty of Integrated Human and Social Welfare Studies*, *51*, 117-130. https://core.ac.uk/reader/268066929

Chen, H., Miyakoshi, Y., Nakatani, H., Fujii, T., Rahman, M., & Kobayashi, T. (2017). Cognition, training, and education of nurses in oral feeding assistance for hospitalized patients: A comparative study among nurses in China and Japan. *Hiroshima Journal of Medical Sciences*, *66*(3), 61-69. https://doi.org/10.24811/hjms.66.3_61

Davis, A. J. (1999). Global influence of American nursing: Some ethical issues. *Nursing Ethics*, *6*(2), 118-125. https://doi.org/10.1177/096973309900600204

Ea, E. (2007). Facilitating acculturation of foreign-educated nurses. *Online Journal of Issues in Nursing*, *13*(1).

Fukuzaki, T., Iwata, N., Ooba, S., Takeda, S., & Inoue, M. (2021). The effect of nurses' work-life balance on work engagement: The adjustment effect of affective commitment. *Yonago Acta Medica*, *64*(3), 269-281. https://doi.org/10.33160/yam.2021.08.005

Goh, Y. S., & Lopez, V. (2016). Job satisfaction, work environment and intention to leave among migrant nurses working in a publicly funded tertiary hospital. *Journal of Nursing Management*, *24*(7), 893-901. https://doi.org/10.1111/jonm.12395

Gong, J. (2018). Research on Chinese nurse adaption situations in multicultural work occurrences. Identity and language use of people in the move. *Language Management in Contact Situations*, *15*, 67-73.

Guo, Z., Sakuda, H., & Sakaguchi, M. (2012). Organizational commitment and organizational citizenship behavior: The characteristics of Japanese nurses and Chinese nurses. *Journal of Japan Academy of Nursing Science*, *32*(1), 59-68.

Han, H. (2013). Nihon ni okeru kangoshibusoku to chugokujinkangoshi ukeire no jittai to tenbou: Nicchu no kangoroudoujijo to kangojinzai yosei system no hikakubunseki [Nurse shortage in Japan and the status and prospects of accepting Chinese nurses: Comparative analysis of work situation and system for nursing education in Japan and China]. *Yamaguchi*: Ph.D. Thesis. Yamaguchi University.

Hatanaka, K., & Tanaka, T. (2014). Zainichi gaikokujin kaigoshi kouhosei no ibunka tekiou -Sansou kouzou moderu ni motoduku judanteki jirei no bunseki- [Cross cultural adjustment of foreign care workers in Japan -Analyzing the longitudinal cases based on a three-layered structural model-]. *Okayama: Journal of Humanities and Social Sciences*, *37*, 67-76.

Hatanaka, K., & Tanaka, T. (2015). The influences of intercultural social skills on the cross-cultural adjustment of foreign healthcare workers in Japan. *Multicultural Relations*, *12*, 105-116.

Hatanaka, K., & Tanaka, T. (2016). Cross-cultural factors that influence adjustments of foreign care workers in Japan: Towards a three-layered structural model. *International Journal of Health and Life-Sciences*, *2*(3), 01-17. https://doi.org/10.20319/lijhls.2016.23.0117

He, F. X., Lopez, V., & Leigh, M. C. (2012). Perceived acculturative stress and sense of coherence in Chinese nursing students in Australia. *Nurse Education Today*, *32*(4), 345-350. https://doi.org/10.1016/j.nedt.2011.05.004

NPO International Nurse Support [Internet] (2021). *Achievements*. http://www.insnpo.org/english/activity.html

Ishihara, M. (2012). Nihon no iryougenba ni okeru chugokujin kangoshi no komyunikeshon: Byoin funin chokugo no kotoba no mondai wo chushin ni [Chinese nurses and communication in the Japanese medical field: Focusing on language problems immediately after hospital assignment]. *Tokyo. Communication Studies*, *36*, 67-81.

Ma, K., Pitner, R., Sakamoto, I., & Park, H. Y. (2020). Challenges in acculturation among international students from Asian collectivist cultures. *Higher Education Studies*, *10*(3), 34-43. https://doi.org/10.5539/hes.v10n3p34

Makino, M. (2005). *Ibunka storesu to shinshin Iryou [Cross-cultural stress and psychosomatic medicine]. [Shinko Igaku Shuppansha]*

Mao, X., & Daibo, I. (2012). Chugoku Bunka no yoso wo Koryoshita Shakaiteki sukiru Toreningu noPuroguramu Kaihatsu oyobi Koka no Kento [Development and evaluation of a social skills training program suitable for Chinese cultural characteristics]. Tokyo: The Japanese. *Journal of Personality*, *21*(1), 23-39.

Moyce, M., Lash, R., & Siantz, L. L. M. (2015). Migration experiences of foreign educated nurses: A systematic review of the literature. *Journal of Transcultural Nursing*, *2*, 181-188. https://doi.org/10.1177/1043659615569538

Nagae, M., Iwase, T., Furusawa, A., Tubonouchi, C., Shimai, T., & Ando, T. (2021). EPA Indoneshia. Kangoshi Kouhosha no Nihon no Shokubakankyou heno tekiou ni kansuru Kenkyu [Research on adjustment of EPA Indonesian nurse candidates to the Japanese work environment]. *Aichi: Bulletin of Japanese Red Cross Toyota College of Nursing*, *8*(1), 97-119.

O'Neill, F. (2011). From language classroom to clinical context: The role of language and culture in communication for nurses using English as a second language: A thematic analysis. *International Journal of Nursing Studies*, *48*(9), 1120-1128. https://doi.org/10.1016/j.ijnurstu.2011.02.008

Pang, D., Senaratana, W., Kunaviktikul, W., Klunklin, A., & McElmurry, B. J. (2009). Nursing values in China: The expectations of registered nurses. *Nursing and Health Sciences*, *11*(3), 312-317.

Shimizu, T. (1983). Chugokujin no Shikou to Kodoyoshiki: Nicchu no hikaku wo Chushin Toshite [Chinese thoughts and behavior: Focusing on comparison between Japan and China]. *Tokyo: Bulletin of Asia University*, *10*, 47-74.

The Japan foundation and Japan educational exchanges and services [Internet] (2022). *What is Japanese-language proficiency test?*. https://www.jlpt.jp/e/about/index.html

Togari, T., & Yamazaki, Y. (2005). Examination of the reliability and factor validity of 13-item five-point version sense of coherence scale. *Minzoku Eisei*, *71*(4), 168-182.

Tuo, J., Kabayama, M., Kamide, K., & Aimi, Y. (2021). A qualitative study on challenges Chinese nurses face while working in Japanese hospitals. *The Open Nursing Journal*, *15*(1), 122-129. https://doi.org/10.2174/1874434602115010122

Wang, C. C., Whitehead, L., & Bayes, S. (2016). Nursing education in China: Meeting the global demand for quality healthcare. *International Journal of Nursing Sciences*, *3*(1), 131-136. https://doi.org/10.1016/j.ijnss.2016.02.009

Wang, H. (2003). Language and its cultural context: China and Japan compared. *NUCB Journal of Language Culture and Communication*, *5*(2), 67-79.

Walker, L., & Clendon, J. (2015). New Zealand's migrant Asian nurses: Recent trends, future plans. *Labour, Employment and Work in New Zealand*. https://doi.org/10.26686/lew.v0i0.2221

Xu, Y., Gutierrez, A., & Kim, S. H. (2008). Adaptation and transformation through (un)learning: Lived experiences of immigrant Chinese nurses in US healthcare environment. *ANS. Advances in Nursing Science*, *31*(2), E33-E47. https://doi.org/10.1097/01.ANS.0000319570.99254.e5

Yamaguchi, Y., Inoue, T., Harada, H., & Oike, M. (2016). Job control, work-family balance and nurses' intention to leave their profession and organization: A comparative cross-sectional survey. *International Journal of Nursing Studies*, *64*, 52-62.

Yoshida, E., Yamada, K., Shibataki, H., & Morioka, I. (2013). Kangoshi no sensu obu kohirensu to sutoresu hanno tono kanren [Relationship between sense of coherence and stress reactions among nurses in a hospital]. *Tokyo. Journal of Japan Society of Nursing Research*, *36*(5), 25-33.

Yoshioka, M., & Inagaki, K. (2017) Taiwan ni okeru kango, kaigo no jissai to kadai -Taihoku, Karen, *Touen no byouin, daigaku, koureisha shisetu*, [Kaigosabisu jigyosho heno homon wo toshite [practice and issue of nursing and care in Taiwan: through visits to the hospital, the universities, facilities for the elderly folk and the nursing service offices in Taipei, Hualien and Taoyuan]]. *Shiga: Seisen Journal of Nursing Studies*, *6*, 83-90. https://core.ac.uk/download/pdf/84431842.pdf

Yu, F., & Watanabe, K. (2016). The sence of coherence and lifestyle of the youth in China. *Journal of Okayama University*, *51*(3), 51-61.

Original Research

Identification of factors associated with the severity of oral mucositis in patients receiving cancer chemotherapy

Chizuko Yoshikawa, MSc[1] iD, and Yasushi Takamatsu, PhD, MD[2] iD

[1]Department of Nursing, International University of Health and Welfare, Fukuoka Faculty of Health and Medical Care, Fukuoka, Japan, and [2]Division of Medical Oncology, Hematology and Infectious Diseases, Department of Internal of Medicine, Fukuoka University, Fukuoka, Japan

Abstract

Objective: To investigate the risk factors affecting the onset and severity of oral mucositis in Japanese patients with cancer undergoing chemotherapy. **Methods:** Patients who underwent chemotherapy at a regional cancer hospital between January 20, 2017, and October 30, 2019, were enrolled in the study. Patients aged 20 – 80 years with malignant tumors underwent inpatient chemotherapy treatment and gave consent to participate in the study. Oral hygiene, immunocompetence, and nutritional status were assessed. The Common Terminology Criteria for Adverse Events Version 5.0 was used to assess the severity of adverse responses, and patients with oral mucositis grades 0 – 1 were assigned to group 1 and those grade 2 or higher to group 2. **Results:** Seventy patients were enrolled. Sixteen treatment plans were found. Group 1 had 45 patients and group 2 had 25. The following factors were related to oral mucositis severity: caries, periodontitis, unsuitable dentures (p = .041), frequency of toothbrushing (p = .024), and leukocytopenia grade 3 or higher (p = .030). There were no differences between the two groups in terms of oral hygiene, such as tongue coating and frequency of gargling, or the serum albumin and total protein levels. The risk factors for oral mucositis grade 2 or higher included the presence of caries, periodontal disease, unsuitable dentures (p = .041), toothbrushing twice daily or less (p = .024), and leukocytopenia grade 3 or higher (p = .030). **Conclusions:** Monitoring oral health and adopting preventive measures before and after chemotherapy can help manage oral mucositis in patients with cancer.

Introduction

Oral mucositis during chemotherapy causes lesions on oral tissues, and the associated discomfort, bleeding, and dysgeusia significantly lower the quality of life (QoL) of patients with cancer by affecting eating and swallowing (Steinmann et al., 2021). Stokman et al. (2006) reported that oral mucositis increases the risk of local and systemic infections in immunosuppressed patients and that severe oral mucositis affects the treatment of the primary disease in terms of dose reductions and unplanned interruptions of cancer therapies, thereby negatively impacting survival. Therefore, steps to minimize the risk factors for oral mucositis and avoid its aggravation are essential to guarantee that patients can finish chemotherapy without reducing their QoL.

Good oral hygiene helps reduce the severity of oral mucositis and mitigates the risk of bacteremia (Epstein et al., 1999). Thus, maintaining oral hygiene is essential to avoid

oral mucositis. However, chemotherapeutic agents can damage the oral mucosal barrier and promote local invasion and systemic propagation of commensal microorganisms. Oral mucositis occurs with a prevalence of approximately 40% in standard-dose anticancer regimens (Karthaus et al., 1999). The incidence and severity of mucositis depend on regimen, doses, and timing of chemotherapy (Elad et al., 2022). Chemotherapy-induced mucositis varies from 40 to 76% in patients treated with standard- and high-dose chemotherapy, respectively (Parulekar et al., 1998). A review by Villa and Sonis (2016) showed that approximately 30 − 40% of cancer patients receiving chemotherapy developed mucositis. The prevalence approached 60% − 85% among patients receiving hematopoietic stem cell transplantation and approached 90% in patients with head and neck cancer who were treated with radiotherapy plus chemotherapy (Villa & Sonis, 2016).

The importance of oral care and management during chemotherapy has been recognized since Sonis (1998, 2004) reported that mucosal infection caused by the resident flora of the oral cavity worsens oral mucositis. Clinical guidelines from the American Society of Clinical Oncology (Brown and Gupta, 2020) and the Multinational Association of Supportive Care in Cancer and International Society for Oral Oncology (Elad et al., 2020) for best care of patients undergoing chemotherapy have emphasized on not only the understanding of pathophysiology of oral mucositis but also patient education and communication between the patient and medical staff. Oral mucositis pain as well as duration of hospital stay for patients treated with chemotherapy can be reduced by adopting professional oral health care. Thus, the postchemotherapy management plan should include thorough understanding of variables that influence the severity of oral mucositis (Kubota et al., 2015).

The effectiveness of self-care using a combination of different oral hygiene products and methods, including toothbrushing, is recommended to lower the severity of oral pathologies, including mucositis, in hematology-oncology patients and hematopoietic stem cell transplantation recipients (Elad et al., 2015). Shouval et al. (2019) revealed risk factors for oral mucositis severity following allogeneic hematopoietic stem cell transplantation. However, factors affecting the severity of oral mucositis in patients with blood, hematopoietic, and solid tumors who undergo treatments other than hematopoietic stem cell transplantation have not been investigated in detail. The importance of screening for factors associated with oral mucositis onset and oral hygiene management to delay the development of severe oral mucositis has been recognized (McGuire et al., 2013). A previous study identified age and metastasis as factors that affect the duration of severe oral mucositis (Damascena et al., 2018). Determining the variables that influence the degree of oral mucositis is crucial to help the medical staff in creating more efficient plans to manage oncological patients.

Thus, this study aimed to identify the risk factors for oral mucositis and factors affecting its severity in Japanese patients with cancer who underwent chemotherapy. Being among the initial studies from Japan about the pathophysiology of oral mucositis, this research adds significant perspectives to the literature.

Materials and Methods

Design

This study was designed as an analytical observational study.

Participants

Among patients who received chemotherapy between January 20, 2017, and October 30, 2019, at Fukuoka University Hospital, Fukuoka, Japan, a designated regional cancer hospital with 900 beds, patients meeting the following eligibility requirements were enrolled: 1) patients aged 18 − 82 years diagnosed with malignant tumors, 2) inpatient treatment with chemotherapy, and 3) patient consent for use of electronic chart data for the study that was provided by signing the relevant consent form. In the facility, before starting chemotherapy, patients received detail explanations about oral mucositis and its preventive interventions. The nurses continued to observe the patient's oral cavity even after commencing chemotherapy.

Data Collection Methods

1) Data on patient background (age, sex, and disease name) were obtained from medical records (electronic charts) using a basic information data sheet. For chemotherapy patients, nurses documented their oral hygiene status (caries, periodontal disease, loose dentures, tongue coating) and the number of times they brush their teeth and gargle from the time they were brought to the hospital. The target facilities used these oral assessment sheets of the medical assistance record from the electronic medical record. Oral hygiene and blood test data for oral mucositis risk factors were obtained upon admission and 2 weeks after beginning initial treatment as the severity of oral mucositis peaks within 2 weeks (Elad et al., 2022).

2) For the risk of oral mucositis, the patient-side risk factors, testing necessary for early detection, and risk factors related to medication from the Ministry of Health, Labour and Welfare manual of treatments for serious adverse reactions (2009) and the reports of Uemura et al. (2021) and Kitazawa et al. (2018) were used. The eight items examined were as follows: (1) oral hygiene conditions (caries, periodontal disease, and unsuitable dentures); (2) tongue coating; (3) toothbrushing; (4) gargling; immunocompetence in terms of (5) leukocyte count and (6) neutrophil count; and nutritional status in terms of (7) serum albumin level and (8)

total protein level. Concomitant use of radiation therapy was excluded because no patients received this therapy, and because smoking was prohibited on the premises, there were no smokers.

Blood samples were taken, and tests were conducted at the outpatient department of Fukuoka University Hospital 2 weeks after beginning treatment as the symptoms of oral mucositis associated with chemotherapy often appear at around 7 days and peak at around 10−12 days (Sonis, 2004). If the patient was hospitalized, blood samples were collected every 4−5 days according to the treatment protocol, and if the patient was discharged from the hospital, a blood test was performed at the outpatient visit. Consent was obtained from the patient for the use of blood sample related data. The serum albumin level, total protein level, leukocyte count, and neutrophil count were investigated. Since leukocyte and neutrophil counts fluctuate with granulocyte colony-stimulating factor (G-CSF), the test value before administering G-CSF was used if it was administered within 2 weeks of starting therapy. The severity of leukocytopenia and neutropenia was evaluated using the Common Terminology Criteria for Adverse Events (CTCAE) Version 5 grade classification. Based on a report by Itagaki et al. (2007), l3.5 g/dL was considered the cutoff for the serum albumin level, and 6.2 g/dL was selected as the cutoff for the total protein level in accordance with Kitazawa et al. (2018).

3) Data on oral mucositis were collected from the participants' electronic records. The severity of oral mucositis was assessed using the CTCAE Version 5 grade classification. In this classification, grade 0 corresponds to an absence of symptoms, grade 1 to mild symptoms not requiring treatment, grade 2 to unimpaired oral intake with need for diet therapy due to pain, grade 3 to severe pain impairing oral intake, and grade 4 to a life-threatening condition. In the current investigation, the highest grade was applied during the asymptomatic and treatment phases. The patients were divided into two groups according to the severity of oral mucositis: patients with grades 0−1 were categorized into group 1 and those with grades 2−3 into group 2 (oral mucositis). None of the patients had grade 4 disease.

4) Risk factors of oral mucositis and comparison by oral mucositis grade were compared. Eleven items, including age, sex, disease, oral hygiene condition (caries, periodontal disease, presence or absence of unsuitable dentures, tongue coating [based on the Oral Assessment Grade (OAG)], daily toothbrushing frequency, daily gargling frequency), immunocompetence (leukocyte and neutrophil count), and nutritional status (serum albumin level and total protein level) were examined as risk factors of oral mucositis. Group 1 (oral mucositis grades 0−1) and group 2 (grades 2−3) were compared by univariate analysis using the Mann-Whitney U test and Fisher's exact test.

5) Factor analysis related to severity of oral mucositis was performed. To investigate the factors influencing severity, univariate analysis was first performed with oral mucositis of grade 2 or higher as the objective variable. This was followed by a multivariate analysis using stepwise logistic regression analysis with factors that had a *p*-value <.05 in the univariate analysis. These things were chosen as the explanatory factors for caries, periodontal disease, and unsuitable dentures. The participants were divided into two groups according to the median value for the frequency of toothbrushing: those who brushed their teeth less than three times and those who brushed them three or more times. Participants were also split into two groups based on tongue coating of grade <2 and grade ≥2. Based on the leukocyte and neutrophil counts and the CTCAE Version 5 criteria, the participants were classified as those having grades <3 and ≥3. IBM Statistics Version 27 was used for the analysis, and the significance threshold was set at <5%.

Ethical Considerations

This study was approved by the ethics review board of the Fukuoka University Faculty of Medicine (approval no. 16-9-06). Consent was obtained from the managing physician and nurses in the ward before patient selection. Written consent was obtained from all participants after explaining the aims and methods of the study verbally and in writing, protection of privacy, free participation, and freedom to withdraw their consent at any time. The data collected were treated with linkable anonymization so that the participants could not be identified.

Results

Patient Background

Details of the patient background are shown in Table 1. The median age of the participants was 62 (range, 18−82) years; 34 patients were men and 36 were women; and 42 had blood and hematopoietic disorders and 28 had solid tumors. The treatment regimens included a combination of antimetabolites, alkylating agents, neoplastic antibiotics, plant alkaloids, platinum, and taxane drugs. Over half of the patients received cytosine arabinoside (17.1%), methotrexate (15.7%), or R-CHOP regimen (rituximab, cyclophosphamide, doxorubicin, vincristine, prednisolone) (14.3%). Antimetabolites (methotrexate, fluorouracil, and cytosine arabinoside), alkylating agents (cyclophosphamide, melphalan, and dacarbazine), antitumor antibiotics (doxorubicin and epirubicin), and vinca alkaloids (vincristine and vinblastine) were used for these regimens. Furthermore, topoisomerase inhibitors (etoposide and irinotecan) and platinum medications (cisplatin and carboplatin) were used for 16% of the patients.

Table 1. Patient background.

Surveyed items			n	%
				N = 70
Age			62 (18–82)	
Sex	Male		34	48.6
	Female		36	51.4
Disease	Malignant lymphoma		22	31.4
	Acute leukemia		9	12.9
	Adult onset T-cell leukemia		4	5.7
	Multiple myeloma		7	10
	Lung cancer		9	12.9
	Breast cancer		10	14.3
	Colorectal cancer		5	7.1
	Pancreatic cancer, etc.		4	5.7
Therapeutic regimen				
Ara-C	Cytosine arabinoside		12	17.1
MTX	Methotrexate		11	15.7
R-CHOP	Rituximab, cyclophosphamide, doxorubicin (H: doxorubicin hydrochloride), vincristine (O: Oncovin), prednisolone		10	14.3
EPOCH	Etoposide, prednisolone, vincristine (O: Oncovin), cyclophosphamide, Doxorubicin (H: doxorubicin hydrochloride)		3	4.3
ABVD	Doxorubicin (A: Adriamycin), bleomycin, vinblastine, dacarbazine		3	4.3
MP	Melphalan, prednisolone		3	4.3
VTD	Bortezomib (V: Velcade), thalidomide, dexamethasone		2	2.9
VCD	Bortezomib (V: Velcade), cyclophosphamide, dexamethasone		2	2.9
CE	Carboplatin, etoposide		4	5.7
PE	Cisplatin (P: platinum antitumor agent), etoposide		3	4.3
PI	Cisplatin (P: platinum antitumor agent), irinotecan		2	2.9
AC	Doxorubicin (A: Adriamycin), cyclophosphamide		4	5.7
CEF	Cyclophosphamide, epirubicin, fluorouracil		3	4.3
TC	Paclitaxel (T: taxane), carboplatin		2	2.9
FOLFOX6	Fluorouracil, Levofolinate, oxaliplatin		3	4.3
FOLFIRI	Fluorouracil, Levofolinate, irinotecan		2	2.9

Table 2. Severity of oral mucositis based on CTCAE grades 1–4.

	0	1	2	3	4		
	Asymptomatic	Mild symptoms No treatment needed	Moderate symptoms Does not impair oral intake: requires modification of diet	Severe pain Impairs oral intake	Life-threatening	Grade 0–1	Grade 2–3
n (%)	14 (20.0)	31 (44.3%)	17 (24.3%)	8 (11.4%)	0	45 (64.3%)	25 (35.7%)

CTCAE = Common Terminology Criteria for Adverse Events Version 5.

Severity of Oral Mucositis

The severity of oral mucositis developed during chemotherapy and the number of cases are displayed in Table 2. The severity of oral mucositis was grades 0 and 1 in 14 (20.0%) and 31 (44.3%) patients, respectively, with a total of 45 (64.3%) patients with grades 0 − 1 (group 1). The severity was grade 2 in 17 cases (24.3%) and grade 3 in 8 cases (11.4%), with a total of 25 (35.7%) patients with grades 2 − 3 (group 2). Twenty-five of the seventy patients (35.7%) experienced moderate or severe pain due to oral mucositis, which hindered oral intake.

Factors Affecting the Risk Factors and Severity of Oral Mucositis

Table 3 displays the risk factors for oral mucositis by grade. Univariate analysis comparing groups 1 and 2 revealed no discernable differences between age and sex. Regarding oral hygiene, group 2 had a significantly higher rates of caries, periodontal disease, and unsuitable dentures ($p = .018$), and

Table 3. Risk factors for oral mucositis and comparison by grade (univariate analysis).

				$N = 70$
Surveyed items		Group 1: grade 0–1 $n = 45$	Group 2: grade 2–3 $n = 25$	*p*-value
Age (years)		61 [48–68]	58 [18–82]	.3[a)]
Sex	Male/female	23/22	11/14	.206[b)]
Disease	Malignant lymphoma	15	7	
	Acute leukemia	3	6	
	Adult-onset T-cell leukemia	2	2	
	Multiple myeloma	6	1	
	Lung cancer	8	1	
	Breast cancer	7	3	
	Colorectal cancer	4	1	
	Pancreatic cancer	4	0	
Caries, periodontitis, unsuitable dentures	No	41	17	*.018[a)]
	Yes	4	8	
Tongue coating	OAG: grade 1–3 (one to three points)	2.11 ± 0.53	2.42 ± 0.56	*.045[b)]
Frequency of toothbrushing		3.36 ± 0.53	2.88 ± 0.60	*.023[b)]
Frequency of gargling		4.27 ± 0.78	4.08 ± 1.08	.136[b)]
Leukocyte count (/dL)		3740 [980–5890]	2645 [470–10800]	*.012[b)]
Neutrophil count (/dL)		980 [50–3050]	670 [150–4350]	*.038[b)]
Serum albumin (g/dL)		3.6 [2.8–4.3]	3.5 [2.3–4.2]	.093[b)]
Total protein (g/dL)		6.4 [5.5–6.9]	5.7 [4.9–7.5]	.126[b)]

Note: Tongue coating and frequency of toothbrushing are shown as mean ± standard deviation. The median [min–max values] is presented for other parameters.

OAG = Oral Assessment Guide; grade 1 = moisture and papillae; grade 2 = tongue coating, papillae disappearance; grade 3 = thick tongue coating, redness, and swelling

[a)] Fisher's exact test, [b)] Mann-Whitney U-test

*$p < .05$

Table 4. Factors associated with grade 2 and higher (multivariate analysis) oral mucositis.

			$n = 25$
Variable		*p*-value	OR (95% Cl)
Caries, periodontitis, unsuitable dentures	No vs. yes	*.041	4.272 (1.061–17.206)
Tongue coating	<Grade 2 vs. ≥grade 2	.158	
Frequency of toothbrushing	<3 times vs. ≥3 times	*.034	0.248 (0.074–0.831)
Leukocytopenia	<Grade 3 vs. ≥grade 3	*.030	4.396 (1.158–16.683)
Neutropenia	<Grade 3 vs. ≥grade 3	.092	

Note: Tongue coating and frequency of toothbrushing (median values)

Severity of adverse reactions is compared in reference to the Common Terminology Criteria for Adverse Events Version 5.

CI = confidence interval; OR = odds ratio

*$p < .05$

a significantly higher number of patients in group 2 had tongue coating ($p = .045$). While patients in group 1 brushed their teeth substantially more frequently ($p = .023$), there was no discernable difference between the two groups in the frequency of gargling. Regarding immunocompetence, group 2 had significantly lower leukocyte ($p = .012$) and neutrophil counts ($p = .038$). Regarding nutritional status, there were no appreciable variations in the serum albumin or total protein levels between both groups.

The results of the multivariate analysis with the presence of oral mucositis grade 2 or higher as the objective variable and items with $p < .05$ in the univariate analysis as the explanatory variables are shown in Table 4. Regarding dental hygiene, there were significant differences in the occurrence of caries, periodontal disease, unsuitable dentures ($p = .041$), and frequency of toothbrushing ($p = .034$) between the

groups, whereas there was no significant variation in tongue coating. Regarding the parameters of immunocompetence, there was a significant difference in the leukocyte count ($p = .030$) but not in the neutrophil count.

Therefore, the presence of caries, periodontal disease, unsuitable dentures, brushing of teeth twice a day or less, and grade 3 or higher leukocytopenia were determined as risk factors that influence the severity of oral mucositis.

Discussion

According to the Oral Mucositis Assessment Guidelines, a comprehensive baseline assessment should be made prior to any therapy (Quinn et al., 2008). According to this guideline, the best management for patients receiving chemotherapy relies on the circumstances and risks, and a baseline assessment of oral mucositis risks should be prepared for inpatients (Quinn et al., 2008). This study investigated the risk factors affecting the severity of oral mucositis in patients undergoing inpatient chemotherapy. The analysis found the presence of caries, periodontal disease, unsuitable dentures ($p = .041$), toothbrushing twice daily or less ($p = .024$), and leukocytopenia of grade 3 or higher ($p = .030$) as risk factors associated with oral mucositis of grade 2 or higher.

The study participants were characterized by age, male to female ratio, and laboratory test values similar to the previous studies on chemotherapy-induced oral mucositis (Pulito et al., 2020; McGuire et al., 2013). Therefore, the findings of this study can be regarded as typical of the clinical situations encountered by chemotherapy patients.

The incidence of chemotherapy-induced oral mucositis according to the US National Institute of Health is 30% − 35%, but the incidence increases to 50% in patients with solid cancers (Elad et al., 2015). Reportedly, in pediatric patients, presence of hematologic malignancies including lymphoma and germinal tumors such as nephroblastoma, neuroblastoma, and retinoblastoma elevated the risk of chemotherapy-induced mucositis (Fadda et al., 2006; Valer et al., 2021). Also, the duration of mucositis was significantly longer ($p < .0013$) in patients with hematologic malignancy than those with solid tumors (Martino et al., 2003). Our analysis included adult patients and a higher number of patients with hematopoietic malignancies ($n = 42$) than with solid tumors ($n = 28$). Thus, the results of our study should be interpreted carefully, considering the possibility that the characteristics of hematopoietic malignancies are more strongly reflected than those of solid tumors.

The risk factors for chemotherapy-induced oral mucositis can be generally categorized into 1) the effects of treatment and 2) patient-side factors (Lionel et al., 2006). The effects of treatment depend on whether the regimen predisposes the patient to oral mucositis. Oral mucositis developed frequently among patients with head and neck cancer and re-

ceiving antimetabolites fluorouracil (Moslemi et al., 2016); pediatric patients receiving methotrexate (Valer et al., 2021); adult patients with hematologic malignancies receiving alkylating agents cyclophosphamide and melphalan during and undergoing in hematopoietic cell transplant (Alsulami & Shaheed, 2022); patients receiving antitumor antibiotics doxorubicin, bleomycin, daunorubicin, or irinotecan (Naveed et al., 2019); and patients with breast cancer receiving the plant alkaloid taxane paclitaxel (Al Ibraheemi & Shamoun, 2016).

As these drugs can induce oral mucositis as a side effect, it was assumed that the occurrence of oral mucositis in this study was significantly affected by the treatment. The pathogenesis of oral mucositis includes the inhibition of DNA synthesis in the oral mucosal epithelium by anticancer drugs, induction of apoptosis in the oral mucosal tissue by the activation of transcription factors and production of cytokines, generation of active oxygen by the inhibition of cellular metabolic pathways, and allergies to anticancer drugs (Sobue et al., 2018). Primary oral mucositis, which develops by destroying the mucosal tissue, presumably occurs through the production of free radicals in a dose-dependent manner to anticancer drugs, resulting in early onset (Nguyen et al., 2022). Therefore, chemotherapy with anticancer medications linked to a high incidence of oral mucositis should be given concurrently with patient education about the appearance of symptoms relatively soon after the start of chemotherapy before myelosuppression begins, with close observation of the oral cavity to prevent disease onset.

In terms of the severity of oral mucositis, 45 patients were allocated to group 1 and 25 to group 2. One of the main issues associated with oral mucositis is a reduction in oral intake, which is connected to pain in the oral cavity. Twenty-five of the seventy patients (35.7%) with oral mucositis had moderate or worse pain, which impaired oral intake and required diet modification. A meta-analysis involving 445 patients (Tanaka et al., 2022) and a narrative study involving both adult and pediatric patients (García-Gozalbo & Cabañas-Alite, 2021) have suggested that during chemotherapy, oral mucositis is associated with significantly impaired nutrition. According to a review by Ravasco (2019), patients with cancer experience weight loss, and because weight loss significantly lowers the patient QoL, it is important to minimize weight loss. Because dietary intake and body weight were not investigated in this study, it was required to examine the degree of oral mucositis from the standpoints of dietary intake and nutritional management.

In this study, univariate and multivariate logistic regression analyses of the risk factors influencing the severity of oral mucositis were performed. The presence of caries, periodontal disease, unsuitable dentures, frequency of toothbrushing, and leukocytopenia were identified as key risk variables.

Among the factors affecting oral hygiene, caries, periodontal disease, unsuitable dentures, and frequency of toothbrushing were identified as risk factors. The study facility was a designated university hospital for regional cancer care that also had a dental department that permits and encourages multidisciplinary dental care involving dentists and dental hygienists. However, once chemotherapy is started, treatment is often postponed due to dental problems, such as aggravation of caries and periodontitis, as well as unsuitable dentures. Caries and periodontitis can become hotbeds for systemic infections in patients with cancer or neutropenia. Therefore, periodontal examination of patients before treatment is essential for the diagnosis and management of latent risks of infection (Raber-Durlacher et al., 2002). Unfortunately, dental visits are frequently not scheduled because they are at the discretion of the patient, even if they are advised during the treatment planning phase on an outpatient basis. Therefore, dental professionals in multidisciplinary treatment teams for patients with cancer are considered beneficial for their long-term oral health (Bertl et al., 2022). A comprehensive review on dental disease management in patients with cancer emphasized that periodontal therapy prior to and during maintenance after cancer therapy (both head and neck radiation and antineoplastic chemotherapy) can assist attain good oral health (Hong et al., 2018). In reviews investigating patients with different types of malignancies as well as exclusively colorectal cancer, the authors have noted that the patients' understanding of the importance of dental visits to improve their oral environment is insufficient (Epstein et al., 2018; Tezcan et al., 2022). Another study revealed insufficient understanding on dental care in cancer patients among healthcare professionals (Pai & Ongole, 2015).

Oral hygiene items, frequency of gargling, and tongue coating were excluded as risk factors; however, toothbrushing twice daily or less was proposed as a risk factor. The Ministry of Health, Labour and Welfare manual of treatments for serious adverse reactions − oral mucositis due to anticancer drugs (2009) recommends toothbrushing four times a day, once after every meal and once before going to bed. Among the participants of our study, 24.3% brushed four times or more daily and 47.1% brushed three times. The fact that less than 25% of the participants brushed four times daily is consistent with previous findings (Sugiura et al., 2017). In research among Japanese patients with cancer, Ochi et al. (2020) found that 60% of the participants brushed twice a day or less, while Matsumae et al. (2003) observed that most people brushed after breakfast and before bed, but few brushed after lunch and dinner. The results of this study suggest that brushing twice daily or less affects the severity of oral mucositis. Put another way, it is critical to implement interventions that boost the rate of brushing after lunch and dinner since few individuals practice brushing at those times.

Univariate analysis between groups 1 and 2 showed significantly lower leukocyte ($p = .012$) and neutrophil counts ($p = .038$) in group 2. Meanwhile, while the multivariate analysis showed a significant difference for leukocytopenia grade 3 and higher ($p = .030$), there was no significant difference for neutrocytopenia. Kitazawa et al. (2018) reported that leukocyte and neutrophil counts were not risk factors for oral mucositis during allogenic hematopoietic stem cell transplantation and that the total lymphocyte count was the only selected risk factor. Nonetheless, the neutrophil-to-lymphocyte ratio was shown as a reliable indicator useful in assessing the likelihood of more severe oral mucositis in patients receiving radiotherapy for head and neck cancer (Homa-Mlak et al., 2021; Kawashita et al., 2021). Martinez et al. (2014) reported that neutropenia increased the risk of oral mucositis in a prospective cohort study of patients with acute leukemia and non-Hodgkin lymphoma undergoing high-dose chemotherapy.

Decreases in leukocyte, neutrophil, and total lymphocyte counts, which are markers of immunocompetence, impact oral mucositis severity. However, it is possible that the results differed depending on whether the treatment modality consisted of monochemotherapy, radiochemotherapy, or high-dose chemotherapy. Grade 3 leukocytopenia refers to leukocyte counts of 1000-2000 μL/mm^3. The results of this study suggest that, when the leukocyte count is 2000 μL/mm^3 or less, implementation of thorough oral hygiene self-care support and nutritional management is necessary to prevent an increase in the severity of oral mucositis. Nutritional status was linked to the frequency and severity of treatment toxicities including oral mucositis in adult patients with nasopharyngeal carcinoma as well as both pediatric and adult patients with hematologic malignancy undergoing radiotherapy and/or chemotherapy (Shu et al., 2020; García-Gozalbo et al., 2021). In the present study, no significant differences existed in the serum albumin and total protein levels, which are indices of nutritional status, between groups 1 and 2. A study examining blood albumin levels in outpatients revealed that secondary variables, such as aging, illness, and nutritional status, altered by cancer treatment were more likely to cause hypoalbuminemia than the direct effects of chemotherapy (Itagaki et al., 2007). However, cell immunity drops at serum albumin levels of 3.0 g/dL or less, increasing the risk of infection. In addition to serum albumin and total protein levels, comprehensive indicators, such as weight and transferrin levels, should be assessed in future research (Bail et al., 2016).

Suggestions for Clinical Practice

Interprofessional educational programs can improve nursing students' attitudes, confidence, abilities, and performance of oral assessments (Haresaku et al., 2020). Incorporating the

need for monitoring and managing dental caries, periodontal disease, and unsuitable dentures and adopting good toothbrushing practices might help the nurses in managing oral mucositis. The findings of this study would also help nurses recognize the need for observation and prediction according to the disease state in order to prevent oral mucositis and its aggravation. This study found that the factors associated with the degree of mucosal damage during chemotherapy were inadequate oral cavity hygiene and weakened immunity. Recent studies have reported mild oral mucositis in patients who underwent professional oral care by dentists and dental hygienists (Kashiwazaki et al., 2012). Research on oral hygiene conditions and the severity of oral mucositis in hematopoietic stem cell transplant recipients showed that mechanical removal of the oral flora using a toothbrush was required for treating oral mucositis (Uemura et al., 2021). However, transplant recipients are not the only ones at an increased risk, as severe pain in patients with aggravated oral mucositis is often managed by avoiding brushing and focusing on gargling and moisture care. Oral mucositis during neutropenia quadruples the risk of sepsis (Sonis et al., 1998). It is thus essential to choose and recommend oral care tools that allow brushing even in the presence of intraoral pain and to support patients so that they can provide self-care, such as gargling and moisture care, throughout the duration of their treatment. Whole-body nutritional management is also crucial in addition to self-care support to increase immunocompetence. Thorough multidisciplinary oral care and nutritional management between medical, dental, dietician, and nursing teams should be promoted to ensure that the best efforts are made to prevent oral mucositis.

Limitations and Implications for Future Research

This study aimed to determine the risk factors that exacerbate chemotherapy-induced oral mucositis. The sample of patients would ideally include equal numbers of patients with solid and hematopoietic cancers; however, it was not practical, nor was it simple to meet criteria based on disease and therapy, since the study included participants receiving inpatient care. Consequently, the sample included more cases of hematopoietic malignancies than of solid cancers, which may have prevented the results from reflecting the characteristics of hematopoietic malignancies. Consequently, the generalizability of the findings is limited. Future studies should include similar analyses on a larger number of patients with a more balanced ratio of solid and hematopoietic tumors.

Next, the beginning of oral mucositis caused by chemotherapy is influenced not only by the particular chemotherapeutic drug that causes mucosal injury but also by composite factors, including dose, treatment timing, concomitant radiotherapy, and patient status (Pulito et al., 2020). However, the current study did not include stratified analyses in terms

of dose, type, and the number of times of administering chemotherapeutic agents. We view this, coupled with not considering tumor types, as weaknesses of the study. We aim to address this gap in future research.

Additionally, due to a relatively long half-life of $18-21$ days, albumin does not allow monitoring rapid changes in the nutritional status of patients undergoing chemotherapy. Thus, in future to assess the nutritional status of the patient's prealbumin might serve as a more suitable biomarker for reflecting the nutritional state (Shu et al., 2020). Furthermore, the impact of nutritional treatments and dietary components on management of chemotherapy-induced oral mucositis should be studied.

Author Contributions
C.Y. searched and reviewed the literature, analyzed the data, and drafted the manuscript; Y. T. negotiated with the patients this study, critically reviewed the manuscript, and supervised the whole study process.

Declaration of Conflicting Interests
The authors declare no conflicts of interest.

Ethical Approval
This study was approved by the ethics review board of the Fukuoka University Faculty of Medicine (approval no. 16-9-06).

References

Al Ibraheemi, A. A., & Shamoun, S. (2016). Incidence and risk factors of oral mucositis in patients with breast cancer who receiving chemotherapy in al-Bashir hospital. *International Journal of Hematology-Oncology and Stem Cell Research*, *10*(4), 217-223. https://ijhoscr.tums.ac.ir/index.php/ijhoscr/article/view/366

Alsulami, F. J., & Shaheed S. U. (2022). Oral cryotherapy for management of chemotherapy-induced oral mucositis in haematopoietic cell transplantation: A systematic review. *BMC Cancer*, *22*(1), 442. https://doi.org/10.1186/s12885-022-09539-8

Bail, J., Meneses, K., & Demark-Wahnefried, W. (2016). Nutritional status and diet in cancer prevention. *Seminars in Oncology Nurs-*

ing, *32*(3), 206-214.

https://doi.org/10.1016/j.soncn.2016.05.004

Bertl, K., Savvidis, P., Kukla, E. B., Schneider, S., Zauza, K., Bruckmann, C., & Stavropoulos, A. (2022). Including dental professionals in the multidisciplinary treatment team of head and neck cancer patients improves long-term oral health status. *Clinical Oral Investigations*, *26*(3), 2937-2948.

https://doi.org/10.1007/s00784-021-04276-x

Brown, T. J., & Gupta, A. (2020). Management of cancer therapy-associated oral mucositis. *JCO Oncology Practice*, *16*(3), 103-109.

https://doi.org/10.1200/JOP.19.00652

Cancer management in the Iwate Medical University Hospital. *Dental Journal of Iwate Medical University*, *46*, 137-142.

https://www.jstage.jst.go.jp/article/iwateshigakukaishi/46/3/46_137/_pdf

Damascena, L. C. L., de Lucena, N. N. N., Ribeiro, I. L. A., de Araujo, T. L. P., de Castro, R. D., Bonan, P. R. F., Lima Neto, E. A., de Araújo Filho, L. M., & Valença, A. M. G. (2018). Factors contributing to the duration of chemotherapy-induced severe oral mucositis in oncopediatric patients. *International Journal of Environmental Research and Public Health*, *15*(6), 1153.

https://doi.org/10.3390/ijerph15061153

Eilers, J. U. N. E., Berger, A. M., & Petersen, M. C. (1988). Development, testing, and application of the oral assessment guide. *Oncology Nursing Forum*, *15*(3), 325-330.

Elad, S., Cheng, K. K. F., Lalla, R. V., Yarom, N., Hong, C., Logan, R. M., Bowen, J., Gibson, R., Saunders, D. P., Zadik, Y., Ariyawardana, A., Correa, M. E., Ranna, V., Bossi, P., & Mucositis Guidelines Leadership Group of the Multinational Association of Supportive Care in Cancer and International Society of Oral Oncology (MASCC/ISOO) (2020). MASCC/ISOO clinical practice guidelines for the management of mucositis secondary to cancer therapy. *Cancer*, *126*(19), 4423-4431.

https://doi.org/10.1002/cncr.33100

Elad, S., Raber-Durlacher, J. E., Brennan, M. T., Saunders, D. P., Mank, A. P., Zadik, Y., Quinn, B., Epstein, J. B., Blijlevens, N. M., Waltimo, T., Passweg, J. R., Correa, M. E., Dahllöf, G., Garming-Legert, K. U., Logan, R. M., Potting, C. M., Shapira, M. Y., Soga, Y., Stringer, J., Stokman, M. A., Vokurka, S., Wallhult, E., Yarom, N., & Jensen, S. B. (2015). Basic oral care for hematology−oncology patients and hematopoietic stem cell transplantation recipients: A position paper from the joint task force of the Multinational Association of Supportive Care in cancer/International Society of oral oncology (MASCC/ISOO) and the European Society for Blood and Marrow Transplantation (EBMT). *Supportive Care in Cancer*, *23*(1), 223-236.

https://doi.org/10.1007/s00520-014-2378-x

Elad, S., Yarom, N., Zadik, Y., Kuten-Shorrer, M., & Sonis, S. T. (2022). The broadening scope of oral mucositis and oral ulcerative mucosal toxicities of anticancer therapies. *CA: A Cancer Journal for Clinicians*, *72*(1), 57-77.

https://doi.org/10.3322/caac.21704

Epstein, J. B., & Schubert, M. M. (1999). Oral mucositis in myelosuppressive cancer therapy. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics*, *88*(3), 273-276.

https://doi.org/10.1016/s1079-2104(99)70026-0

Epstein, J. B., Smith, D. K., Villines, D., Parker, I., Hameroff, J., Hill, B. R., & Murphy, B. A. (2018). Patterns of oral and dental care education and utilization in head and neck cancer patients. *Supportive Care in Cancer*, *26*(8), 2591-2603.

https://doi.org/10.1007/s00520-018-4099-z

Fadda, G., Campus, G., & Lugliè, P. (2006). Risk factors for oral mucositis in paediatric oncology patients receiving alkylant chemotherapy. *BMC Oral Health*, *6*, 13.

https://doi.org/10.1186/1472-6831-6-13

García-Gozalbo, B., & Cabañas-Alite, L. (2021). A narrative review about nutritional management and prevention of oral mucositis in haematology and oncology cancer patients undergoing antineoplastic treatments. *Nutrients*, *13*(11), 4075.

https://doi.org/10.3390/nu13114075

Haresaku, S., Miyoshi, M., Kubota, K., Aoki, H., Kajiwara, E., Monji, M., & Naito, T. (2020). Effect of interprofessional education on oral assessment performance of nursing students. *Clinical and Experimental Dental Research*, *6*(1), 51-58.

https://doi.org/10.1002/cre2.248

Homa-Mlak, I., Brzozowska, A., Mlak, R., Szudy-Szczyrek, A., & Małecka-Massalska, T. (2021). Neutrophil-to-lymphocyte ratio as a factor predicting radiotherapy induced oral mucositis in head neck cancer patients treated with radiotherapy. *Journal of Clinical Medicine*, *10*(19), 4444.

https://doi.org/10.3390/jcm10194444

Hong, C. H., Hu, S., Haverman, T., Stokman, M., Napeñas, J. J., Braber, J. B. D., Gerber, E., Geuke, M., Vardas, E., Waltimo, T., Jensen, S. B., & Saunders, D. P. (2018). A systematic review of dental disease management in cancer patients. *Supportive Care in Cancer*, *26*(1), 155-174.

https://doi.org/10.1007/s00520-017-3829-y

Itagaki, F., Kato, H., Motonaga, S., Ichida, Y., Matsui, R., Endo, K., Kamibayashi, Y., Honma, M., & Kouda, Y. (2007). Gan kagaku ryōhō o shikō shita gairai kanja ni okeru kessei arubumin nōdo [Serum albumin levels in outpatients receiving anti-cancer chemotherapy]. *Iryo Yakugaku*, *33*(12), 1032-1036.

Karthaus, M., Rosenthal, C., & Ganser, A. (1999). Prophylaxis and treatment of chemo- and radiotherapy-induced oral mucositis - Are there new strategies?. *Bone Marrow Transplantation*, *24*(10), 1095-1108.

https://doi.org/10.1038/sj.bmt.1702024

Kashiwazaki, H., Matsushita, T., Sugita, J., Shigematsu, A., Kasashi, K., Yamazaki, Y., Kanehira, T., Yamamoto, S., Kondo, T., Endo, T., Tanaka, J., Hashino, S., Nishio, M., Imamura, M., Kitagawa, Y., & Inoue, N. (2012). Professional oral health care reduces oral mucositis and febrile neutropenia in patients treated with allogeneic bone marrow transplantation. *Supportive Care in Cancer*, *20*(2), 367-373.

https://doi.org/10.1007/s00520-011-1116-x

Kawashita, Y., Kitamura, M., Soutome, S., Ukai, T., Umeda, M., & Saito, T. (2021). Association of neutrophil-to-lymphocyte ratio with severe radiation-induced mucositis in pharyngeal or laryngeal cancer patients: A retrospective study. *BMC Cancer*, *21*(1), 1064.

https://doi.org/10.1186/s12885-021-08793-6

Kitazawa, F., Katayama, M., Murayama, K., Morimoto, T., Ueda, K., Nakayama, Y., Takara, K., Sahara, T., Fuchida, S., Shimazaki, C. (2018). Dōshuzōketsukansaibōishoku-ji ni hatsugen suru kōkū nenmaku-en no jūshō-do ni eikyōwoataeru risuku inshi [The risk actors affecting the severity of oral mucositis caused by allogeneic hematopoietic stem cell transplantation]. *Nihonbyōin'yaku-*

zaishikai Zasshi, *54*(9), 1126-1130.
https://jglobal.jst.go.jp/detail?JGLOBAL_ID=20180224393730462
8

Kubota, K., Kobayashi, W., Sakaki, H., Nakagawa, H., Kon, T., Mimura, M., Ito, R., Furudate, K., & Kimura, H. (2015). Professional oral health care reduces oral mucositis pain in patients treated by superselective intra-arterial chemotherapy concurrent with radiotherapy for oral cancer. *Supportive Care in Cancer*, *23*(11), 3323-3329.
https://doi.org/10.1007/s00520-015-2774-x

Larson, P. J., Miaskowski, C., MacPhail, L., Dodd, M. J., Greenspan, D., Dibble, S. L., Paul, S.M., & Ignoffo, R. (1998). The PRO-SELF© Mouth Aware program: An effective approach for reducing chemotherapy-induced mucositis. *Cancer Nursing*, *21*(4), 263-268.
https://doi.org/10.1097/00002820-199808000-00007

Lionel, D. H., Christophe, L., Marc, A., & Jean-Luc, C. (2006). Oral mucositis induced by anticancer treatments: Physiopathology and treatments. *Therapeutics and Clinical Risk Management*, *2*(2), 159-168.
https://doi.org/10.2147/tcrm.2006.2.2.159

Martinez, J. M., Pereira, D., Chacim, S., Mesquita, E., Sousa, I., Martins, Â., Azevedo, T., & Mariz, J. M. (2014). Mucositis care in acute leukemia and non-Hodgkin lymphoma patients undergoing high-dose chemotherapy. *Supportive Care in Cancer*, *22*(9), 2563-2569.
https://doi.org/10.1007/s00520-014-2199-y

Martino, M., Morabito, F., Console, G., Irrera, G., Messina, G., Pucci, G., Nardi, M., Nobile, F., Molica, S., Cicero, G., Palazzo, S., Peta, A., Musolino, C., & Iacopino, P. (2003). Differences in transplant-related complications between hematologic malignancies and solid tumors receiving high-dose chemotherapy and autologous peripheral blood stem cell transplantation. *Tumori*, *89*(4), 385-390.
https://doi.org/10.1177/030089160308900407

Matsumae, S., Ikeyama, R., Yoshimura, E., Nabetani, Y., Nagata, H., Yamagami, C., & Morikawa, Y. (2003). Ketsueki shikkan de kagaku ryōhō o ukeru kanja no kōkōnai Yasukiyo ni taisuru shidō: Burasshingu ni chakumoku shite [Oral hygiene education for patients hematological malignancy before receiving chemotherapy: Focusing in tooth brushing]. *Ōsakadaigaku Kango-Gaku Zasshi*, *9*(1), 53-59.

McGuire, D. B., Fulton, J. S., Park, J., Brown, C. G., Correa, M. E. P., Eilers, J., Elad, S., Gibson, F., Oberle-Edwards, L. K., Bowen, J., Lalla, R. V., & Mucositis Study Group of the Multinational Association of Supportive Care in Cancer/International Society of Oral Oncology (MASCC/ISOO). (2013). Systematic review of basic oral care for the management of oral mucositis in cancer patients. *Supportive Care in Cancer*, *21*(11), 3165-3177.
https://doi.org/10.1007/s00520-013-1942-0

Ministry of Health, Labour and Welfare. Manual of treatments for serious adverse reactions -Oral mucositis due to anticancer drugs- 1-23 (2009).
https://www.mhlw.go.jp/topics/2006/11/dl/tp1122-1l09.pdf

Moslemi, D., Nokhandani, A. M., Otaghsaraei, M. T., Moghadamnia, Y., Kazemi, S., & Moghadamnia, A. A. (2016). Management of chemo/radiation-induced oral mucositis in patients with head and neck cancer: A review of the current literature. *Radiotherapy and Oncology*, *120*(1), 13-20.

https://doi.org/10.1016/j.radonc.2016.04.001

Naveed, S., Thappa, D. M., Dubashi, B., Pandjatcharam, J., Munisamy, M., & Singh, N. (2019). Mucocutaneous adverse reactions of cancer chemotherapy and chemoradiation. *Indian Journal of Dermatology*, *64*(2), 122-128.
https://doi.org/10.4103/ijd.IJD_129_17

Nguyen, H., Sangha, S., Pan, M., Shin, D. H., Park, H., Mohammed, A. I., & Cirillo, N. (2022). Oxidative stress and chemoradiation-induced oral mucositis: A scoping review of in vitro, in vivo and clinical studies. *International Journal of Molecular Sciences*, *23*(9), 4863.
https://doi.org/10.3390/ijms23094863

Ochi, K., Iwawaki, Y., Murota, M., Nakamura, T., Yoshida, N., Hirao, M., & Matsuda, K. (2020). Gairai kagaku ryōhō o ukeru kanja ni okeru kōnaien no shōjō ga kōkū kanren QOL ni oyobosu eikyō [The influence of oral mucositis symptoms on oral health in patients undergoing outpatient chemotherapy]. *Kyōtofuritsuikadaigaku Kango Gakka Kiyō*, *30*, 11-20.

Pai, R. R., & Ongole, R. (2015). Nurses' knowledge and education about oral care of cancer patients undergoing chemotherapy and radiation therapy. *Indian Journal of Palliative Care*, *21*(2), 225-230.
https://doi.org/10.4103/0973-1075.156507

Parulekar, W., Mackenzie, R., Bjarnason, G., & Jordan, R. C. (1998). Scoring oral mucositis. *Oral Oncology*, *34*(1), 63-71.
https://doi.org/10.1016/s1368-8375(97)00065-1

Pulito, C., Cristaudo, A., Porta, C. L., Zapperi, S., Blandino, G., Morrone, A., & Strano, S. (2020). Oral mucositis: the hidden side of cancer therapy. *Journal of Experimental and Clinical Cancer Research*, *39*(1), 210.
https://doi.org/10.1186/s13046-020-01715-7

Quinn, B., Potting, C. M., Stone, R., Blijlevens, N. M., Fliedner, M., Margulies, A., & Sharp, L. (2008). Guidelines for the assessment of oral mucositis in adult chemotherapy, radiotherapy and haematopoietic stem cell transplant patients. *European Journal of Cancer (Oxford, England: 1990)*, *44*(1), 61-72.
https://doi.org/10.1016/j.ejca.2007.09.014

Raber-Durlacher, J. E., Epstein, J. B., Raber, J., van Dissel, J. T., van Winkelhoff, A., Guiot, H. F., & van der Velden, U. (2002). Periodontal infection in cancer patients treated with high-dose chemotherapy. *Supportive Care in Cancer*, *10*(6), 466-473.
https://doi.org/10.1007/s00520-002-0346-3

Ravasco, P. (2019). Nutrition in cancer patients. *Journal of Clinical Medicine*, *8*(8), 1211.
https://doi.org/10.3390/jcm8081211

Shouval, R., Kouniavski, E., Fein, J., Danylesko, I., Shem-Tov, N., Geva, M., Yerushalmi, R., Shimoni, A., & Nagler, A. (2019). Risk factors and implications of oral mucositis in recipients of allogeneic hematopoietic stem cell transplantation. *European Journal of Haematology*, *103*(4), 402-409.
https://doi.org/10.1111/ejh.13299

Shu, Z., Zeng, Z., Yu, B., Huang, S., Hua, Y., Jin, T., Tao, C., Wang, L., Cao, C., Xu, Z., Jin, Q., Jiang, F., Feng, X., Piao, Y., Huang, J., Chen, J., Shen, W., Chen, X., Wu, H., Wang, X., Qiu, R., Lu, L., & Chen, Y. (2020). Nutritional status and its association with radiation-induced oral mucositis in patients with nasopharyngeal carcinoma during radiotherapy: A prospective study. *Frontiers in Oncology*, *10*, 594687.
https://doi.org/10.3389/fonc.2020.594687

Sobue, T., Bertolini, M., Thompson, A., Peterson, D. E., Diaz, P. I., & Dongari-Bagtzoglou, A. (2018). Chemotherapy-induced oral mucositis and associated infections in a novel organotypic model. *Molecular Oral Microbiology*, *33*(3), 212-223. https://doi.org/10.1111/omi.12214

Sonis, S. T. (1998). Mucositis as a biological process: A new hypothesis for the development of chemotherapy-induced stomatotoxicity. *Oral Oncology*, *34*(1), 39-43. https://doi.org/10.1016/s1368-8375(97)00053-5

Sonis, S. T. (2004). A biological approach to mucositis. *Journal of Supportive Oncology*, *2*(1), 21-32.

Steinmann, D., Babadağ Savaş, B., Felber, S., Joy, S., Mertens, I., Cramer, H., Paul, A., Layer, M., Klafke, N., Stolz, R., Heyder, U., Neuberger, P., Winkler, M., Idler, C., Heine, R., Kaschdailewitsch, E., John, H., Schmeling, B., Zielke, T., Horneber, M., Witt, C. M., & Voiss, P. (2021). Nursing procedures for the prevention and treatment of mucositis induced by cancer therapies: Clinical practice guideline based on an interdisciplinary consensus process and a systematic literature search. *Integrative Cancer Therapies*, *20*, 1534735420940412. https://doi.org/10.1177/1534735420940412

Stokman, M. A., Spijkervet, F. K. L., Boezen, H. M., Schouten, J. P., Roodenburg, J. L. N., & De Vries, E. G. E. (2006). Preventive intervention possibilities in radiotherapy-and chemotherapy-induced oral mucositis: Results of meta-analyses. *Journal of Dental Research*, *85*(8), 690-700. https://doi.org/10.1177/154405910608500802

Sugiura, Y., Kosaka, Y., & Ogura, S. (2019). Bō daigaku byōin no gairai tsūin ni yoru kagaku ryōhō kanja ni okeru kōkū no fukusayō no jikaku shōjō ni kansuru chōsa [Study on the oral subjective symptoms of outpatients with chemotherapy in a University Hospital]. *Nihon Shika Eisei Gakkai Zasshi*, *13*(2), 83-89. https://cir.nii.ac.jp/crid/1524232505860876800

Tanaka, Y., Shimokawa, T., Harada, K., & Yoshida, K. (2022). Effectiveness of elemental diets to prevent oral mucositis associated with cancer therapy: A meta-analysis. *Clinical Nutrition ESPEN*, *49*, 172-180. https://doi.org/10.1016/j.clnesp.2022.03.005

Tezcan, S., Tanır, G. İ., Yılmaz, H., Memiş, S., Yumuk, P. F., & Apikoğlu, Ş. (2023). Assessment of chemotherapy-related educational needs of colorectal cancer patients. *Journal of Oncology Pharmacy Practice*, *29*(6), 1387-1391. https://doi.org/10.1177/10781552221122782

Uemura, M., Tamura, T., Wakabayashi, N., & Suzuki, Y. (2021). Zōkekkansaibō ishoku kanja ni okeru kōkū seisō jōtai to kōkū nenmaku-en jūshō-do no kentō [A study of the relationship between state of oral hygiene and oral mucositis grade in hematopoietic stem cell transplant recipients]. *Nihon Shika Eisei Gakkai Zasshi*, *16*(1), 31-42. https://cir.nii.ac.jp/crid/1521699231170710784

Valer, J. B., Curra, M., Gabriel, A. F., Schmidt, T. R., Ferreira, M. B. C., Roesler, R., Evangelista, J. M. C., Martins, M. A. T., Gregianin L, & Martins, M. D. (2021). Oral mucositis in childhood cancer patients receiving high-dose methotrexate: Prevalence, relationship with other toxicities and methotrexate elimination. *International Journal of Paediatric Dentistry*, *31*(2), 238-246. https://doi.org/10.1111/ipd.12718

Villa, A., & Sonis, S. T. (2016). Pharmacotherapy for the management of cancer regimen-related oral mucositis. *Expert Opinion on Pharmacotherapy*, *17*(13), 1801-1807. https://doi.org/10.1080/14656566.2016.1217993

Original Research

Utility of the admission/discharge patient flow management system at the acute care hospital

Shima Sakai, RN, PhD[1] iD, Mari Ikeda, RN, PhD[2] iD, Yoshiko Kondo, RN[3] iD,
Atsuko Fujii, RN[3] iD, and Michio Itabashi, MD, PhD[3] iD

[1]Faculty of Human Sciences, Sophia University, Tokyo, Japan, [2]Department of Family Nursing, Graduate School of Medicine, The University of Tokyo, Tokyo, Japan, and [3]Tokyo Women's Medical University Hospital, Tokyo, Japan

Abstract

Objective: This study aimed to verify the effects of implementing the admission/discharge patient flow management (PFM) system on hospital length of stay, duration from admission to surgery, unscheduled readmission rate, and patient satisfaction. **Methods:** A 1-year prospective observational study was conducted to compare patient outcomes before and after implementing the PFM system. Data were collected from electronic medical records, matched according to surgical technique and age, and analyzed using the Chi-square test and t-test. Patient satisfaction was determined through surveys sent by mail. **Results:** A total of 1138 participants were included in this study. PFM implementation significantly reduced the duration from admission to surgery; however, it did not significantly improve the length of stay or unscheduled readmission rate. The patient satisfaction rate was >65%. **Conclusions:** Preoperative orientation and assessment by a multidisciplinary team in the outpatient department could reduce the duration from admission to surgery and improve patient satisfaction.

Introduction

The healthcare system is shifting from hospital-based to community-based in order for patients to continue living within familiar communities for as long as possible. In particular, discharge planning and preventing readmission have become critical issues with the introduction of the Diagnosis Procedure Combination and functional differentiation of hospitals. Furthermore, there have been several studies on hospital discharge planning and collaboration among hospital community care organizations for smooth discharge and transition to home care.

A Cochrane review showed that discharge planning, including post-discharge follow-up through multidisciplinary collaboration for older patients, could effectively reduce the hospital length of stay and readmission rates and improve patient satisfaction (Gonçalves-Bradley et al., 2022). Discharge-planning interventions seek to facilitate the coordination of post-discharge care and improve communication between the hospital and community services in order to aid the transition of patients from the hospital to their discharge destination. Studies have described multidisciplinary interventions for supporting discharge, such as patient education by nurse practitioners and nurses (Cajanding, 2017), home visits by nurses (Gilbert et al., 2021), telephone follow-up interviews (Goldman et al., 2014), follow-up appointments

with the primary care physician and other community service providers (Lindpaintner et al., 2013), a tailored intersectoral discharge program involving a multi-professional team (Meyer et al., 2022), pharmacist-led drug administration and adherence (Bonetti et al., 2019), a comprehensive chronic medication review, and a detailed geriatrician-led transition-of-care communication with outpatient health professionals (Legrain et al., 2011). However, these studies only evaluated emergency room patients and emergency inpatients from admission to post-discharge follow-up and did not consider pre-admission outpatient support.

Regarding pre-hospitalization patient support, preoperative assessment clinics have increased worldwide to help hospitals handle the growing number of patients and the complexity of surgical procedures (Kristoffersen et al., 2022). Pre-admission assessment by anesthesiologists, surgeons, and nurses can effectively reduce healthcare costs (Chan et al., 2008), decrease mortality (Kamal et al., 2011), reduce the hospital length of stay (Mendes et al., 2005), reduce surgical cancellation rates (van Klei et al., 2002), and improve patient satisfaction (Arun et al., 2021). However, these studies were limited to interventions in preoperative outpatient clinics and did not consider collaboration with the hospital ward where the patient is admitted. Few studies (Maculotti et al., 2020) have examined the effects of interventions involving multidisciplinary collaboration between the hospital and community service in the discharge support process, from pre-admission assessment to hospital discharge planning.

In Japan, discharge planning for older patients, psychiatric patients, and patients requiring long-term care has been included in the medical treatment fee schedule since 2008 to facilitate the smooth transfer of patients from the hospital to their discharge destination. Accordingly, independent discharge-planning departments comprising nurses and medical social workers (MSWs) have been established to support patients at a high risk of discharge delay (Ministry of Health, Labour and Welfare, 2008). Due to the shortening of the length of hospital stay, outpatient visits are expected to play an important role in community-hospital collaboration during the transition period. Its roles are to prevent hospitalization in cooperation with community service providers, share information with hospital wards at the time of admission, assess the need for discharge support, and share information at the time of discharge and to prevent re-hospitalization immediately after discharge. As challenges for patients with scheduled admissions, it has been reported that discharge support interventions are delayed because the need for discharge support is assessed on the ward at the time of admission (Tange, 2016) and that surgery dates are delayed because preoperative instructions such as discontinuation of medications are not followed (Kaneko et al., 2020). In addition, older patients more likely have decreased activities of daily living (ADL) due to hospitalization, which

leads to anxiety immediately after discharge (Matsumoto et al., 2018) and risk of re-hospitalization (Tsutsui et al., 2006). These issues have increased the need to identify latent issues for patients before hospitalization, connect them to appropriate resources early, and facilitate smooth discharge planning. Thus, attention has shifted toward the admission/discharge patient flow management (PFM) system, which collects information regarding patients scheduled for hospitalization at outpatient visits and provides consistent support management to facilitate the early resolution of various problems; this has been established in outpatient visits (Okabe et al., 2013). Moreover, in the 2018 revision of the reimbursement system, the Ministry of Health, Labour and Welfare proposed a new approach for supporting hospitalization and discharge, which involves a PFM-based multidisciplinary team approach for patients with scheduled admissions (Ministry of Health, Labour and Welfare, 2018).

Therefore, this study aimed to verify the effects of implementing the admission/discharge PFM system on the hospital length of stay, duration from admission to surgery, and unscheduled readmission rate. In addition, we aimed to evaluate patient and family satisfaction with the PFM system. We also examined the effectiveness of a new multidisciplinary approach involving collaboration between the outpatient department, inpatient ward, and community from pre-admission assessment to discharge planning. This study evaluates a new initiative to establish an outpatient-based discharge support process from pre-hospitalization to discharge. The discharge support intervention is expected to improve the quality of discharge planning for patients and their families and promote multidisciplinary cooperation between the hospital and the community.

Materials and Methods

Setting and Study Design

This study was conducted in a 1300-bed university hospital in Tokyo, Japan. An Admission and Discharge Support (ADS) center, which comprises a physician, nurses, pharmacists, and MSWs, was established during the outpatient visit. Patients scheduled for surgery underwent preoperative orientation and assessment at the ADS center, with patient information required for discharge planning being transferred to the ward nurses. This prospective observational study compared outcomes before (November 1, 2016-October 31, 2017, the pre-PFM group) and after (November 1, 2017-October 31, 2018, the post-PFM group) implementation of the PFM system.

Conventional Care (the Pre-PFM Group)

The physician informed the patients scheduled for surgery about inpatient treatment during their outpatient visit. After admission, operating room nurses made a preoperative visit

to explain the surgery. Upon admission, ward nurses assessed the need for discharge support and collaborated with the discharge-planning department to provide intervention until discharge.

Establishment of the PFM System in the ADS Center (the Post-PFM Group)

A multidisciplinary workgroup comprising representatives from the nursing, physician, medical office, pharmaceutical, and social work departments collaborated to improve the quality of hospitalization and discharge planning. First, operational flow was created: After consultation with the outpatient physician, the ADS center staff assessed the needs of each scheduled inpatient and provided information and support to the inpatient ward and community multidisciplinary staff before admission. Afterward, manuals were prepared and training sessions were held for physicians, nurses (outpatient, operating room, discharge coordination departments), pharmacists, MSWs, and medical office staff to discuss the purpose of the PFM system and their specific roles and the operational flow.

In the post-PFM group, the ADS center staff, comprising the multidisciplinary staff, conducted multidisciplinary assessments, collaborated with the wards and the community to share patient information, and initiated interventions before admission. Specific roles included a pharmacist for medication management, an operating room nurse to explain surgical protocols, and an ADS nurse to assess postoperative medical management, nutritional status affecting frailty, and the need for discharge support. Moreover, follow-up visits were scheduled for obtaining information regarding patients who will make the outpatient visit after discharge from the hospital by taking over the information from the wards. The intervention of ward nurses in collaboration with the discharge-planning department from admission to discharge was the same as that in the conventional care group.

Participants

Patients scheduled for inpatient surgery were included in the gastroenterology, urology, breast endocrine surgery, neurosurgery, and respiratory surgery departments between November 1, 2016 and October 31, 2018. These major surgical departments have a large number of scheduled surgical admissions, and the department heads agreed to cooperate in the study. The inclusion criteria for the post-PFM group were as follows: (a) age ≥18 years at the time of obtaining consent, (b) referred for the PFM system by their primary physician, and (c) written informed consent obtained from the patient or surrogate. The data for the pre-PFM group was obtained retrospectively from the electronic medical records and matched for the disease, surgical procedure, and age with the post-PFM group. The patients from the pre-PFM group were informed that they are allowed to stop par-

ticipating in the study. The minimal sample size was calculated to be 421, with a significance α level of 5% (0.05) and a power of 80% (0.8), based on previously reported readmission and risk-reduction rates of 5.0%-8.5% and 4.9%-6.0% (Hansen et al., 2011). The Ethical Review Committee of the authors' institution approved this study (No.4463-R).

Data Collection

Data such as age, sex, name of the disease, surgical procedure, admission and discharge dates, date of surgery, discharge location, unscheduled readmission within 1 month, ADL, cognitive level, medications, and family structure were collected from the electronic medical records. The pre- and post-PFM groups were matched at a 1:1 ratio according to the name of the disease, surgical procedure, and age.

Patient satisfaction pre-PFM was based on outpatient satisfaction data collected and published annually by the hospital. The data collection period was 5 days in September 2017. The satisfaction item was the explanation of physicians, nurses, and pharmacists. Data on patient satisfaction post-PFM were collected prospectively from patients who consented to the study. Specifically, patients were asked to complete a self-administered mailed questionnaire 2-4 weeks after discharge. This questionnaire collected data including age, sex, clinical department, the explanation of medical staff, five items regarding satisfaction with the PFM system on a 5-point Likert scale, and overall satisfaction.

Statistical Analyses

The primary outcomes were the hospital length of stay, unscheduled readmissions within a month, surgical cancellation rate, and duration from admission to surgery, and the secondary outcome was the patient satisfaction. Descriptive statistics for all variables of interest were calculated. Between-group comparisons of continuous and categorical variables were performed using the t-test and Chi-square/Fisher's exact test, respectively. A *p*-value of <.05 was considered statistically significant. All statistical analyses were performed using IBM SPSS Statistics for Windows, version 23 (IBM Corp., Armonk, NY, USA).

Results

Basic Characteristics of the Participants

Of 571 eligible patients, 569 were included in the post-PFM group; 2 patients withdrew their consent. Accordingly, we included 569 patients in the pre-PFM group who were matched according to the disease name, surgical procedure, and age.

Table 1 shows the demographic characteristics of the participants. Most patients were scheduled for urologic surgery (402 [35.3%] patients), followed by gastrointestinal surgery (262 [23.0%] patients). Overall, there were 651 (57.2%)

males and 487 (42.8%) females. Moreover, most patients were in their 60s (302 [26.5%]), followed by those in their 70s (280 [24.6%]).

There were no significant between-group differences in sex, ADL, and cognitive function at the time of admission, incidence of medication discontinuation, and family structure (Table 2). Moreover, 96%-97% of the patients had independent ADL without cognitive decline. The pre-PFM group had more smokers than the post-PFM group (93 [16.3%] vs.

57 [10.0%]; *p* = .002).

Duration from Admission to Surgery and Length of Hospital Stay

The post-PFM group showed a significantly shorter duration from admission to surgery than the pre-PFM group (1.9 ± 1.9 vs. 2.6 ± 6.0 days; *p* = .006; Table 3). Moreover, there was no significant difference in the mean length of hospital stay between the post- and pre-PFM groups (10.6 ± 13.3 days vs. 11.7 ± 14.8 days; *p* = .222).

Surgical Cancellation Rate and Readmission Rate

There was no significant difference in the surgical cancellation rate between the post-PFM (15 [2.6%]) and pre-PFM groups (12 [2.1%]; *p* = .698; Table 4). Moreover, there was no significant difference in the rate of unscheduled readmission within 1 month between the post-PFM (6 [1.1%]) and pre-PFM groups (14 [2.5%]; *p* = .112).

In the post-PFM group, five cases of surgery cancellation were due to symptom improvement, metastasis, complications, or other treatment changes, one due to intake of discontinued medication, and nine due to cold or poor health. In the pre-PFM group, five cases of surgery cancellation were due to intake of discontinued medication, two due to smoking, and five due to cold or poor health.

Patient and Family Satisfaction with the PFM System

The response rate to the sent questionnaire was 69.1% (*n* = 393). We found that >70% of the patients were satisfied with the surgical explanation, medication management explanation, and multidisciplinary care during the admission and discharge process (Figure 1). Moreover, 66.9% of the

Table 1. Characteristics of the participants.

	N = 1138	
	n	%
Clinical department		
Urologic surgery	402	35.3
Gastrointestinal surgery	262	23.0
Breast endocrine surgery	160	14.1
Neurosurgery	186	16.3
Respiratory surgery	128	11.2
Sex		
Male	651	57.2
Female	487	42.8
Age, years		
18–19	6	0.5
20–29	28	2.5
30–39	74	6.5
40–49	162	14.2
50–59	204	17.9
60–69	302	26.5
70–79	280	24.6
80–89	82	7.3

Table 2. Comparison of patient characteristics between pre- and post-PFM groups.

		Post-PFM		Pre-PFM		*p*-value
		n = 569 (%)		*n* = 569 (%)		
Sex	Male	316	(55.5)	335	(58.9)	.281
	Female	253	(44.5)	234	(41.1)	
ADL	Independence	548	(96.3)	549	(96.5)	
	Partial assistance	18	(3.2)	16	(2.8)	.877
	Complete assistance	3	(0.5)	4	(0.7)	
Cognitive function	Normal	556	(97.7)	551	(96.8)	.467
	Cognitive decline	13	(2.3)	18	(3.2)	
Smoking	Smoker	57	(10.0)	93	(16.3)	.002
	Non-smoker	512	(90.0)	476	(83.7)	
Presence of discontinued medications	Yes	88	(15.5)	110	(19.3)	.100
	No	481	(84.5)	459	(80.7)	
Family structure	Living together	483	(84.9)	479	(84.2)	.806
	Living alone	86	(15.1)	90	(15.8)	

Note: Chi-square test.

Table 3. Comparison of the length of hospital stay and duration from admission or surgery between the pre- and post-PFM groups.

	Post-PFM, *n* = 569	Pre-PFM, *n* = 569	*p*
	mean ± SD	mean ± SD	
Days from admission to surgery	1.9 ± 1.9	2.6 ± 6.0	.006
Length of hospital stay	10.6 ± 13.3	11.7 ± 14.8	.222

Note: t-test.

Table 4. Comparison of the rates of surgery cancellation and unscheduled readmissions within a month between the pre- and post-PFM groups.

		Post-PFM		Pre-PFM		*p*
		n = 569	(%)	*n* = 569	(%)	
Surgery cancellation or delay	Yes	15	(2.6)	12	(2.1)	.698
	No	554	(97.4)	557	(97.9)	
Unscheduled readmission within 1 month	Yes	6	(1.1)	14	(2.5)	.112
	No	563	(98.9)	555	(97.5)	

Note: Chi-square test.
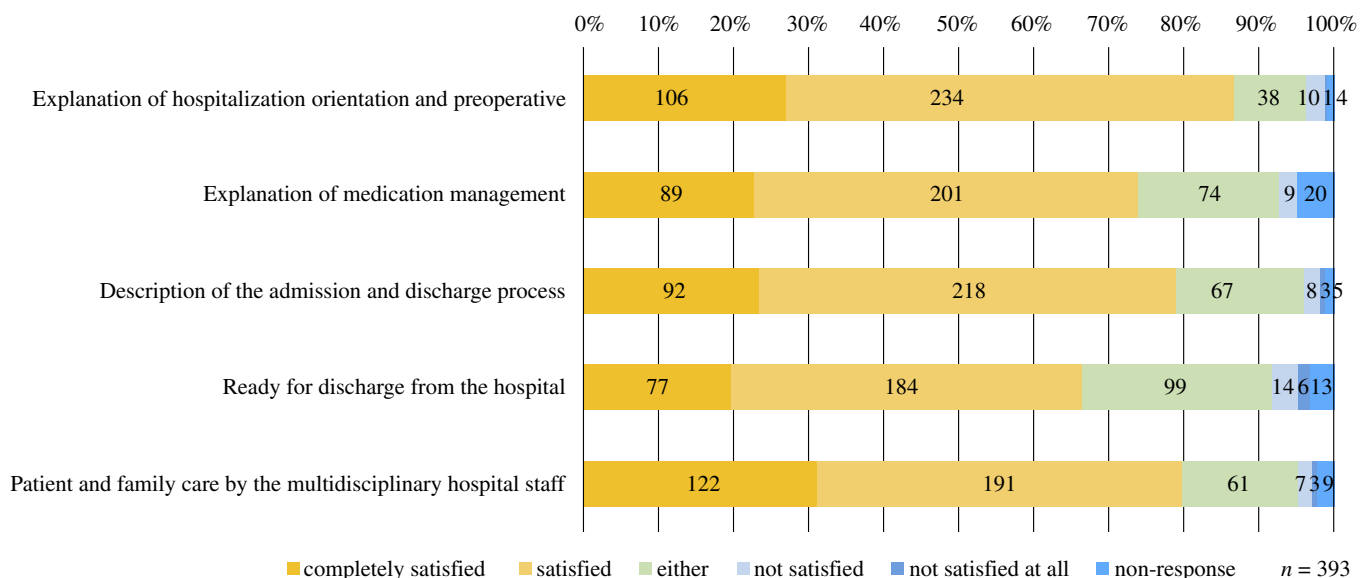
Figure 1. Patient satisfaction.

patients were satisfied with their readiness for discharge from the hospital. The percentage of satisfaction with explanations provided by physicians, nurses, and pharmacists was higher post-PFM (Figure 2).

Discussion

Hospital Length of Stay, Readmission Rate, and Surgical Cancellation Rate

The findings revealed that implementing PFM may have significantly shortened the duration from admission to surgery.

Individualized patient assessment in outpatient settings may have facilitated the post-admission preoperative preparation and thus allowed for a smooth perioperative experience. It has been shown that pharmacist-led preoperative interventions minimize the adverse effects of high-risk medications (Han et al., 2022). The post-PFM group showed fewer cases of surgery cancellations due to intake of discontinued medication, which suggested that the pharmacists' role allowed appropriate medication protocol, including preoperative withdrawal of respective medications.

It has also been shown that preoperative orientation by
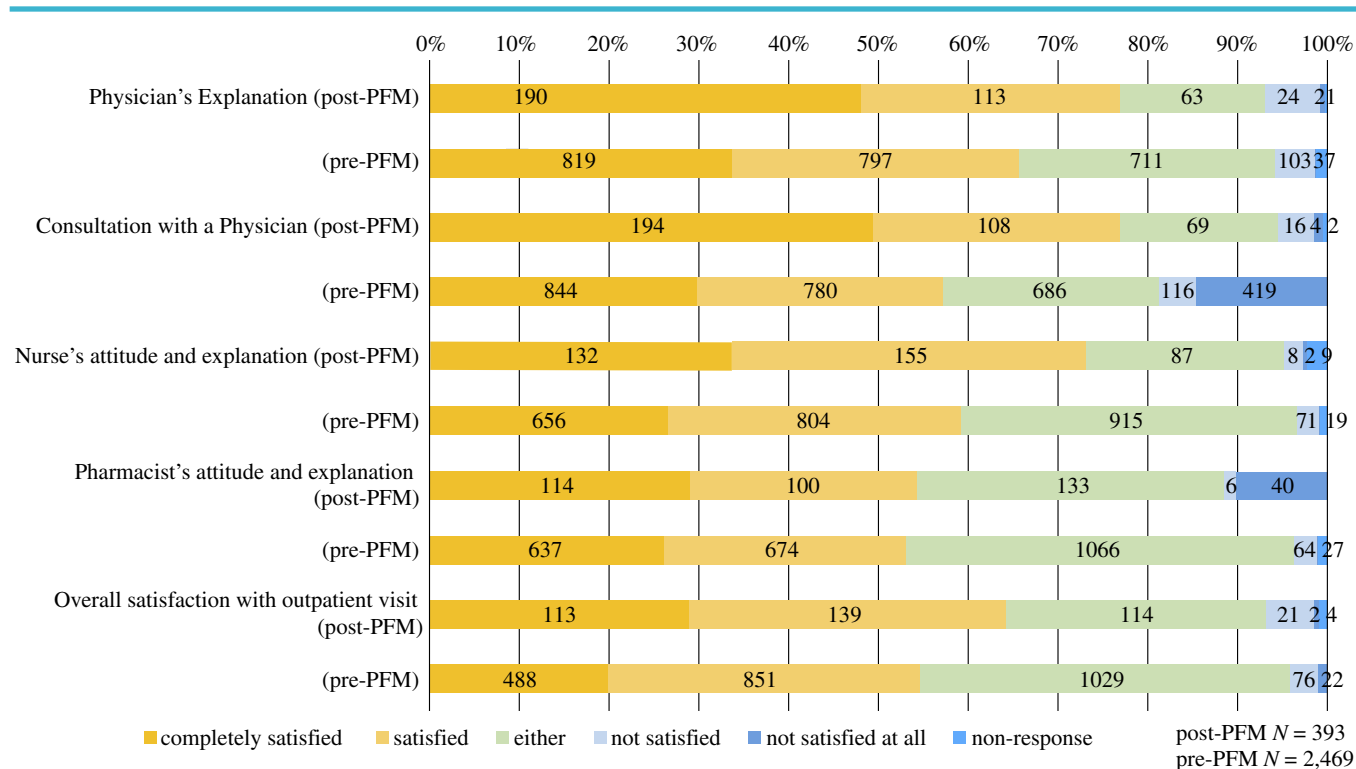
Figure 2. Outpatient satisfaction ratings for explanations of physicians, nurses, and pharmacists.

anesthesiologists and trained nurses reduces surgical cancellation rates (van Klei et al., 2004). Appropriately trained nurses can perform preoperative assessments at the same level as physicians (Nicholson et al., 2013) and can collect the medical and life history of the patients in their assessments. Accordingly, implementing the PFM system allowed a multidisciplinary approach that minimizes preoperative and perioperative risks through preoperative evaluation of the patient's medical and life history to predict and prepare for potential post-discharge concerns.

There was no significant difference between the length of hospital stay and unscheduled readmission rate, which could be attributed to the patients' high ADL and cognitive levels. Future qualitative studies are warranted to elucidate details regarding the occurrence of unscheduled readmission.

Patient Satisfaction Survey

A multidisciplinary approach to patients scheduled for surgical admission at the ADS center improved understanding of the process from admission to discharge and satisfaction with consultation time. As satisfaction with the preparation for discharge was lower, further studies are warranted to establish a system for implementing information obtained at the ADS center to provide consistent and appropriate support to inpatient wards. Since stress and anxiety are high in perioperative patients immediately after surgery and after discharge from the hospital (Gobbo et al., 2020), it is important to provide inpatient and ongoing care in the outpatient visit.

Limitations and Implications for the Future

This study has some limitations. First, our findings may not be applicable to countries with different healthcare systems. However, our findings may inform studies in other countries on the utility of a new admission/discharge support system that applies a multidisciplinary team approach from the pre-admission outpatient visit to discharge. The number of perioperative patients with multiple diseases and medications and frail older patients is expected to increase in the future. We believe that a multidisciplinary team approach in the outpatient visit prior to hospitalization for addressing the complex and latent issues faced by patients, and a new collaborative system with the hospital ward and the community starting from the outpatient visit, including continued care after discharge, will reduce the risks associated with surgery and contribute to a smooth return to home. Second, the pre-PFM patient satisfaction data were collected retrospectively and were anonymous. Thus, they differ from those of matched patients in the electronic medical records. However, as the findings demonstrated general satisfaction (>65% satisfaction rate), we believe that the PFM system improves patient satisfaction. It is necessary to explore further the details of the needs of perioperative patients regarding preparation for discharge from the hospital.

Conclusions

The admission/discharge PFM system significantly reduced the duration from admission to surgery and improved patient satisfaction. Pharmacist-led interventions may have reduced the surgery cancellation rate due to preoperative intake of discontinued medication. Further studies are warranted to examine the effect on the length of stay and unscheduled re-admissions.

References

Arun, N., Al-Jaham, K. M. A., Alhebail, S. A., Hassan, M. J. A., Bakhit, R. H., Paulose, J., Marcus, M. A. E., Ramachandran, B., & Lance, M. D. (2021). Nurse-run preanaesthesia assessment clinics: an initiative towards improving the quality of perioperative care at the ambulatory care centre. *BMJ Open Quality*, *10*(4), e001066.
https://doi.org/10.1136/bmjoq-2020-001066

Bonetti, A. F., Bagatim, B. Q., Bottacin, W. E., Mendes, A. M., Rotta, I., Reis, R. C., Fávero, M. L. D., Fernandez-Llimos, F., & Pontarolo, R. (2019). Pharmacotherapy problems in cardiology patients 30 days post discharge from a tertiary hospital in Brazil: A randomized controlled trial. *Clinics (Sao Paulo, Brazil)*, *74*, e1091.
https://doi.org/10.6061/clinics/2019/e1091

Cajanding, R. J. (2017). Effects of a structured discharge planning program on perceived functional status, cardiac self-efficacy, pa-

tient satisfaction, and unexpected hospital revisits among Filipino cardiac patients: A randomized controlled study. *The Journal of Cardiovascular Nursing*, *32*(1), 67-77.
https://doi.org/10.1097/jcn.0000000000000303

Chan, C. Y. W., Nam, H. Y., Raveenthiran, R., Choon, S. K., & Tai, C. C. (2008). Outpatient pre-operative assessment in joint replacement surgery. *The Medical Journal of Malaysia*, *63*(2), 100-103.

Gilbert, T., Occelli, P., Rabilloud, M., Poupon-Bourdy, S., Riche, B., Touzet, S., Bonnefoy, M., & PROUST Study Group. (2021). A nurse-led bridging program to reduce 30-day readmissions of older patients discharged from acute care units. *Journal of the American Medical Directors Association*, *22*(6), 1292-1299.e5.
https://doi.org/10.1016/j.jamda.2020.09.015

Gobbo, M., Saldaña, R., Rodríguez, M., Jiménez, J., García-Vega, M. I., de Pedro, J. M. & Cea-Calvo, L. (2020). Patients' experience and needs during perioperative care: A focus group study. *Patient Prefer Adherence*, *14*, 891-902.
https://doi.org/10.2147/PPA.S252670

Goldman, L. E., Sarkar, U., Kessell, E., Guzman, D., Schneidermann, M., Pierluissi, E., Walter, B., Vittinghoff, E., Critchfield, J., & Kushel, M. (2014). Support from hospital to home for elders: A randomized trial. *Annals of Internal Medicine*, *161*(7), 472-481.
https://doi.org/10.7326/m14-0094

Gonçalves-Bradley, D. C., Lannin, N. A., Clemson, L., Cameron, I. D., & Shepperd, S. (2022). Discharge planning from hospital. *Cochrane Database of Systematic Reviews*, *2022*(2).
https://doi.org/10.1002/14651858.cd000313.pub6

Han, A., Nguyen, N. Y., Hung, N., & Kamalay, S. (2022). Efficacy of a bariatric surgery clinic-based pharmacist. *Obesity Surgery*, *32*(8), 2618-2624.
https://doi.org/10.1007/s11695-022-06022-y

Hansen, L. O., Young, R. S., Hinami, K., Leung, A., & Williams, M. V. (2011). Interventions to reduce 30-day re-hospitalization: A systematic review. *Annals of Internal Medicine*, *155*(8), 520-528.
https://doi.org/10.7326/0003-4819-155-8-201110180-00008

Kaneko, K., Suzuki, M., Hoshi, H., Shimura, T., Ono, E., Shimizu, Y., Nohara, M., Matumoto, M., Yoshinari, M., Nagaoka, A., Kikuchi, N., Karahashi, M., & Mizunuma, K. (2020). Patient Flow Management:PFM ni okeru jisanyaku kanbetsu system no kouchiku [Construction of the bringing medicine differentiation system in Patient Flow Management: PFM]. *The Japanese Red Cross Medical Journal*, *71*(2), 341-345.

Kristoffersen, E. W., Opsal, A., Tveit, T. O., Berg, R. C., & Fossum, M. (2022). Effectiveness of pre-anaesthetic assessment clinic: A systematic review of randomised and non-randomised prospective controlled studies. *BMJ Open*, *12*(5), e054206.
https://doi.org/10.1136/bmjopen-2021-054206

Legrain, S., Tubach, F., Bonnet-Zamponi, D., Lemaire, A., Aquino, J.-P., Paillaud, E., Taillandier-Heriche, E., Thomas, C., Verny, M., Pasquet, B., Moutet, A. L., Lieberherr, D., & Lacaille, S. (2011). A new multimodal geriatric discharge-planning intervention to prevent emergency visits and rehospitalizations of older adults: The optimization of medication in AGEd multicenter randomized controlled trial. *Journal of the American Geriatrics Society*, *59*(11), 2017-2028.
https://doi.org/10.1111/j.1532-5415.2011.03628.x

Lindpaintner, L. S., Gasser, J. T., Schramm, M. S., Cina-Tschumi, B., Müller, B., & Beer, J. H. (2013). Discharge intervention pilot improves satisfaction for patients and professionals. *European Jour-*

nal of Internal Medicine, *24*(8), 756-762.
https://doi.org/10.1016/j.ejim.2013.08.703

Maculotti, D., Melis, V., Roveron, G., Spena, P. R., Villa, G., & Patient Flow Stoma Group. (2020). Patient flow for the management of ostomy patients. *Minerva Chirurgica*, *75*(5), 365-372.
https://doi.org/10.23736/s0026-4733.20.08472-2

Matsumoto, R., & Sato, M. (2018). Jyutsugo kanjya ga taiin chyokugo ni idaku omoi [Worries and fears that a postoperative patient holds just after a discharge]. *Bulletin of School of Nursing*, *11*(1), 79-85.

Mendes, F. F., Mathias, L. A. da S. T., Duval Neto, G. F., & Birck, A. R. (2005). Impacto da implantação de clínica de avaliação pré-operatória em indicadores de desempenho. *Revista Brasileira de Anestesiologia*, *55*(2), 175-187.
https://doi.org/10.1590/s0034-70942005000200004

Meyer, A. M., Bartram, M. P., Antczak, P., Becker, I., Benzing, T., & Polidori, M. C. (2022). A tailored discharge program improves frailty and mood in patients undergoing usual rehabilitative care: A randomized controlled trial. *Journal of the American Medical Directors Association*, *23*(12), 1962.e1-1962.e13.
https://doi.org/10.1016/j.jamda.2022.09.003

Ministry of Health, Labour and Welfare. (2008). Shinryouhoushuu no Senteihouhou. [Reimbursement selection method]. Retrieved from http://www.mhlw.go.jp/topics/2008/03/tp0305-1.html (in Japanese). [retrived May 25 2022].

Ministry of Health, Labour and Welfare. (2018). Shinryouhoushuu-kaitei no gaiyou 3. [Overview of medical reimbursement]. Retrieved from
https://www.mhlw.go.jp/file/06-Seisakujouhou-Hokenkyoku.pdf (in Japanese). [retrived May 25 2022].

Nicholson, A., Coldwell, C. H., Lewis, S. R., & Smith, A. F. (2013). Nurse-led versus doctor-led preoperative assessment for elective surgical patients requiring regional or general anaesthesia. *The Cochrane Library*.
https://doi.org/10.1002/14651858.cd010160.pub2

Okabe, M., Yanagihara, K., Tutumi, C., Suzuki, T., Katuma, N., Hatakeyama, M., Nishino, R., Oogushi, W., Tuchimoto, M., & Takazawa, C. (2013). Awareness of discharge support among nurses working at an advanced treatment hospital that employs a PFM system, and analysis of related factors. *Tokai University School of Health Sciences bulletin*, *13*, 3-12.

Tange, M. (2016). Taiincyousei kangoshi ga sankasuru taiinshien conference no kouka [The effect of discharge adjustment nurses participating in discharge support conference]. *The Journal of Japan Society for Health Care Management*, *17*(2), 72-74.

Tsutsui, H., Tsuchihashi-Makaya, M., Kinugawa, S., Goto, D., Takeshita, A., & JCARE-CARD Investigators. (2006). Clinical characteristics and outcome of hospitalized patients with heart failure in Japan. *Circulation Journal*, *70*(12), 1617-1623.
https://doi.org/10.1253/circj.70.1617

van Klei, W. A., Hennis, P. J., Moen, J., Kalkman, C. J., & Moons, K. G. M. (2004). The accuracy of trained nurses in pre-operative health assessment: results of the OPEN study. *Anaesthesia*, *59*(10), 971-978.
https://doi.org/10.1111/j.1365-2044.2004.03858.x

van Klei, W. A., Moons, K. G., Rutten, C. L., Schuurhuis, A., Knape, J. T., Kalkman, C. J., & Grobbee, D. E. (2002). The effect of outpatient preoperative evaluation of hospital inpatients on cancellation of surgery and length of hospital stay. *Anesthesia and Analgesia*, *94*(3), 644-649.
https://doi.org/10.1097/00000539-200203000-00030

Original Research

Development of a support program to improve clinical reasoning of nurses with 2-3 years of work experience

Junko Okada, RN, PhD[1] (iD), and Kyoko Shida, RN, PHN, MSN[2] (iD)

[1]Faculty of Nursing, Kyoto Tachibana University, Kyoto, Japan, and [2]Graduate School of Nursing, Osaka Metropolitan University, Osaka, Japan

Abstract

Objective: Herein, we aimed to develop and evaluate a program to improve clinical reasoning among competent-level nurses (i.e., nurses with 2-3 years of work experience). The primary hypothesis of the study is as follows: "Upon completing the program, competent-level nurses can understand the patient from multiple perspectives, resulting in the best nursing care for the patient." **Methods:** A quasiexperimental design was employed. The program incorporated the attributes and consequences of a conceptual analysis of clinical reasoning into an experiential learning model and consisted of a prior learning module and two training sessions. *The Problem-Solving Client Support Behavior Self-Rating Scale for Nurses* (9 subscales, 45 items) and the Mann-Whitney U test were used to evaluate the effectiveness of the intervention and between-group comparisons, respectively. **Results:** Data from 57 participants were analyzed. The intervention group showed improved scores for the subscales "determine the priority of solving problems and respond flexibly to the requests of clients" ($U = 241.5$, $p = .012$), "persuade and convince clients to accept help that they initially refuse" ($U = 226.0$, $p = .006$), "customize assistance depending on the particular situation" ($U = 214.5$, $p = .003$), and "assess the effectiveness of assistance and provide support" ($U = 221.0$, $p = .004$). **Conclusions:** This program improved the ability of competent-level nurses to use multiple reasoning patterns to gain a rich, multifaceted understanding of patients and make decisions about the optimal care for patients based on that understanding.

Introduction

Clinical reasoning involves iterative thinking processes in which a healthcare professional continuously concludes by reasoning about specific aspects of a patient's condition, including concerns or changes related to it (Benner et al., 2009). By practicing clinical reasoning, nurses can avoid the risk of care practice that deviates from patients' wishes and concerns (Cruz et al., 2009; Price, 2011), make decisions responsive to patients' needs (Clarke, 2014; Dalton & Gee,

2015), and provide quality nursing care (Kuiper et al., 2009). Clinical reasoning is an important clinical competency for nurses (Daniel et al., 2019), making its improvement a goal of nursing education.

Experience and reflection are effective in improving clinical reasoning (Benner et al., 2009), and education incorporating simulation and reflection on clinical nursing practice is being implemented. For example, the method of reflecting on simulation practice through debriefing (Dreifuerst, 2010) helps nursing students understand the issues, significance,
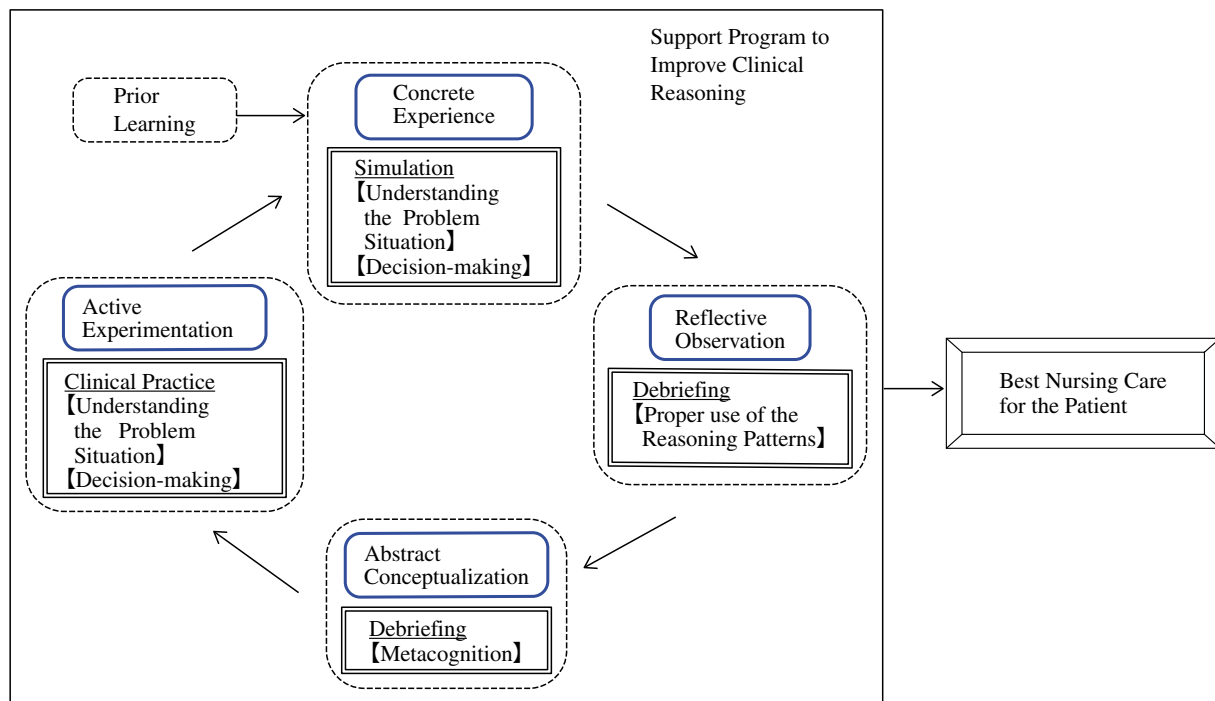
Figure 1. Conceptual framework of the study.

Note: The conceptual framework for this study was developed by incorporating the attributes and consequences of clinical reasoning into Kolb's (1984) empirical learning model. LCJR, laser clinical judgment rubric.

and distinct context of any given case. However, it mainly aims to improve critical thinking skills and not teach students how to understand a particular situation or the importance of using multiple ways of thinking to interpret a situation. In addition, analytical thinking can be improved by considering the patient's history and clinical symptoms to identify key issues (Bartlett et al., 2008; Kautz et al., 2009). By reflecting on one's reasoning by studying entries in a nursing reflection journal (Kuiper et al., 2009), learners reported improvement in their metacognition and reflective thinking; however, the relationship between these abilities and understanding patients remains unclear.

Clinical reasoning is influenced by multiple factors, including its relevance to patient values and benefits, healthcare providers' experiences, and the culture of the healthcare providers' team (Levett-Jones et al., 2010; Okada, 2020; Simmons, 2010). Therefore, improvement cannot be achieved by analytically interpreting what is experienced and deriving clinical judgments. In addition, learners effectively learn from their experiences by reflecting on their meaning and drawing lessons (Kolb, 1984). For adults, a follow-up activity based on what has been learned allows for consistent reflection and promotes transformational learning (Cranton, 1996). Therefore, in addition to repeating the experiential learning cycle (Kolb, 1984), programs to improve clinical reasoning must be structured to consider the factors influencing it. It is important to reflect on the

reasoning process that helps determine priorities for nursing practice and the factors influencing them. Although several educational programs have been implemented to improve clinical reasoning (Dreifuerst, 2010), none considered the factors that influence clinical reasoning; additionally, the methods of reflection have varied.

Herein, we aimed to develop and evaluate the effectiveness of a program to support the improvement of clinical reasoning among nurses with 2-3 years of clinical experience (competent-level nurses), in accordance with Kolb's experiential learning model (1984). Competent-level nurses play preceptor and leadership roles in several workplaces (Hirano & Koyama, 2018; Onbe et al., 2022) and influence the quality of nursing throughout the organization; they recognize that experiential learning is essential to understand specific situations (Benner et al., 2009) and are primed to learn clinical reasoning. Therefore, the development of clinical reasoning support programs targeting competency levels is an important matter with direct implications for improving the quality of care across an organization.

The conceptual framework for this study was created by incorporating the attributes and consequences of clinical reasoning (Okada, 2020) into Kolb's (1984) experiential learning model (Figure 1). Clinical reasoning is defined as the use of analytic processes, intuition, and narrative thinking to interpret a particular situation and metacognition to continually evaluate the situation and confirm one's reasoning proc-

ess. Furthermore, improved clinical reasoning is defined as a nurse's ability to use a combination of interrelated reasoning patterns, such as analytic processes, intuition, and narrative thinking, in a given situation to gain a rich and comprehensive understanding of the patient and provide the best nursing care for the patient.

Study hypotheses:

· Primary hypothesis

· Upon program completion, competent-level nurses can understand patients from multiple perspectives, resulting in the best nursing care for patients.

· Secondary hypothesis

Upon program completion, the ability of competent-level nurses to understand problem situations, interpret them using multiple reasoning patterns, and use metacognition to check their reasoning processes will be improved.

Materials and Methods

Design

We employed a quasiexperimental design; groups were created using matching methods to ensure that study participants had similar years of experience and unit characteristics; within the groups, participants were randomly assigned to intervention and control groups for pre- and post-intervention measurements.

As the intervention and control groups were not clearly separated at the beginning of the study, information exchanges between the two groups during the study period were probable, possibly influencing the results. To address this concern, after the first simulation of the 1st day of training, participants were not allowed to discuss their session content outside the training. Participants who engaged in other training sessions in clinical reasoning or judgment during the program period were excluded from the analysis to avoid the influence of other learning.

Participants

The participants were competent-level nurses (with 2-3 years of work experience). We distributed a written request for study participation to 407 competent-level nurses working in general hospitals in the Kinki region, Japan. A total of 62 nurses working in different units in eight hospitals agreed to participate (acceptance rate = 15.2%) and were categorized according to the hospital for which they worked. Groups of 8-12 participants were formed using a matching method; this approach ensures equal experience and unit attributes, based on the literature on the appropriate number of participants for effective group learning (Kobayashi & Suzuki, 2018). For hospitals with <8 participants, groups were created by unit attributes. At the beginning of the training, it was necessary to change the training schedule because of the sudden illness of a study participant, and there were ad-

justments to ensure that the number of participants in each group was not skewed. At the start of training, the intervention and control groups had 34 and 28 participants, respectively.

The required sample size calculated using the G*Power 3 software (significance level set at 5%, effect size of 0.8, and power of 0.8) was 52 participants. This value was then multiplied by a dropout rate of 20% to obtain the required sample size of 64 participants.

In the present program, participants learn the importance and use of clinical reasoning by reflecting on their nursing practice and thinking in simulations using worksheets developed based on the reflective cycle (Gibbs, 1988). Methods encouraging reflective thinking effectively improve clinical reasoning (Bartlett et al., 2008; Forneris et al., 2015), and reflection using tools such as worksheets can help learners think like nurses. (Dreifuerst, 2010). Therefore, we assumed that the program would be highly effective and set a large effect size (0.8).

Procedure

The intervention comprised a prior learning module and 2 days of training. The training included a simulation and debriefing. The former involved making the best clinical judgment and preparing a nursing care plan for a patient who could not get out of bed as planned on the 2nd day after gastric cancer surgery. The patient's role was played by a healthcare worker unfamiliar with the participants and trained for this simulation. The simulation was designed to meet the 11 criteria presented in the INACSL Standards of Best Practice (INACSL Standards Committee, 2016). The interval between days 1 and 2 of training was 4 weeks, based on Cranton's (1996) study (Figure 2).

Prior Learning

Prior learning included pyloric gastrectomy and the Billroth I method, drain and tract management, wound and drain site monitoring, potential postoperative complications, and postoperative patient weaning. It understood and proficiently executed the examples used in the simulation.

Day 1 of Training (Face-to-Face)

In total, 8-10 people participated in the 10-min simulation; 1 played the role of the nurse and practiced, while the others observed the simulation, which was videotaped. After the first simulation, the participants were divided into intervention and control groups and moved to separate rooms. The former group completed a worksheet and attended a debriefing session according to the worksheet. Next, they participated in the second simulation, completed a worksheet, and attended a debriefing session. They were also requested to practice clinical reasoning in a clinical setting until the 2nd day of training.

Day 2 of Training (Face-to-Face or Online)

The participants in the intervention group watched videos
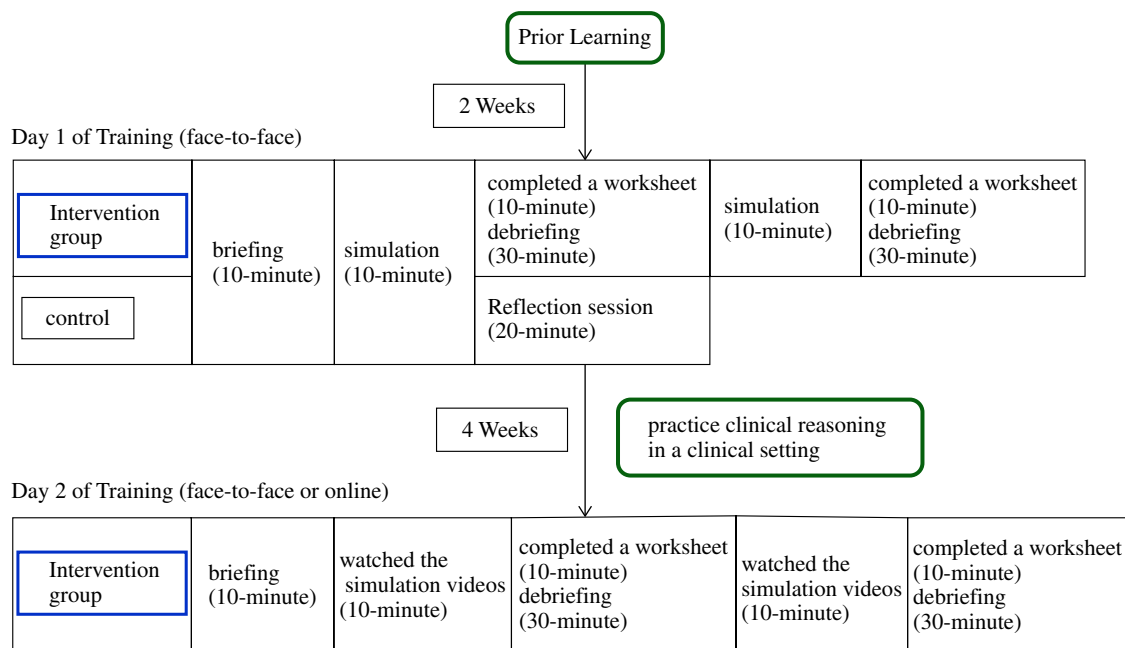
Figure 2. Support program to improve the clinical reasoning of nurses with 2–3 years of work experience: Protocol.

Note: This is an overview of the program, detailing the content of the 2-day training, intervention methods, and times for the intervention and control groups, respectively.

(two sessions) depicting the simulation from day 1 of training that their group practiced and completed a separate worksheet. We conducted a debriefing session based on the simulation videos and examples of clinical reasoning practice in clinical settings, where participants shared what they noticed and found difficult.

Control Group Participation

The control group completed the training after participating in the first simulation and its review on day 1 of the training. Additionally, they completed questionnaires 4 weeks after day 1 of training and 8 weeks after day 2 of training.

Materials

Simulation Scenarios

The simulation scenario included the learning objectives, simulation setting, patient background and current situation, and prior learning tasks. The simulation cases were designed based on enhancing clinical reasoning, aiming to identify and intervene in situations that are challenging to assess or unexpected, and considering the patient's needs in terms of physical, psychological, and social aspects.

Debriefing Guide

The guide is based on six elements of debriefing quality assurance, as described in the *Debriefing Assessment for Simulation in Healthcare (DASH) Instructor Version*[©] (Simon et al., 2009):

1) Establishing an engaging learning environment
2) Maintaining an engaging learning environment

3) Structuring debriefing in an organized way
4) Provoking engaging discussions
5) Identifying and exploring performance gaps
6) Helping trainees achieve or sustain good future performance

Worksheets

The worksheet was developed based on Gibbs' (1988) reflective cycle and designed to be completed before and after the debriefing so that participants could compare differences in their thinking and clinical judgments. Table 1 shows the worksheet items and time frames.

Measures

Baseline characteristics and five measures were used to assess program effectiveness. The demographic characteristics of the participants were based on previous requirements for clinical reasoning (Okada, 2020) and included age, gender, education, years of nursing experience, years of experience in current positions, units, educational role experiences, and learning experiences related to thinking and clinical problem-solving. The *Problem-Solving Client Support Behavior Self-Evaluation Scale for Nurse*, *Scale to Reflect on Nursing Support in Patients' Treatment Decisions*, *Metacognitive Scale for Adults*, and *Lasater Clinical Judgment Rubric (LCJR)* were adopted based on the attributes of clinical reasoning (Okada, 2020). Program satisfaction was assessed using the *Debriefing Assessment for Simulation in Healthcare*[©] *Student Version (DASH*[©]*-SV)*, adapted from Drei-

Table 1. Worksheet item and time frames.

Item	Time frame
1. What did you think happened to the patient?	Postsimulation
2. How did you feel at the beginning?	
3. What are some of the best things you have done in the nursing care you provided to that patient? Please include the reason for your opinion.	
4. What do you wish you had done more of in the nursing care you provided to that patient? Please include the reason for your opinion.	Postsimulation Postdebriefing
5. What information do you think you need to practice the nursing you answered in #4? Please include the reason for your opinion.	
6. How will you think about your decision to care the next time you encounter a situation like this (a judgmental or unexpected situation) ? Please include the reason for your opinion.	Postdebriefing

fuerst's (2010) study.

Problem-solving Client Support Behavior Self-evaluation Scale for Nurses

This scale was designed by Hattori and Funashima (2010) to measure nurses' quality of behaviors necessary for solving clients' problems. It comprises nine subscales and 45 items, with confirmed reliability and validity. The subscales are as follows: I. repeatedly collect and assess information to solve problems, II. confirm the wishes of clients in solving problems, III. determine the priority of solving problems and respond flexibly to the requests of clients, IV. collaborate with members of the healthcare team to resolve problems efficiently, V. persuade and convince clients to accept help that they initially refuse, VI. help clients solve their problems, VII. customize assistance depending on the particular situation, VIII. prevent problems that often arise from treatment and assistance, and IX. assess the effectiveness of assistance and provide support. A study using this scale (Sugimoto et al., 2017) found that nurses with more experience could identify patients' wishes and provide assistance tailored to each patient's individuality. As "the best care for the patient" is the care practiced by making decisions based on multiple interpretations and understandings through clinical reasoning and confirming patients' wishes (Okada, 2020), this scale can be used to assess improvements in clinical reasoning. The items were rated on a five-point scale (5 = *very true* to 1 = *mostly false*). The total score was 45-225, with higher scores indicating a great ability to determine the best nursing care for patients.

Scale to Reflect on Nursing Support in Patients' Treatment Decisions

This scale assesses how nurses consider patients' wishes and their role in supporting patients' treatment decisions (Ogata, 2015). The scale consists of five subscales and 20 items, with confirmed reliability and validity. The simulation conducted in this program involved learners understanding patients' wishes and determining the appropriate care to be provided in changing situations; therefore, this scale can adequately assess nurses' "use multiple reasoning patterns

depending on the situation" for understanding patients. The 20 items are categorized into five subscales: I. analysis of patients' and their family members' wishes, II. recognition of nurses' roles, III. comprehension of the circumstances of the patients and their family members, IV. comprehension of the circumstances of the medical team involved, and V. comprehension of the therapeutic situation. The items were rated on a four-point scale (4 = *always thought about it* to 1 = *never thought about it at all*). The total score was 20-80, with higher scores indicating a greater ability to use multiple reasoning patterns depending on the situation.

Metacognitive Scale for Adults

This scale was developed by Abe and Ida (2010). It measures metacognition in adults and has confirmed reliability and validity. It is widely used to measure metacognition in young nurses (Doi & Hosoda, 2023) and nursing students (Kimura et al., 2021) and to measure metacognition in competent-level nurses. It comprises 28 items and three subscales: monitoring, control, and metacognitive knowledge. The items are rated on a six-point scale (6 = *applies very well* to 1 = *does not apply at all*). The total score was 28-168, with higher scores indicating higher metacognitive ability.

Lasater Clinical Judgment Rubric (LCJR)

LCJR (Lasater, 2007) is based on 11 aspects of the clinical judgment model (Tanner, 2006) under four stages: noticing, interpreting, responding, and reflecting: beginning (1 point), developing (2 points), accomplished (3 points), and exemplary (4 points). LCJR has been used in various instructional settings and previous research has demonstrated its utility in simulation education for nursing students by enabling self-assessment of their practice (Cato et al., 2009). The total score was 11-44 points, and a higher score indicates a better ability to grasp the problem situation and use multiple reasoning patterns depending on the situation.

Debriefing Assessment for Simulation in Healthcare[©] Student Version (DASH[©]-SV)

This scale was developed by Simon et al. (2009), assessing the implementation and debriefing of the simulation

Table 2. Survey content, scales, and time frames.

Survey content		Scales	Time frame
Antecedents	·Learning experience ·Social context	Age, sex, education, years of nursing experience, years of experience in current unit, experience in educational roles, learning experiences related to thinking and clinical judgment	Preintervention
Attributes	·Grasp the problem situation ·Use multiple reasoning patterns depending on the situation ·Metacognition	LCJR Scale to Reflect on Nursing Support in Patients' Treatment Decisions, LCJR Metacognitive scale for adults	After day 1 of training, after day 2 of training, Postintervention
Consequences	·Decision-making ·Best nursing care for the patient	Problem-Solving Client Support Behavior Self-Evaluation Scale for Nurses	Preintervention, Postintervention
Program evaluation	·Participant satisfaction	DASH©-SV	After day 1 of training, after day 2 of training

Note: LCJR = lasater clinical judgment rubric

through six elements. Items are rated on a seven-point scale (7 = *very effective* to 1 = *not at all effective or harmful*). The total score was 6-42, with higher scores indicating greater satisfaction with the training.

Data Collection and Study Period

We administered the surveys four times: preintervention (during prior learning), after day 1 of training, after day 2 of training, and postintervention (8 weeks after the conclusion of day 2 of training). All survey methods involved self-reporting. Participants completed and submitted a paper questionnaire or scanned a Quick Response (QR) code and responded online. Data collection was conducted from October 2021 to April 2022.

In the literature (Kirkpatrick & Kirkpatrick, 2006), behavioral changes should ideally be evaluated 2-3 months post-training. Therefore, we scheduled the postintervention survey period to start 8 weeks after the conclusion of day 2 of training. We assessed satisfaction with each training session. Table 2 presents the survey content, scales, and time frames.

Data Analysis

The analysis was performed using IBM SPSS Statistics for Windows, Version 27, with $p = .05$.
Comparison of Intervention and Control Group Attributes
We conducted χ^2 tests for sex, education, educational role, and learning experiences related to thinking and clinical judgment. We conducted unpaired *t*-tests for age, years of nursing experience, and years of experience in the current unit to ensure that the two groups had no significant differences.
Comparison between Groups
For group comparisons of the *Problem-Solving Client Support Behavior Self-Evaluation Scale for Nurses*, *Scale to Reflect on Nursing Support in Patients' Treatment Decisions*,

Metacognitive Scale for Adults, and *LCJR*, the Mann-Whitney U test was used for between-group comparisons given that normality was not assumed for subscale scores at each survey time point.
Participant Satisfaction with the Training
The Mann-Whitney U test was performed on the DASH©-SV subscale scores after day 1 of training because normality was not assumed.

Ethical Considerations

The participants were informed verbally and in writing about the study objectives, methods, reporting of results, their free will and right to refuse participation, burdens and benefits of participation, the privacy of participants and their organizations, handling of simulation videos, and infection control related to the COVID-19 pandemic. Afterward, they provided their consent to participate. We explained that nurses in the control group, if desired, could watch simulation videos and undergo debriefing using worksheets after the study was completed. This study was approved by the Research Ethics Committee of the Graduate School of Nursing, Osaka Prefecture University (approval no. 2021-18).

Results

Participant Demographic Characteristics

Of the 62 participants who responded to the presurvey, 5 (intervention group, 1; control group, 4) dropped out during the program. We conducted a test of independence using participants' demographic data and found no significant differences between the intervention and control groups (Table 3).

Table 3. Demographic characteristics of the participants and independence test results.

Group participant		Intervention (n = 33)		Control (n = 24)		Comparison of attributes		
		n (%)	M (SD)	n (%)	M (SD)	t-value	χ²	p-value
Age (years)			24.79 (1.45)		25.38 (2.65)	−1.072		.288
Sex	Male	8 (24.2)		2 (8.3)			2.431	.119
	Female	25 (75.8)		22 (91.7)				
Education	Bachelor	23 (69.7)		13 (54.1)			2.417	.299
	Associate	0 (0.0)		1 (4.2)				
	Diploma	10 (30.3)		10 (41.7)				
Nursing experience (years)			2.27 (0.45)		2.29 (0.46)	−0.154		.878
	2	24 (72.7)		17 (70.8)				
	3	9 (27.3)		7 (29.2)				
Experience in current unit (years)	1	3 (9.1)		3 (12.5)			1.874	.599
	1–2	2 (6.1)		0 (0.0)				
	2–3	24 (72.7)		19 (79.2)				
	3–4	4 (12.1)		2 (8.3)				
Experience in educational roles	Yes	6 (18.2)		4 (16.7)			.022	.882
	No	27 (81.8)		20 (83.3)				
Learning experiences	Yes	1 (3.0)		1 (4.2)			.053	.818
	No	32 (96.7)		23 (95.8)				

Evidence of Program Effectiveness

Changes in Clinical Reasoning Scale Scores
Group comparison of the difference in pre- and post-intervention scores revealed that the intervention group scored significantly higher for subscales *III* (U = 241.5, *p* = .012), *V* (U = 226.0, *p* = .006), *VII* (U = 214.5, *p* = .003), and *IX* (U = 221.0, *p* = .004) of the *Problem-Solving Client Support Behavior Self-Evaluation Scale for Nurses* (Table 4).

Changes in Scale Scores of Attribute Factors for Clinical Reasoning
Our analysis of the scores on the *Scale to Reflect on Nursing Support in Patients' Treatment Decisions* revealed a mean baseline total score of 58.05 (7.02). In the between-group comparison of the difference in pre- and post-intervention scores, the intervention group scored significantly higher for subscales *I* (U = 238.0, *p* = .010), *II* (U = 262.5, *p* = .029), and *V* (U = 189.5, *p* =.001) (Table 5).

Our analysis of baseline scores on the *Metacognitive Scale for Adults* revealed a mean total score of 108.88 (14.80). Intergroup comparisons of the differences in pre- and post-intervention scores showed significant differences in the subscales of *monitoring* (U = 161.0, *p* <.001) and *control* (U = 164.0, *p* <.001) (Table 6).

Regarding *LCJR*, the mean baseline total score was 27.93 (5.15). Between-group comparison of differences in the pre- and post-intervention scores revealed a significant difference in the subscale of *awareness* (U = 246.0, *p* = .013) (Table 7).

Participant Satisfaction with the Training
The mean score for *DASH©-SV* after day 1 of training was 36.42 (5.57) and 30.71 (3.67) in the intervention and control groups, respectively. In the group comparison of *DASH©-SV* scores on day 1 of training, the intervention group scored significantly higher in all items (Table 8).

Discussion

Program Effectiveness

The increase in score for subscale *III* (determining the priority of solving problems and responding flexibly to clients' requests) indicated that participants acquired the ability to systematically gather and integrate the obtained information and determine which nursing care is best for patients. The clinicians' ability to notice changes in patients or deviations from expectations (predictions) is an important concern in clinical reasoning (Benner et al., 2009), avoiding the risk of nursing care deviating from patients' wishes and concerns (Cruz et al., 2009). Our program enabled competent-level nurses to notice unexpected events, including changes in patients and improved their ability to respond.

The increase in scores for subscales *V* (persuade and convince clients to accept help that they initially refuse) and *VII* (customize assistance depending on the particular situation) indicated that the participants developed an understanding of patients' and families' experiences with the illness. Nurses should provide patients with information consistent with their values and needs to help patients accept care (Larsson et al., 2011). In addition, nurses deepen their understanding of patients by listening to them and their families' experi-

Table 4. group comparison of the scores for the problem solving client support behavior self-evaluation scale for nurses.

Subscale	Group	Before (baseline) M (IQR)	*p*-value	Difference before and after M (IQR)	*p*-value
I	I	17.00 (16.50–19.00)	.947	2.00 (−1.00–4.00)	.249
	C	18.00 (17.00–18.00)		0.50 (−2.00–2.75)	
II	I	15.00 (15.00–17.00)	.048*	2.00 (−1.00–4.00)	.75
	C	15.00 (13.00–16.00)		2.00 (0.00–3.00)	
III	I	16.00 (15.00–18.00)	.96	2.00 (0.00–4.00)	.012*
	C	17.00 (15.25–17.00)		0.00 (−1.00–1.00)	
IV	I	20.00 (19.00–21.00)	.587	−2.00 (−4.00–1.00)	.50
	C	20.00 (20.00–21.00)		−1.50 (−5.00–0.75)	
V	I	17.00 (16.00–19.00)	.697	1.00 (−1.50–4.00)	.006**
	C	17.00 (17.00–18.00)		−1.00 (−3.00–1.00)	
VI	I	19.00 (18.00–20.00)	.822	0.00 (−2.00–2.00)	.071
	C	18.50 (18.00–20.00)		−1.00 (−3.00–0.00)	
VII	I	12.00 (10.00–14.00)	.229	4.00 (2.00–8.00)	.003**
	C	13.00 (12.00–15.00)		1.00 (0.00–4.00)	
VIII	I	21.00 (19.50–23.00)	.589	−2.00 (−6.00–0.00)	.291
	C	21.00 (19.25–22.00)		−4.00 (−6.00– (−0.25))	
IX	I	18.00 (17.00–19.00)	.176	0.00 (−2.00–1.00)	.004**
	C	19.00 (18.00–20.00)		−3.00 (−5.00– (−1.00))	

Note: Mann-Whitney U test *: $p<.05$ **: $p<.01$

I = intervention group; C = control group

Subscale:

  I. Repeatedly collect and assess information to solve problems

  II. Confirm the wishes of clients in solving problems

  III. Determine the priority of solving problems and respond flexibly to the requests of clients

  IV. Collaborate with members of the healthcare team to resolve problems efficiently

  V. Persuade and convince clients to accept help that they initially refuse

  VI. Help the clients solve their problems by themselves

  VII. Customize assistance depending on the particular situation

  VIII. Prevent problems that often arise from treatment and assistance

  IX. Assess the effectiveness of assistance and provide support

ences with the illness (Benner et al., 2009). Thus, the study participants understood the patients' situations through narrative thinking, thought about how to effectively interact with the patient so that they understood and met their expectations, and considered the need for assistance. Specifically, their explanation technique improved.

Subscale *VII* (customize assistance depending on the particular situation) showed the greatest increase in the difference between pre- and post-intervention scores. For nurses to provide appropriate support according to individual situations, they can consider the nursing care needed for the patient, provide nursing care according to patients' situation, and determine which nursing care is required. On day 2 of training, the program participants shared their clinical reasoning practices; evaluated their interpretations and judgments, the appropriateness of the nursing content they were practicing, and patients' situations; and learned to adjust, modify, and improve nursing care. Nurses develop competence by responding to similar situations through experience (Benner et al., 2009). Our participants improved their ability to determine assistance according to individual situations by accumulating learning from the simulation experience, clinical practice experience, and reflection at debriefing.

The increase in the score for subscale *IX* (assessing the effectiveness of assistance and providing support) indicated an improved ability to judge the effectiveness of assistance by integrating their observations with patients' reactions and complaints and the ability to identify and consider failures based on the information obtained. Nurses must have sufficient knowledge about patients to make appropriate decisions regarding the patient's situation and accurately assess the impact of the care provided. Moreover, by critically reflecting on their experiences and considering the basis of their judgments and effects of using different methods, nurses can be aware of their unconsciously triggered assumptions. Our program enabled the participants' awareness

Table 5. Group comparison of the scores for scale to reflect on nursing support in patients' treatment decisions.

Subscale	Group	Before (baseline) M (IQR)	*p*-value	Difference before and after M (IQR)	*p*-value
I	I	15.00 (14.00–16.00)	.408	2.00 (0.00–2.50)	.010*
	C	15.00 (15.00–15.75)		0.00 (−1.00–1.00)	
II	I	14.00 (12.00–15.00)	.331	2.00 (0.50–4.00)	.029*
	C	14.00 (13.00–15.00)		0.50 (−1.75–2.00)	
III	I	10.00 (9.00–12.00)	.204	1.00 (−1.00–3.00)	.073
	C	11.00 (10.00–12.00)		0.00 (−1.00–1.00)	
IV	I	9.00 (8.00–9.50)	.986	1.00 (0.00–2.00)	.315
	C	9.00 (9.00–9.00)		0.50 (0.00–2.00)	
V	I	9.00 (8.50–10.00)	.168	1.00 (0.00–2.00)	.001**
	C	9.00 (9.00–11.00)		0.00 (−1.75–0.00)	

Note: Mann-Whitney U test *: *p* < .05 **: *p* < .01

I = intervention group; C = control group

Subscale:

   I. Analysis of the wishes of the patients and their family members

   II. Recognition of nurses' roles

   III. Comprehension of the circumstances of the patients and their family members

   IV. Comprehension of the circumstances of the medical team involved

   V. Comprehension of the therapeutic situation

Table 6. Group comparison of the scores for metacognitive scale for adults.

Subscale	Group	Before (baseline) M (IQR)	*p*-value	Difference before and after M (IQR)	*p*-value
Monitoring	I	39.00 (36.00–43.00)	.616	9.00 (7.00–14.75)	<.001**
	C	40.00 (37.00–44.00)		3.50 (−0.75–7.50)	
Control	I	37.00 (32.00–40.50)	.859	6.00 (3.00–8.50)	<.001**
	C	36.00 (33.00–41.75)		0.50 (−3.00–4.00)	
Metacognitive Knowledge	I	34.00 (31.00–36.00)	.644	3.00 (1.50–7.00)	.172
	C	33.50 (30.25–36.00)		2.00 (−0.5–4.00)	

Note: Mann-Whitney U test **: *p*<.01

I = intervention group; C = control group

Table 7. Group comparison of the scores for LCJR.

Subscale	Group	Before (baseline) M (IQR)	*p*-value	Difference before and after M (IQR)	*p*-value
Noticing	I	7.00 (6.00–8.00)	.124	0.00 (0.00–1.00)	.013*
	C	8.00 (7.00–9.00)		−1.00 (−2.00–1.00)	
Interpreting	I	5.00 (4.00–6.00)	.132	0.00 (−0.5–1.00)	.251
	C	6.00 (5.00–6.00)		0.00 (−1.00–1.00)	
Responding	I	10.00 (8.50–11.00)	.034*	1.00 (−1.00–2.00)	.158
	C	10.50 (10.00–12.00)		0.00 (−2.75–1.00)	
Reflecting	I	4.00 (4.00–6.00)	.334	0.00 (0.00–1.50)	.235
	C	5.00 (4.00–6.00)		0.00 (−1.00–1.00)	

Note: Mann-Whitney U test *: *p*<.05

I = intervention group; C = control group

LCJR = lasater clinical judgment rubric

Table 8. Group comparison of the scores for DASH©-SV.

Subscale	Group	After the training on day 1 M (IQR)	p-value
DASH_1	I	6.00 (5.00–7.00)	.039*
	C	6.00 (5.00–6.00)	
DASH_2	I	6.00 (5.50–7.00)	.001**
	C	5.00 (5.00–6.00)	
DASH_3	I	6.00 (6.00–7.00)	<.001**
	C	4.50 (3.00–5.00)	
DASH_4	I	6.00 (5.50–7.00)	<.001**
	C	5.00 (4.00–6.00)	
DASH_5	I	6.00 (6.00–7.00)	.002**
	C	5.00 (5.00–6.00)	
DASH_6	I	6.00 (5.00–7.00)	.007**
	C	6.00 (5.00–6.00)	

Note: Mann-Whitney U test *: *p*<.05 **: *p*<.01

I = intervention group; C = control group

DASH©-SV = debriefing assessment for simulation in healthcare©-student version

of their own thinking patterns, learn about different ways of thinking and their results, and understand a patient's situation from multiple perspectives.

Conversely, for subscale *II* (confirming the wishes of clients in solving problems), it was difficult to assess the effectiveness of the program because significant differences between groups were found at baseline. Item II assesses the quality of problem-solving behavior of patients (Hattori & Funashima, 2010). Nursing practices respecting patients' and families' wishes may have been influenced by the support of senior nurses in reflecting on practice and conducting case conferences. Therefore, future comparisons must consider such experience in matching.

Effects of Reflecting on Actions in Nursing Practice

Subscale *I* (analyzing patients' and family members' wishes) showed a significant difference in pre- and post-intervention scores. To understand the intentions of patients and their families, nurses should learn about the patients' feelings and thoughts through dialogue and nursing support in daily interactions and provide information as professionals. Continuously monitoring the patient's response during nursing care can also help nurses determine how well the current nursing care adheres to the patient's and family's wishes. However, competent-level nurses lack well-developed engagement skills (Benner et al., 2009). Notably, nurses' confidence in communicating positively correlates with work experience (Mehralian et al., 2023). Organizational culture is another factor that influences clinical reasoning (King et al., 2017; Levett-Jones et al., 2010). Nurses should engage in discussions with people with different values. In our program, participants with different cultural backgrounds used work-

sheets to organize their thoughts and openly discussed how to engage with and understand patients.

Practicing reflective thinking requires training, without which reflective learning is limited (Naicker & Van Rensburg, 2018). The worksheets used in our program, based on Gibbs' (1988) Reflective Cycle, required participants to take interest in patients, understand what happened to them, and explain why the situation occurred. Thus, they were trained to think systematically about patients' situations. Furthermore, the repetition of case study information in the worksheet and debriefing promoted the participants' understanding of the patient and themselves. They recognized their views on nursing and the assumptions leading to them and acquired new values, resulting in an increase in their scores for subscale *II* (Recognition of nurses' roles).

Effects on Nurses' Metacognition

Competent-level nurses experience anxiety when situations are too hectic, novel, or complex to understand (Benner et al., 2009). It was not easy for our participants to use "monitoring" and "control" to adjust their behavior while focusing on and evaluating their thoughts in a particular situation. However, after they improved in these aspects through our program, the participants learned the importance and methods of objectively observing their thoughts during the debriefing on day 1 of training. In the debriefing on day 2 of training, the participants reviewed the clinical practice content and learned to perform "monitoring" and "control" during practice. Metacognition and reflection are intrinsically related (Baird et al., 1991; Manasia & Pârvan, 2014), and reflection in human judgment is a typical and distinct metacognitive process (Gurbin, 2015). Thus, metacognition is learned through effective reflection, and the debriefing conducted in our program was effective in strengthening metacognition, which is the practical process of clinical reasoning.

Effects on Nurses' Clinical Judgment

In the clinical judgment model, "noticing" is influenced by the context in which the situation occurs, nurses' values concerning the specific patient situation, and the culture of the unit (Tanner, 2006). The increase in noticing scores resulted from participants' learning the importance of paying attention to diverse information in debriefing and recognizing the assumptions of their thinking in clinical judgment and how it differed from that of others. In particular, on day 2 of training, the participants engaged in a discussion on clinical reasoning—which they individually practiced in clinical settings—confirmed their strengths and weaknesses, and identified deviations from the expected patterns. Moreover, they learned to handle such deviations. In addition, the participants realized that the data to be interpreted are diverse, such as the patient's humanity and personality, inten-

tions, values, and social backgrounds. Similarly, they learned the necessity of using multiple thoughts for interpretation.

Competent-level nurses can independently provide standard nursing care and determine and plan what the patient needs, but they cannot successfully handle all the complexities and the variety of events (Benner et al., 2009). Therefore, we provided these nurses with effective support to nurture their "noticing" ability and to connect "noticing" to "interpreting."

Suggestions for Nursing Management

To improve their clinical reasoning, competent-level nurses need a learning process that allows them to experience reasoning while working with patients and to apply their experience to other situations. Our program effectively improved clinical reasoning for competent-level nurses, with high participant satisfaction and low dropout rates. Moreover, the program content met the participants' learning needs. Therefore, we strongly recommend implementing the program as an in-service training intended to support competent-level nurses' learning.

Limitations

The participants in this program were familiar, as groups were created hospital-wise. Because learning is influenced by social interactions, interpersonal relationships, and communication with others (Gagné et al., 2005), this approach possibly influenced program effectiveness. In the future, participants should be randomly assigned to verify the effectiveness of the program. Furthermore, the study acceptance rate (15.2%) was potentially influenced by the COVID-19 pandemic. The organizations where competent-level nurses belong may have restricted their participation in face-to-face training. Therefore, we aimed to increase the acceptance rate by shortening the face-to-face training time and securing online training time. Finally, program effectiveness was assessed based on participant self-evaluation, which possibly introduced bias into the evaluation content. In the future, we will include peer evaluations to objectively assess program effectiveness.

Conclusion

The novelty of this program is that it focuses on improving clinical reasoning, has a structure that allows learning, and uses worksheets to encourage thought organization and lively exchange of ideas. Because this program effectively improved the clinical reasoning of competency-level nurses, we recommend its implementation as an in-hospital educational program.

Data Availability Statement
The datasets generated and analyzed during the current research are available from the corresponding authors on reasonable request.

References
Abe, M., & Ida, M. (2010). Seijinyoumetaninchishakudo no sakusei no kokoromi: Metacognitive awareness inventory wo mochiite [An attempt to construct the Adults' Metacognition Scale: Based on Metacognitive Awareness Inventory]. *The Journal of Psychology Rissho University*, *1*, 23-34.
https://rissho.repo.nii.ac.jp/records/4204

Baird, J. R., Fensham, P. J., Gunstone, R. F., & White, R. T. (1991). The importance of reflection in improving science teaching and learning. *Journal of Research in Science Teaching*, *28*(2), 163-182.
https://doi.org/10.1002/tea.3660280207

Bartlett, R., Bland, A., Rossen, E., Kautz, D., Benfield, S., & Carnevale, T. (2008). Evaluation of the outcome-present state test model as a way to teach clinical reasoning. *Journal of Nursing Education*, *47*(8), 337-344.
https://doi.org/10.3928/01484834-20080801-01

Benner, P., Tanner, C. A., & Chesla, C. A. (2009). *Expertise in nursing practice: Caring clinical judgement & ethics* (2nd ed.). Springer Publishing Company.

Cato, M. L., Lasater, K., & Peeples, A. I. (2009). Nursing students' self-assessment of their simulation experiences. *Nursing Education Perspectives*, *30*(2), 105-108.

Clarke, C. (2014). Promoting the 6Cs of nursing in patient assessment. *Nursing Standard*, *28*(44), 52-59.
https://doi.org/10.7748/ns.28.44.52.e7967

Cranton, P. (1996). *Professional development as transformative learning: New perspectives for teachers of adults*. Jossey-Bass.

Cruz, D. M., Pimenta, C. M., & Lunney, M. (2009). Improving critical thinking and clinical reasoning with a continuing education course. *Journal of Continuing Education in Nursing*, *40*(3), 121-127.
https://doi.org/10.3928/00220124-20090301-05

Dalton, L., & Gee, T. (2015). Using clinical reasoning and simulation-based education to 'flip' the enrolled nurse curriculum. *Australian Journal of Advanced Nursing*, *33*(2), 28-34.

Daniel, M., Rencic, J., Durning, S. J., Holmboe, E., Santen, S. A., Lang, V., Ratcliffe, T., Gordon, D., Heist, B., Lubarsky, S., Estrada, C. A., Ballard, T., Artino, A. R. Jr., Sergio Da Silva, A., Cleary, T., Stojan, J., & Gruppen, L. D. (2019). Clinical reasoning assessment methods: A scoping review and practical guidance. *Academic Medicine*, *94*(6), 902-912.
https://doi.org/10.1097/ACM.0000000000002618

Doi, Y., & Hosoda, Y. (2023). Kangokeidaigaku ni shozokusuru wakatekyouin no kangodaigakukyouinnouryoku no kanrenyouin [A study on related factors of nursing faculty competencies for junior faculty belonging to a university nursing program]. *Japanese Journal of Medical and Nursing Education*, *31*(4), 39-48.

Dreifuerst, K. T. (2010). *Debriefing for meaningful learning: Fostering development of clinical reasoning through simulation* [Doctoral dissertation. Indiana University]. Indiana University Scholar Works Repository, 1-211.
https://scholarworks.iupui.edu/server/api/core/bitstreams/a2c95cc6-c24e-4d06-9e66-643d2853422e/content

Forneris, S. G., Neal, D. O., Tiffany, J., Kuehn, M. B., Meyer, H. M., Blazovich, L. M., Holland, A. E., & Smerillo, M. (2015). Enhancing clinical reasoning through simulation debriefing: A multisite study. *Nursing Education Perspectives*, *36*(5), 304-310.
https://doi.org/10.5480/15-1672

Gagné, R. M., Wager, W. W., Golas, K., & Keller, J. M. (2005). *Principles of instructional design*. Thomson/Wadsworth.

Gibbs, G. (1988). Learning by doing (online edition). *The Further Education Unit at Oxford Polytechnic*.

Gurbin, T. (2015). Metacognition and technology adoption: Exploring influences. *Procedia − Social and Behavioral Sciences*, *191*, 1576-1582.
https://doi.org/10.1016/j.sbspro.2015.04.608

Hattori, M., & Funashima, N. (2010). Kangoshi no mondaikaiketsukoudoujikohyoukashakudo no kaihatsu−kuraiento no kakaeru mondai wo kaiketsu surutame ni hitsuyou na kangoshikoudou no shitsukoujou ni mukete [Development of a problem solving client support behavior self-evaluation scale for nurses: Improving the quality of behaviors necessary to support clients solving their problems]. *Chiba Academy of Nursing Science*, *16*(1), 9-16.
https://opac.ll.chiba-u.jp/da/curator/900071845/13448846_16-1_9.pdf

Hirano, R., & Koyama, M. (2018). Shinninpuriseputaa no shinjinkangoshishidou ni okeru konnan oyobi konnan wo norikoeru tameno koudou to motomeru shien [Novice preceptors' difficulties with clinical instructions for newly graduated nurses, their behaviors and support needs to overcome these difficulties]. *Journal of Nursing Research*, *41*(5), 971-981.
https://doi.org/10.15065/jjsnr.20180427022

INACSL Standards Committee (2016). INACSL standards of best practice: Simulation^SM simulation design. *Clinical Simulation in Nursing*, *12*(S), S5-S12.
http://doi.org/10.1016/j.ecns.2016.09.005

Kautz, D., Kuiper, R., Bartlett, R., Buck, R., Williams, R., & Knight-Brown, P. (2009). Building evidence for the development of clinical reasoning using a rating tool with the outcome-present state-test (OPT) model. *Southern Online Journal of Nursing Research*, *9*(1), 1-13.

Kimura, R., Murakami, D., & Kuwana, Y. (2021). Kangodaigakusei no 'tekiouteki na jikochumoku' wo sokushinsuru kyouikuhouryaku no kentou: Ninchitokusei ga metaninchi ni oyobosu eikyou [examination of educational strategies to promote adaptive self-attention of nursing students: Effects of cognitive traits on metacognition]. *Japan Society of Traditional Medicine and Nursing Science*, *2*(2), 55-64.

King, C., Russell, K., & Bulsara, C. (2017). Promoting student belongingness: 'WANTED' − The development, implementation and evaluation of a toolkit for nurses. *Australian Journal of Advanced Nursing*, *34*(3), 48-53.

Kirkpatrick, D., & Kirkpatrick, J. (2006). *Evaluating training programs: The four levels* (3rd ed.). Berrett-Koehler Publishers.

Kobayashi, T., & Suzuki, R. (2018). Active learning no katsuyou [Utilizing active learning]. Igaku Shoin.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice Hall.

Kuiper, R., Heinrich, C., Matthias, A., Graham, M. J., & Bell-Kotwall, L. (2008). Debriefing with the OPT model of clinical reasoning during high fidelity patient simulation. *International Journal of Nursing Education Scholarship*, *5*, Article 17.
https://doi.org/10.2202/1548-923X.1466

Kuiper, R., Pesut, D., & Kautz, D. (2009). Promoting the self-regulation of clinical reasoning skills in nursing students. *The Open Nursing Journal*, *3*, 76-85.
https://doi.org/10.2174/1874434600903010076

Larsson, I. E., Sahlsten, M. J. M., Segesten, K., & Plos, K. A. E. (2011). Patients' perceptions of barriers for participation in nursing care. *Scandinavian Journal of Caring Sciences*, *25*(3), 575-582.
https://doi.org/10.1111/j.1471-6712.2010.00866.x

Lasater, K. (2007). Clinical judgment development: Using simulation to create an assessment rubric. *Journal of Nursing Education*, *46*(11), 496-503.
https://doi.org/10.3928/01484834-20071101-04

Levett-Jones, T., Hoffman, K., Dempsey, J., Jeong, S. Y.-S., Noble, D., Norton, C. A., Roche, J., & Hickey, N. (2010). The 'five rights' of clinical reasoning: An educational model to enhance nursing students' ability to identify and manage clinically 'at risk' patients. *Nurse Education Today*, *30*(6), 515-520.
https://doi.org/10.1016/j.nedt.2009.10.020

Manasia, L., & Pârvan, A. (2014). Challenging adult learning and work experience through metacognitive reflection. A case study approach. *Procedia − Social and Behavioral Sciences*, *142*, 447-453.
https://doi.org/10.1016/j.sbspro.2014.07.694

Mehralian, G., Yusefi, A. R., Dastyar, N., & Bordbar, S. (2023). Communication competence, self-efficacy, and spiritual intelligence: Evidence from nurses. *BMC Nursing*, *22*(1), 99.
https://doi.org/10.1186/s12912-023-01262-4

Naicker, K., & van Rensburg, G. H. (2018). Facilitation of reflective learning in nursing: Reflective teaching practices of educators. *Af-*

rica Journal of Nursing and Midwifery, *20*(2), 1-15. https://doi.org/10.25159/2520-5293/3386

Ogata, Y. (2021). Kanja no chiryoukettei ni okeru kangoshien no hurikaerishakudo no shinraisei・datousei no kentou: Nichijouteki ni chiryoukettei no kangoshien wo okonau kangoshi ni chakumoku shite [Investigation of the reliability and validity of a scale to reflect on nursing support in patients' treatment decision Focusing on nurses who provide nursing support for patients' treatment decisions on a daily basis]. *Journal of Japan Academy of Nursing Science*, *41*, 324-333. https://doi.org/10.5630/jans.41.324

Okada, J. (2020). Kango ni okeru clinical reasoning no gainen bunseki [A concept analysis of clinical reasoning in nursing]. *Memoirs of Kyoto Tachibana University*, *46*, 93-107. https://tachibana.repo.nii.ac.jp/records/481

Onbe, H., Nakanishi, K., Yamazaki, C., Tanifuji, S., & Arai, H. (2022). An educator's growth as a nursing preceptor: A modified grounded theory approach. *The Kitakanto Medical Journal*, *72*(3), 263-269. https://doi.org/10.2974/kmj.72.263

Price, B. (2011). Improving clinical reasoning in children's nursing through narrative analysis. *Nursing Children and Young People*, *23*(6), 28-35.

https://doi.org/10.7748/ncyp2011.07.23.6.28.c8601

Simmons, B. (2010). Clinical reasoning: Concept analysis. *Journal of Advanced Nursing*, *66*(5), 1151-1158. https://doi.org/10.1111/j.1365-2648.2010.05262.x

Simon, R., Raemer, D., & Rudolph, J. (2009). Debriefing assessment for simulation in healthcare (DASH). Center for Medical Simulation. https://harvardmedsim.org/debriefing-assessment-for-simulation-in-healthcare-dash/

Sugimoto, C., Oshiro, A., & Omura, H. (2017). Gankanjakea ni taisuru kangoshi no mondaikaiketsukoudou no genjouhaaku [Current state of nurses' problem-solving behaviors in the care of cancer patients]. *Journal of Japanese Red Cross Shizuoka Hospital*, *37*(1), 30-34. https://redcross.repo.nii.ac.jp/records/13544

Tanner, C. A. (2006). Thinking like a nurse: A research-based model of clinical judgment in nursing. *Journal of Nursing Education*, *45*(6), 204-211. https://doi.org/10.3928/01484834-20060601-04

Williams, T. (2019). Using high fidelity simulation to prepare baccalaureate nursing students enrolled in a historically Black college and university. *ABNF Journal*, *30*(2), 37-43.

Appropriate needle penetration depth for intramuscular injections depends on the injection site, recipient arm position, and injection technique: A randomized crossover study

Kosuke Maeda, PhD, RN, PHN(iD)

Graduate School of Human Health Sciences, Tokyo Metropolitan University, Tokyo, Japan

Abstract

Objective: Various medications, such as COVID-19 vaccines, are administered via intramuscular (IM) injection into the deltoid muscle. Although the depth of needle insertion into the deltoid muscle may vary depending on the injection site, recipient arm position, and the injection technique that bundles or stretches the tissue, no research has validated these observations. Therefore, this study aimed to investigate the effects of different injection sites, arm positions, and injection techniques on subcutaneous tissue, muscle thickness, and skin-to-bone depth in order to enhance the safety of IM injection practices. **Methods:** Thirty healthy young adults were enrolled in this randomized crossover study. An ultrasound device evaluated the effects of two injection sites, two recipient arm positions, and three injection techniques on subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth. **Results:** The subcutaneous tissue exhibited increased thickness at the injection site distal to the deltoid muscle. In addition, muscle thickness was greater on the distal side of the deltoid when the recipient's arm was extended, while it was greater on the proximal side when the arm flexed. The injection technique involving muscle bunching exclusively thickened the muscle layer without changing subcutaneous tissue thickness and simultaneously increased the depth from the skin to the bone. **Conclusions:** The safe insertion depth of the needle for IM injection into the deltoid muscle varied depending on the injection site, recipient arm position, and the injection technique employed. Trial Registration: UMIN-CTR. Clinical Trial: UMIN000048289.

Introduction

The delivery of various medications, such as antibiotics, vitamins, treatments for infertility, allergy relief, and antipsychotics, is commonly achieved through intramuscular (IM) injections. Notably, COVID-19 vaccines are also administered via IM injections (CDC, 2023a; CDC, 2023b). The deltoid muscle is the preferred site for IM injections, emphasizing the crucial importance of precise muscle penetration for effective drug delivery.

It is essential to assess the appropriate needle insertion depth from the skin into the muscle in order to enhance the safety of deltoid muscle injections. A 25-mm needle is recommended when administering IM injections into the deltoid muscle (CDC, 2023c). A study that investigated thickness of the subcutaneous tissue of the deltoid muscle in Japanese individuals reported that the average subcutaneous tissue thickness was 5.4 to 7.4 mm (Takahashi et al., 2014; Kikuchi et al., 2009) and it can be assumed that a 25-mm needle can penetrate the subcutaneous tissue and enter the

muscle. However, findings from a study examining subcutaneous tissue and muscle thickness in young Japanese adults indicated that a 25-mm needle may be inserted too deeply in some cases (Nakajima et al., 2020). Furthermore, research suggests that a 16-mm (five-eighths of an inch) needle may be more suitable for Japanese individuals aged ≥ 50 years with an average physique (Nakayama et al., 2022). Needle penetration that is too deep poses a risk of shoulder injury related to vaccine administration (SIRVA) (Yuen et al., 2022; Wood & Ilyas, 2022). Importantly, SIRVA is reported as a complication associated with COVID-19 vaccination in Japan (Kagawa et al., 2023), and Kearns et al.'s (2023) systematic review revealed a scarcity of published studies on the selection of vaccination needle length.

In Japan, the deltoid muscle is targeted for IM injections at two specific sites. One site is positioned three fingerbreadths below the acromion, commonly employed in clinical settings (Nakajima et al., 2017; Takahashi et al., 2014; Kikuchi et al., 2009). The other site is positioned at the intersection of the line down from the center of the acromion and the topmost line of the anterior and posterior axillary lines (Nakajima et al., 2020). Patients receiving IM injections have their arms in two positions, either abducted to 60° (Cook, 2011) or hanging and relaxed at their sides (Ministry of Health, 2023). However, the precise details of needle penetration depth associated with these combinations of injection sites and arm positions remain unclear.

The assessment of needle penetration depth necessitates understanding not only the skin-to-bone depth but also the subcutaneous tissue and muscle thickness. Various studies have used ultrasound (US) devices to examine subcutaneous tissue and muscle thickness (Rahamimov et al., 2021; Nakajima et al., 2020; Mayer et al., 2020; Takahashi et al., 2014; Kikuchi et al., 2009). To enhance the safety of IM injection practices, this study used US to investigate subcutaneous tissue and muscle thickness and the skin-to-bone depth for each combination of injection site and arm position. In addition, research has shown that the choice of needle length is influenced by whether the tissue is bunched or stretched (Ministry of Health, 2023). Previous studies conducted in Japan have examined subcutaneous tissue and muscle thickness without bundling or stretching the tissue (Nakayama et al., 2022; Nakajima et al., 2020; Nakajima et al., 2017; Takahashi et al., 2014; Kikuchi et al., 2009). Despite the existence of injection techniques for bundling and stretching tissues (Rahamimov et al., 2021; Poland et al., 1997), there is a lack of information on their effects on subcutaneous tissue, muscle tissue, and skin-to-bone depth in the Japanese population. Therefore, this study aims to explore the impact of injector techniques involving tissue bundling and stretching on subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth.

Materials and Methods

This randomized crossover study was conducted using US devices to assess and compare subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth under various conditions within the deltoid muscle region. The study protocol was explained to the participants verbally and in writing; written informed consent was obtained from each participant. This study adhered to the principles of the Declaration of Helsinki. The author's Institutional Ethics Committee (22040) approved this study. The clinical trial registration number is UMIN-CTR Clinical Trial: UMIN 000048289.

Participants

Thirty healthy volunteers were enrolled in this study. The inclusion criteria were as follows: participants aged > 19 years; those with no history of upper limb injury, surgery, or neurological or muscular diseases affecting the upper limbs; those with no known allergies to the equipment used in this study; and those with a body mass index (BMI) ranging from > 17 to < 30 kg/m^2. The determination of the number of participants was not based on a specific calculation but rather guided by reference to prior studies, where participant numbers ranged from 19 to 30 (Nakajima et al., 2020; Nakajima et al., 2017; Marshall et al., 2013). Data collection occurred between November 2022 and March 2023.

Definition of Examined Injection Sites and Arm Positions

Figure 1 shows the IM injection sites examined in this study. Two distinct IM injection sites were identified: (A) positioned three fingerbreadths below the acromion, a common choice in Japanese clinical settings (Nakajima et al., 2017), and (B) located at the intersection of a line dropping from the middle acromion and a line connecting the highest points of the anterior and posterior axillary lines (Nakajima et al., 2020). The definition and marking of injection sites A and B were carried out by two registered nurses trained in basic nursing. Figure 2 shows the arm positions for each injection site defined in this study. Two arm placements were defined: one with the elbow extended and the arm placed beside the body (Extension), and the other with the elbow flexed and the hand on the hip (Flexion). These combinations of injection site and arm position were labeled as A-Extension, A-Flexion, B-Extension, and B-Flexion.

Injection Techniques

Figure 3 shows that the methods performed for all combinations of defined injection sites and arm positions were as follows: (1) Flat: Measurements were taken without applying any skin pressure, flattening, or bunching, using copious amounts of gel, and a noncompression technique. (2) Stretching of the skin (SS): Measurements were obtained
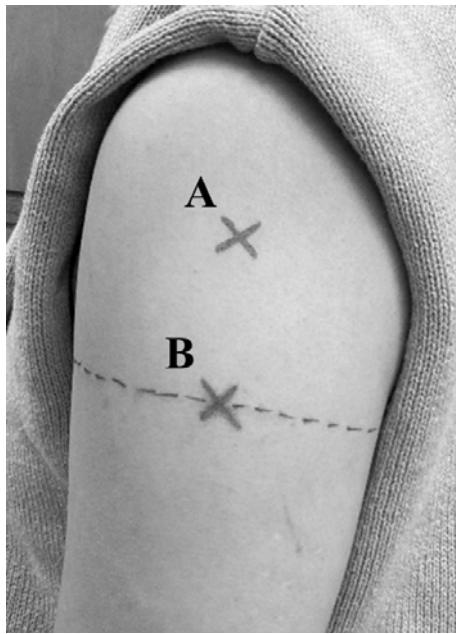
Figure 1. Locations of the two examined intramuscular (IM) injection sites.
Note: A: Three finger breadths below the acromion; B: Intersection of a line dropping from the middle acromion and a line connecting the most superior point of the anterior and posterior axillary lines.

Extension   Flexion

Figure 2. Definition of the two arm positions.
Note: Extension: Participants placed their arms beside their bodies with extended elbows. Flexion: Participants placed their hands on their hips with their elbows flexed.

while stretching the skin over the deltoid muscle. This technique involved pulling the skin using two fingers, specifically the thumb and index finger. (3) Skin bunching (SB): Measurements were obtained while bunching the skin over the deltoid muscle. This technique involved squeezing the skin with two fingers, specifically the thumb and index finger. (4) Muscle bunching (MB): Measurements were taken while bunching the deltoid muscle. This technique involved squeezing the deltoid muscle with the thumb and index fingers.

A computer-generated randomization list randomized the order of Flat, SS, SB, and MB. Owing to the nature of the intervention and the method of measurement, blinding of randomization was not feasible in this study. The three tissue manipulation techniques, SS, SB, and MB, were performed by a midcareer registered nurse trained in basic nursing who underwent repeated injection skills training to ensure consistent application of the intervention. Flat and each technique (SS, SB, and MB) were performed in triplicate. Due to the assumption of no carryover effect from the intervention, a washout period was not implemented. All experiments were conducted in a quiet laboratory setting.

Data Collection

Figure 4 shows that a trained registered nurse used the US diagnostic equipment Aplio i800, equipped with the linear

probe i18LX5 PLI-1205BX (Canon Medical Systems Corp., Tochigi, Japan), to measure subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth. US images for each condition using B-mode were acquired three times to assess subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth. To avoid skin compression by the probe, the probe was held at a right angle to the plane of the examined sites. The obtained measurements were taken as average values from three images under the same conditions to evaluate subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth as previously described (Mayer et al., 2020).

Statistical Analysis

Data of subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth are expressed as the mean ± standard deviation (minimum-maximum). Comparative analyses were conducted for each combination of injection site and arm position under the Flat condition. In addition, this study compared the subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth when employing Flat, SS, SB, and MB techniques for each combination of injection site and arm position. One-way repeated-measures analysis of variance (ANOVA) followed by Bonferroni correction was used to test for significance. Only the skin-to-bone depth of B-Extension was non-normally distributed; however, since the results of a nonparametric test and one-way repeated-

Flat

SS

SB

MB
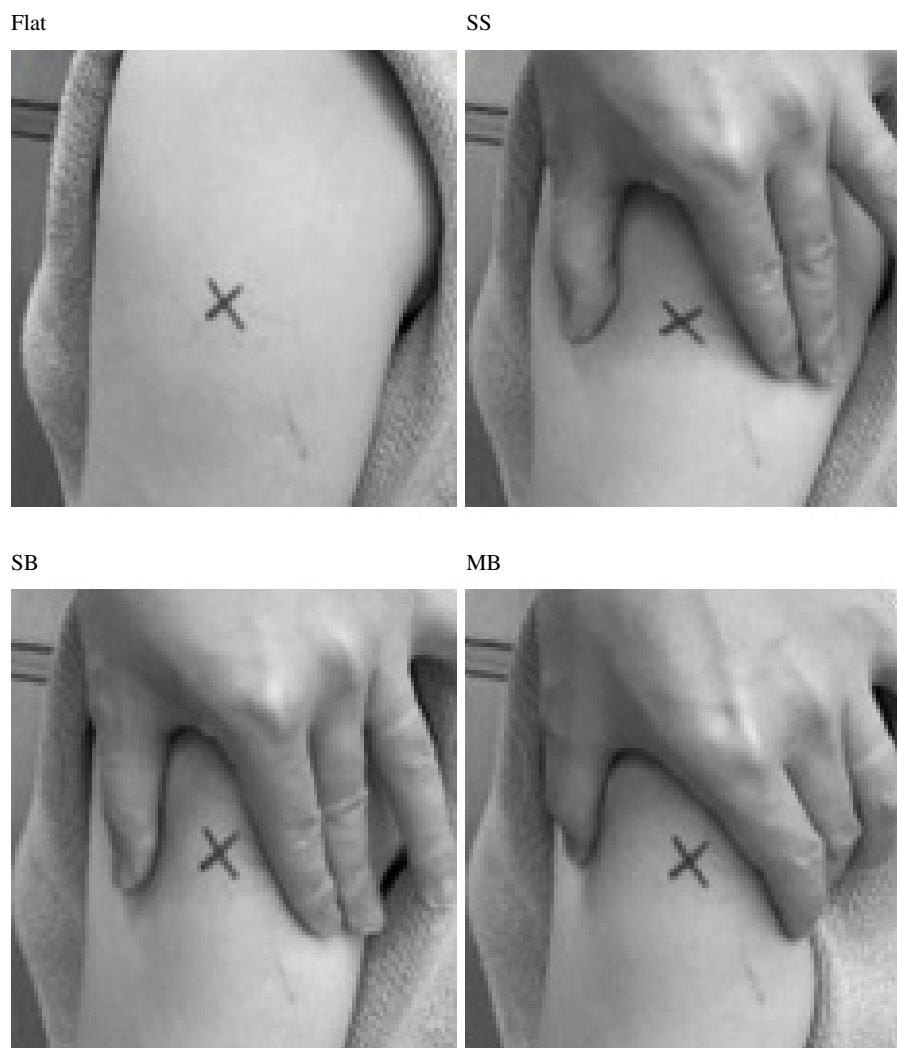
Figure 3. Definition of four interventions (for point B).
Note: Flat: without any skin pressure, stretching or bunching; SS = stretching the skin; SB = skin bunching; MB = muscle bunching.

measures ANOVA followed by Bonferroni correction were identical, all data were analyzed using the latter technique. All statistical analyses were performed using IBM SPSS Statistics version 28.0 (IBM Corp., Armonk, NY, USA). A p value $< .05$ was considered statistically significant.

Results

Participants

A total of 30 healthy volunteers, consisting of 19 females and 11 males, were enrolled, and no participants opted out of the study. The mean age of the participants were 22.6 ± 3.9 (ranging from 20.0 to 35.0) years. Their average BMI was 21.2 ± 2.8 (ranging from 17.4 to 26.8) kg/m^2. All participants were right-hand dominant. The average distance from the acromion of the left arm to injection site B was 9.7 ± 1.3 (ranging from 7.2 to 12.2) cm. There were no missing US data points collected from any of the participants.

Subcutaneous Tissue Thickness, Muscle Thickness, and Skin-to-bone Depth for Each Combination of Injection Site and Arm Position Under the Flat Condition

Table 1 presents the subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth for each combination of injection site and arm position under Flat, SS, SB, and MB techniques. Figure 5a shows that the subcutaneous tissue was significantly thinner in the A-Extension group than in the A-Flexion, B-Extension, and B-Flexion groups (all $p < .01$). In addition, the subcutaneous tissue was significantly thinner in the A-Flexion group than in the B-Extension and B-Flexion groups (all $p < .01$). Figure 5b shows that the muscle thickness was significantly thinner with B-Flexion than with A-Extension, A-Flexion, and B-Extension ($p = .04$, $p < .01$, and $p < .01$, respectively). Furthermore, muscle

thickness was significantly thinner with A-Extension than with A-Flexion and B-Extension ($p = .04$ and $p = .01$, respectively). Figure 5c shows that the skin-to-bone depth was significantly greater in the B-Extension group than in the A-Extension, A-Flexion, and B-Flexion groups (all $p < .01$). Moreover, the skin-to-bone depth was significantly larger
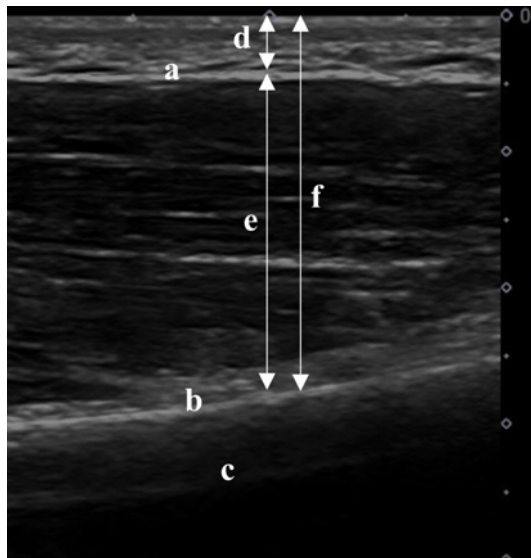
Figure 4. Ultrasound image at B-Extension when using the Flat condition.

Note: a: Superficial fascia; b: deep fascia; c: humerus; d: subcutaneous tissue; e: deltoid muscle; f: skin-to-bone depth.

with A-Flexion than with A-Extension and B-Flexion ($p = .015$ and $p < .01$, respectively).

Subcutaneous Tissue Thickness, Muscle Thickness, and Skin-to-bone Depth Under Flat, SS, SB, and MB for Each Combination of Injection Site and Arm Position

Figure 6a illustrates that the subcutaneous tissue thickness in the A-Extension group was significantly thicker with SB than with Flat, SS, and MB (all $p < .01$) and was significantly thinner with SS than with Flat ($p < .01$). Figure 6b shows that the subcutaneous tissue thickness in the A-Flexion group was significantly thinner with MB than with Flat, SS, and SB (all $p < .01$). Furthermore, Figure 6c shows that the subcutaneous tissue thickness in the B-Extension group was significantly thicker with SB than with Flat, SS, and MB (all $p < .01$) and was significantly thinner with SS than with MB ($p = .046$). In addition, Figure 6d shows that the subcutaneous tissue thickness in the B-Flexion group was significantly thinner with MB than with Flat, SS, and SB ($p = .036$, $p = .038$, and $p = .001$, respectively). Moreover, Figure 7 illustrates that the muscle thicknesses in the A-Extension, A-Flexion, B-Extension, and B-Flexion groups were significantly greater for MB than for Flat, SS, and SB (all $p < .01$). Furthermore, the muscle thicknesses in the A-Extension, A-Flexion, B-Extension, and B-Flexion groups were significantly greater for SB than for Flat and SS (all $p < .01$). Muscle thickness in the A-Extension, A-Flexion, and B-Extension groups were significantly greater for SS than for Flat ($p < .01$, $p < .01$, and $p =$

Table 1. Subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth at each combination of injection site and arm position when using flat, SS, SB, and MB techniques.

Variable	Flat	SS	SB	MB
Subcutaneous tissue thickness				
A-Extension	6.1 ± 1.6 (3.4–9.9)	5.8 ± 1.6 (3.2–9.7)	6.5 ± 2.1 (3.4–12.4)	6.0 ± 1.9 (3.2–11.9)
A-Flexion	6.4 ± 1.7 (3.8–10.4)	6.3 ± 1.8 (3.5–10.4)	6.5 ± 1.9 (3.6–10.6)	6.0 ± 1.6 (3.4–10.1)
B-Extension	8.4 ± 3.2 (3.1–17.5)	8.3 ± 3.3 (2.8–17.6)	9.5 ± 4.1 (3.2–20.8)	8.8 ± 4.0 (2.8–19.4)
B-Flexion	8.3 ± 3.1 (3.3–16.7)	8.4 ± 3.1 (3.2–17.2)	8.4 ± 3.5 (3.1–18.1)	8.0 ± 3.4 (2.9–17.4)
Muscle thickness				
A-Extension	21.1 ± 5.8 (10.9–39.3)	22.7 ± 5.6 (13.4–40.1)	25.3 ± 5.4 (16.6–42.5)	27.5 ± 5.5 (16.3–44.5)
A-Flexion	23.0 ± 5.4 (15.0–36.2)	24.5 ± 5.3 (16.0–36.8)	28.3 ± 5.2 (19.7–40.7)	31.1 ± 5.0 (22.6–44.2)
B-Extension	23.4 ± 6.0 (13.7–41.2)	23.9 ± 5.7 (14.4–40.8)	27.5 ± 5.6 (17.2–42.9)	31.3 ± 5.7 (22.2–47.4)
B-Flexion	18.5 ± 5.0 (12.2–30.0)	19.0 ± 4.4 (12.4–28.5)	23.6 ± 5.1 (14.8–36.4)	27.5 ± 4.8 (20.3–39.6)
Skin-to-bone depth				
A-Extension	27.2 ± 6.3 (15.8–45.8)	28.5 ± 6.2 (17.9–46.4)	31.8 ± 6.3 (21.0–49.7)	33.4 ± 6.3 (20.8–50.7)
A-Flexion	29.4 ± 5.8 (19.4–43.3)	30.8 ± 5.6 (21.5–43.6)	34.8 ± 5.8 (23.4–47.8)	37.1 ± 5.6 (26.5–51.1)
B-Extension	31.8 ± 7.1 (20.5–53.8)	32.2 ± 6.9 (21.2–53.5)	37.1 ± 7.3 (25.6–57.2)	40.1 ± 7.4 (27.8–61.1)
B-Flexion	26.8 ± 5.5 (17.5–42.5)	27.3 ± 5.1 (18.5–41.5)	32.0 ± 5.4 (22.1–45.8)	35.5 ± 5.4 (24.0–49.9)

Note: A: Three finger breadths below the acromion. B: The intersection of a line dropping from the middle acromion and a line connecting the highest points of the anterior and posterior axillary lines. Extension: Participants placed their arms beside their bodies with their elbows extended. Flexion: Participants placed their hands on their hips with their elbows flexed. Flat: Without any skin pressure, stretching or bunching; SS = stretching the skin; SB = skin bunching; MB = muscle bunching. Unit: mm. Data: mean ± SD. Brackets: a range of minimum to maximum values. Number of participants: 30

(a)

(b)

(c)

Figure 5. Subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth were compared for each combination of injection site and arm position when using the Flat condition. (a) Subcutaneous thickness, (b) muscle thickness, (c) skin-to-bone depth.

Note: A: Three finger breadths below the acromion. B: Intersection of a line dropping from the middle acromion and a line connecting the most superior point of the anterior and posterior axillary lines. Extension: Participants placed their arms beside their bodies with their elbows extended. Flexion: Participants placed their hands on their hips with their elbows flexed. Number of participants: 30, *$p < .05$; **$p < .01$; one-way ANOVA with Bonferroni adjustment.

.049, respectively) (Figure 7a-7c). Figure 8 shows that the skin-to-bone depths in the A-Extension, A-Flexion, B-Extension, and B-Flexion groups were significantly greater with MB than with Flat, SS, and SB (all $p < .01$). The skin-to-bone depths in the A-Extension, A-Flexion, B-Extension, and B-Flexion groups were significantly larger with SB than with Flat and SS (all $p < .01$). Furthermore, the skin-to-bone depths in the A-Extension, A-Flexion, and B-Flexion groups were significantly larger with SS than with Flat ($p < .01$, $p < .01$, and $p = .03$, respectively) (Figure 8a, 8b, 8d).

Correlation between BMI and Subcutaneous Tissue Thickness, Muscle Thickness, and Skin-to-bone Depth

Table 2 presents Pearson's correlation coefficients, measuring the correlation between BMI and subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth at each combination of injection site and arm position under the Flat condition. All investigated parameters, such as subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth, exhibited a significant positive correlation with BMI ($.57 \geq r \geq .39$, $p < .05$; $.72 \geq r \geq .48$, $p < .01$; and $.83 \geq r \geq .73$, $p <$

.001, respectively).

Discussion

The administration of IM injections is associated with multiple complications, such as serious tissue damage due to drug leakage during inadvertent subcutaneous administration (Ozen et al., 2019) and SIRVA resulting from excessive puncture (Yuen et al., 2022). Thus, healthcare practitioners must be knowledgeable in the appropriate needle penetration depth when performing IM injections. However, determining the approximate needle depth involves factors such as subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth.

This study focused on the deltoid muscle IM injection site, recipient arm position, and injection technique to compare subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth. The results of the study showed that the safe insertion depth of the needle for IM injections into the deltoid muscle varied based on the injection site, recipient arm position, and injection technique. The strength of this

Figure 6. Subcutaneous tissue thickness when using the Flat, SS, SB, and MB techniques for each combination of injection site and arm position. (a) A-Extension, (b) A-Flexion, (c) B-Extension, (d) B-Flexion.
Note: A: Three finger breadths below the acromion. B: Intersection of a line dropping from the middle acromion and a line connecting the most superior point of the anterior and posterior axillary lines. Extension: Participants placed their arms beside their bodies with their elbows extended. Flexion: Participants placed their hands on their hips with their elbows flexed. Flat: without any skin pressure, stretching or bunching; SS = stretching the skin; SB = skin bunching; MB = muscle bunching. Number of participants: 30, $*p < .05$; $**p < .01$; $***p < .001$, one-way ANOVA with Bonferroni adjustment.

study lies in its exploration of different sites, arm positions, and techniques when injecting into the deltoid muscle.
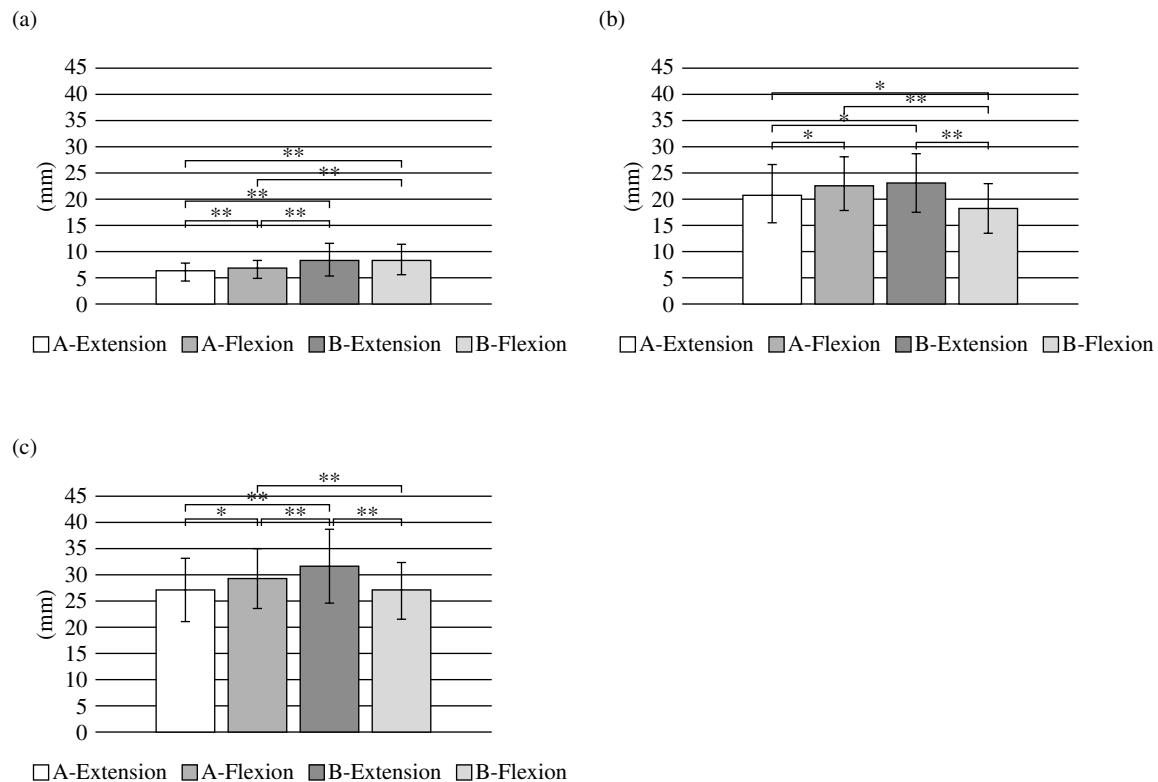
The study found variations in subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth for each combination of injection site and arm position. The subcutaneous tissue thickness for A-Extension and B-Extension were similar to the data from previous US device-validated studies (Nakajima et al., 2017; Kikuchi et al., 2014). Notably, subcutaneous tissue was thicker at injection site B than at injection site A, aligning with findings from other studies that reported a gradual increase in subcutaneous tissue thickness from proximal to distal deltoid muscle (Nakajima et al., 2017). The muscle thickness exhibited distinct patterns: During Extension (i.e., participants with arms beside their bodies and elbows extended), the muscle was thicker in B than in A, while during Flexion (i.e., participants with hands on their hips and elbows flexed), the muscle was thicker in A than in B. This observation is consistent with a recent study indicating that the thickness of the deltoid muscle gradually increases distally during Extension (Nakajima et al., 2017).

However, only a few studies have explored muscle thickness at each injection site during Flexion. The middle deltoid muscle, which is responsible for shoulder abduction, has its origin near the acromion, with insertion at the deltoid tubercle (Reed et al., 2016; John, 2019). Contraction of the middle deltoid is concentric, and during Flexion, the muscle contracts proximally (Ozone et al., 2022), suggesting that site A, the more proximal part of the deltoid muscle, is thicker than site B. This interpretation is supported by the finding that the muscle at site B was thinner during Flexion than during Extension. Based on these findings, the following characteristics were suggested: (1) At IM injection site A, the subcutaneous tissue is thin, and during arm flexion, muscles become thicker, and skin-to-bone depth increases; and (2) at IM injection site B, the subcutaneous tissue is thicker, and during arm extension, muscles become thicker, leading to an increase in skin-to-bone depth.

In the comparison among the Flat, SS, SB, and MB groups, there were considerable differences in subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth.
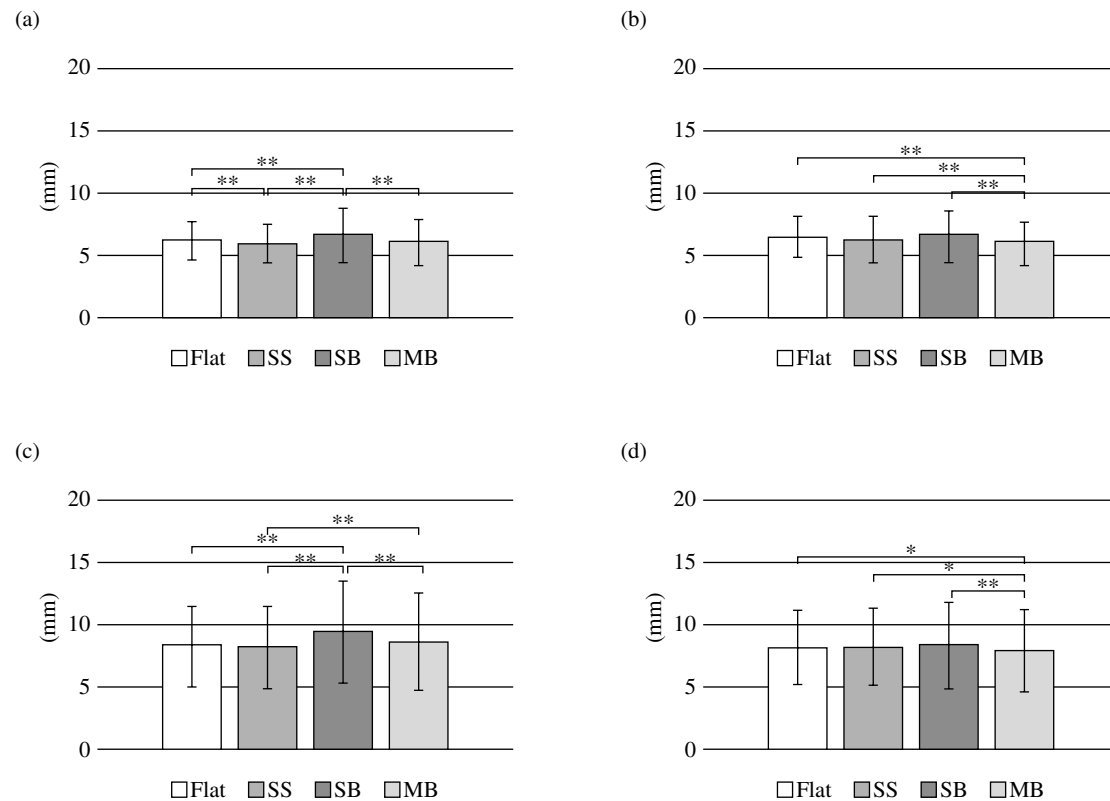
Figure 7. Muscle thickness when using the Flat, SS, SB, and MB techniques for each combination of injection site and arm position. (a) A-Extension, (b) A-Flexion, (c) B-Extension, (d) B-Flexion.

Note: A: Three finger breadths below the acromion. B: Intersection of a line dropping from the middle acromion and a line connecting the most superior points of the anterior and posterior axillary lines. Extension: Participants placed their arms beside their bodies with their elbows extended. Flexion: Participants placed their hands on their hips with their elbows flexed. Flat: Without any skin pressure, stretching or bunching; SS = stretching the skin; SB = skin bunching; MB = muscle bunching. Number of participants: 30, $*p < .05$; $**p < .01$; $***p < .001$, one-way ANOVA with Bonferroni adjustment.

The SS technique involves pulling the skin using two fingers, specifically the thumb and index finger. However, except in the A-Extension group, the subcutaneous tissue did not become thinner with the SS technique than with the Flat condition. Furthermore, contrary to the recommendation in vaccination best practice guidelines (CDC, 2023c) to use short needles when stretching the skin flat, the findings of this study suggest that stretching the skin flat does not thin the subcutaneous tissue. Moreover, it is worth noting that previous research has indicated variations in skin parameters across different body parts (John et al., 2023). While the detailed nature of the subcutaneous tissue of the deltoid muscle cannot be fully elucidated from the results of this study, it appears unlikely that simply pulling the skin on the surface with two fingers results in subcutaneous tissue thinning. Regarding muscle thickness, the SS technique did not directly approach the deltoid muscle. Consequently, the muscle was not as thick as when using SB and MB, and the skin-to-bone depth was not as deep as observed with SB and MB.

SB is a technique involving bundling the skin using two fingers, specifically the thumb and index finger. In their study, Rahamimov et al. (2021) advised against the use of the SB technique due to the associated risks of subcutaneous injection. However, the findings of this study showed that at the two selected IM injection sites, the subcutaneous tissue became thicker during Extension, while during Flexion, there was no significant difference compared to the Flat condition. During Extension, the subcutaneous tissue is pulled horizontally, whereas during Flexion, it is pulled diagonally upward. Particularly, bundling the skin diagonally upward may be more challenging than bundling the skin horizontally. Regarding muscle thickness, although SB did not directly approach the deltoid muscle, the muscle was the second thickest after MB, and the skin-to-bone depth was also the second deepest after MB. The thickness of the subcutaneous tissue during the Flat condition was approximately 6-8 mm for all combinations of injection sites and

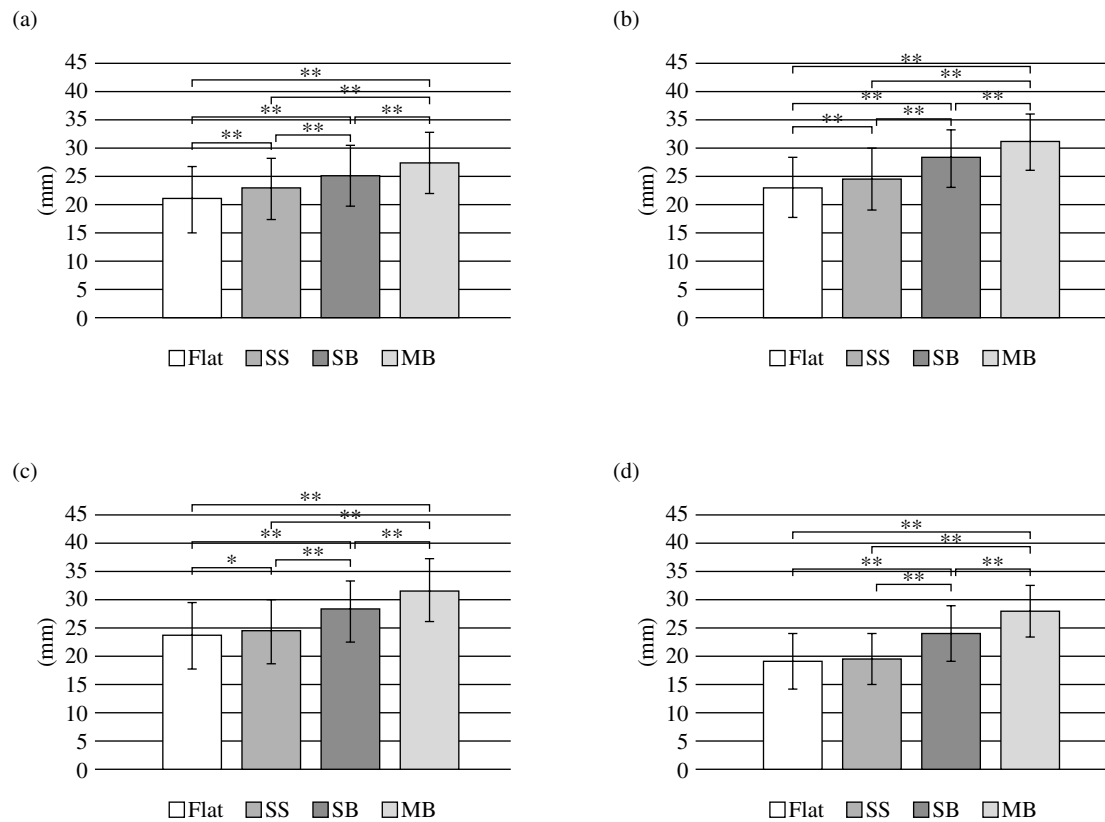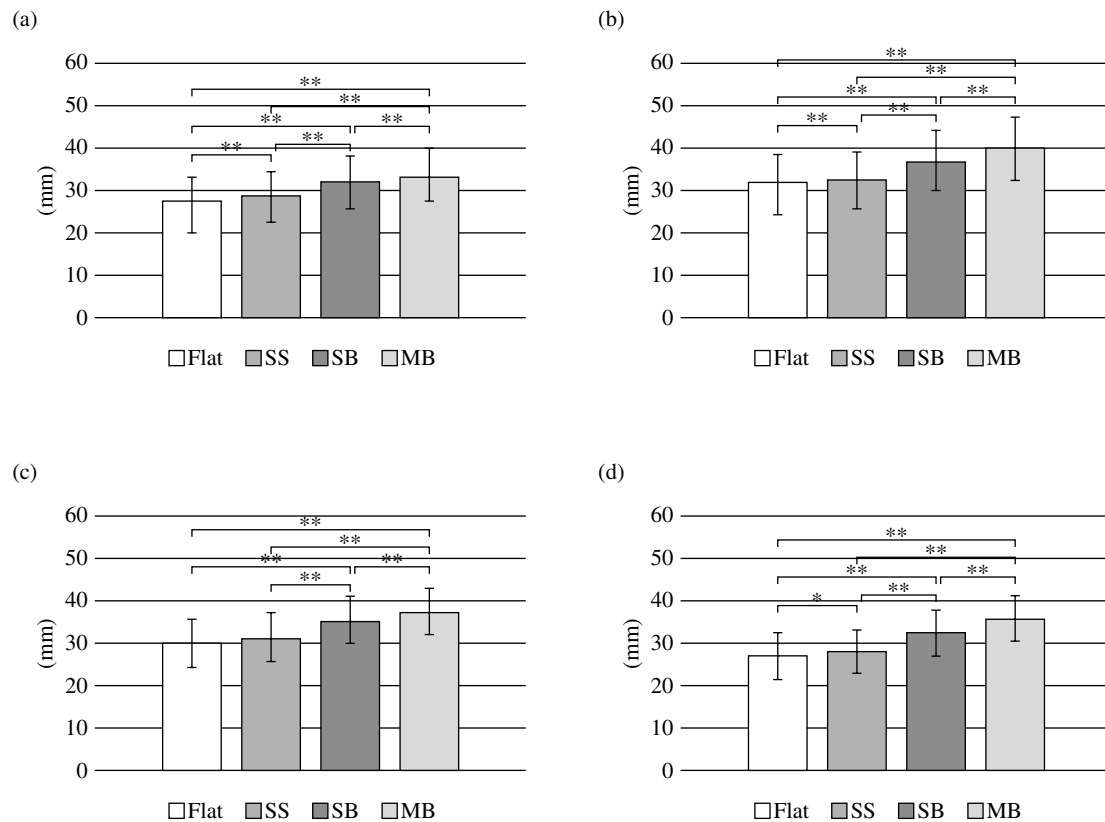**Figure 8.** Skin-to-bone depth when using the Flat, SS, SB, and MB techniques for each combination of injection site and arm position. (a) A-Extension, (b) A-Flexion, (c) B-Extension, (d) B-Flexion.

Note: A: Three finger breadths below the acromion. B: Intersection of a line dropping from the middle acromion and a line connecting the most superior points of the anterior and posterior axillary lines. Extension: Participants placed their arms beside their bodies with their elbows extended. Flexion: Participants placed their hands on their hips with their elbows flexed. Flat: without any skin pressure, stretching or bunching; SS = stretching the skin; SB = skin bunching; MB = muscle bunching. Number of participants: 30, *$p < .05$; **$p < .01$, one-way ANOVA with Bonferroni adjustment.

arm positions. Consequently, it was challenging to bundle only the subcutaneous tissue, thus raising the possibility that the muscle may also be bundled together.

MB is a technique in which the deltoid muscle is bundled using the thumb and index finger (Koster et al., 2009). As expected, the MB method, which focuses on bundling the muscle, successfully thickened the muscle at any combination of injection site and arm position. In addition, due to the increased muscle thickness, MB was able to increase the skin-to-bone depth for any combination of injection site and arm position. Interestingly, the subcutaneous tissue did not become thicker with the MB technique than under the Flat condition at any combination of injection site and arm position.

Based on these findings, each technique exhibits distinct characteristics for Japanese adults: (1) The SS technique does not appear to be very effective in thinning the subcutaneous tissue of the deltoid muscle. (2) The effectiveness of the SB technique is influenced by the technique of the

medical worker performing SB and the recipient's arm position. As a result, the subcutaneous tissue and muscle thickness may vary based on these factors. (3) The MB technique allows only the muscle to thicken at any combination of the injection site and arm position, resulting in the deepest skin-to-bone depth.

This study found that subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth were positively correlated with BMI, regardless of injection site or arm position. Previous reports have shown that the length of the injection needle to be inserted should be determined on an individual basis, taking into account BMI (Takahashi et al., 2014; Cook et al., 2006) and body size (Shankar et al., 2014). The results of this study suggest that changes in injection location in the deltoid muscle or arm position do not affect the results of previous ones (Shankar et al., 2014; Takahashi et al., 2014; Cook et al., 2006).

In conclusion, this study discusses techniques for the safe insertion of a needle into the deltoid muscle during IM in-

Table 2. Pearson's correlation coefficients, indicating the correlation between BMI and the subcutaneous tissue thickness, muscle thickness, and skin-to-bone depth at each combination of injection site and arm position when using the flat condition.

Variable	Pearson's correlation	p value
Subcutaneous tissue thickness		
A-Extension	.39	.034
A-Flexion	.47	.009
B-Extension	.54	.002
B-Flexion	.57	.001
Muscle thickness		
A-Extension	.68	< .001
A-Flexion	.72	< .001
B-Extension	.69	< .001
B-Flexion	.48	.008
Skin-to-bone depth		
A-Extension	.73	< .001
A-Flexion	.80	< .001
B-Extension	.83	< .001
B-Flexion	.75	< .001

Note: A: Three finger breadths below the acromion. B: The intersection of a line dropping from the middle acromion and a line connecting the highest points of the anterior and posterior axillary lines. Extension: Participants placed their arms beside their bodies with their elbows extended. Flexion: Participants placed their hands on their hips with their elbows flexed. BMI, body mass index. Flat: without any skin pressure. Number of participants: 30

jections in Japanese adults. Despite the Centers for Disease Control and Prevention (CDC) recommendation to use a standard 25-mm needle (CDC 2023c), the findings of this study revealed that the average subcutaneous tissue thickness under the Flat condition was 25 mm or less for all combinations of injection site and arm position. In addition, the average skin-to-bone depth was 25 mm or more for all combinations of injection site and arm position under the Flat condition. Therefore, this study posits that, in all instances, even with a fully inserted 25-mm needle at a 90° angle, the needle penetrates the subcutaneous tissue without reaching the bone. However, it is worth noting that this does not imply that all combinations of injection sites and arm positions are universally suitable for all patients. Thus, from a caution perspective, this study hypothesizes that the minimum skin-to-bone depth with the Flat condition might be less than 25 mm for certain combinations, as fully inserting a 25-mm needle at a 90° angle could pose a risk of hitting the bone in some recipients, particularly those with lower BMIs, thereby increasing the risk of SIRVA (Yuen et al., 2022; Wood & Ilyas, 2022). Notably, among the injection techniques, only MB allows the muscle to thicken across all combinations of injection site and arm position, thereby achieving the deepest skin-to-bone depth. Consequently, for specific combinations, such as A-Flexion and B-Extension, where the minimum skin-to-bone depth exceeded 25 mm

and the maximum subcutaneous tissue thickness was less than 25 mm, the findings of this study suggest that (1) overall, using a full 25-mm needle at any combination of injection site and arm position is generally safe, and (2) for recipients with a low BMI, using the MB technique with arm flexion for IM injection site A and arm extension for IM injection site B may be safer.

This study had some limitations. First, all participants in this study had normal BMIs. A previous study of 553 Japanese subjects reported that the maximum subcutaneous tissue thickness at point A in subjects with BMI > 30 was 16 mm (Takahashi et al., 2014). Therefore, the MB technique may be used for A-Flexion even if the BMI is > 30. In the B-Extension group, the maximum subcutaneous tissue thickness using the MB technique was 19.4 mm; although there were no participants with BMI > 30 in this study, it is assumed that a 25-mm needle may not reach the subject's muscles if the BMI is > 30. In the B-Extension group, the subcutaneous tissue was significantly thinner with the SS technique than with the MB technique; thus, the SS technique may be more appropriate when employing B-Extension in individuals with a BMI of > 30. Second, participants in this study were within a specific age range. In general, muscle volume decreases and body fat volume increases with age (Nagy & Pappas, 2019). A previous study of Japanese subjects who were elderly showed that subcutaneous and muscle volume lengths were significantly shorter in subjects aged ≥ 75 years than in those aged 50-64 years (Nakayama et al., 2022). Therefore, the results of this study should be extrapolated with particular caution to Japanese subjects aged ≥ 75 years. To comprehensively address safe IM injection sites, future large-scale studies are required, encompassing individuals with varying BMIs and across different age groups, including those who are obese. Third, data regarding the course of the axillary nerve and the needle length that should remain within the deltoid muscle were not available in this study. If the patient's arm is abducted, the axillary nerve moves closer to the acromion and the risk of nerve injury increases (Kim et al., 2017). Although no studies have directly compared arm position to the frequency of nerve injury, there is insufficient evidence to conclude that arm position is associated with nerve injury. Thus, further studies are warranted to investigate these factors and establish safe injection techniques.

Author Contributions

Declaration of Conflicting Interests

Ethical Approval

This study was approved by the Institutional Ethics Committee of Tokyo Metropolitan University [No. 22040].

Funding

This study was funded by research funds from Faculty of Health Sciences, Tokyo Metropolitan University.

Informed Consent

Informed consent for publication of images of the subjects used in Figs. 1-4 of this study was obtained from all participants involved in this study.

References

Centers for Disease Control and Prevention. (2023a). *Updated (2023 - 24 formula) Moderna COVID-19 vaccine*. CDC. https://www.cdc.gov/vaccines/covid-19/info-by-product/moderna/downloads/vaccine-at-a-glance.pdf

Centers for Disease Control and Prevention. (2023b). *Updated (2023 - 24 formula) Pfizer-BioNTech COVID-19 vaccine*. CDC. https://www.cdc.gov/vaccines/covid-19/info-by-product/pfizer/downloads/vaccine-at-a-glance.pdf

Centers for Disease Control and Prevention. (2023c). *Vaccine recommendations and guidelines of the ACIP: General best practice guidelines for immunization*. CDC. https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/downloads/general-recs.pdf

Cook, I. F. (2011). An evidence based protocol for the prevention of upper arm injury related to vaccine administration (UAIRVA). *Human Vaccines*, *7*(8), 845-848. https://doi.org/10.4161/hv.7.8.16271

Cook, I. F., Williamson, M., & Pond, D. (2006). Definition of needle length required for intramuscular deltoid injection in elderly adults: An ultrasonographic study. *Vaccine*, *24*(7), 937-940. https://doi.org/10.1016/j.vaccine.2005.08.098

John, A. J. U. K., Galdo, F. D., Gush, R., & Worsley, P. R. (2023). An evaluation of mechanical and biophysical skin parameters at different body locations. *Skin Research and Technology*, *29*(2), e13292. https://doi.org/10.1111/srt.13292

John, G. (2019). *The vital shoulder complex: An illustrated guide to assessment, treatment, and rehabilitation (1st ed.)*. North Atlantic Books. https://www.northatlanticbooks.com/shop/the-vital-shoulder-complex/

Kagawa, K., Kuroda, H., Kaneko, D., Imura, M., Imaizumi, U., Kido, K., Tsukimoto, S., Kurata, S., Kishimoto, N., & Sanuki, T. (2023). Safety of COVID-19 vaccine delivery by dentists: An observational cohort study. *Journal of Dental Sciences*, *18*(2), 613-617. https://doi.org/10.1016/j.jds.2022.08.018

Kearns, C., Houghton, C., Dickinson, E., Hatter, L., Bruce, P., Krishnamoorthy, S., Weatherall, M., Hills, T., Doppen, M., Ali Mirjalili, S., & Beasley, R. (2023). What variables should inform needle length choice for deltoid intramuscular injection? A systematic review. *BMJ Open*, *13*(1), e063530. https://doi.org/10.1136/bmjopen-2022-063530

Kikuchi, K., Takahashi, Y., Oyama, N., & Ishida, Y. (2009). Kagakuteki konkyo ni motozuku kinniku nai chusha no chusha bari shinyu shindo ni kansuru kenkyu [Needle length required for intramuscular injection skills: Evidence-based nursing]. *Japanese Journal of Nursing Art and Science*, *8*(1), 66-75. https://doi.org/10.18892/jsnas.8.1_66

Kim, H. J., Park, S. K., & Park, S. H. (2017). Upper limb nerve injuries caused by intramuscular injection or routine venipuncture. *Anesthesia and Pain Medicine*, *12*(2), 103-110. https://doi.org/10.17085/apm.2017.12.2.103

Koster, M. P., Stellato, N., Kohn, N., & Rubin, L. G. (2009). Needle length for immunization of early adolescents as determined by ultrasound. *Pediatrics*, *124*(2), 667-672. https://doi.org/10.1542/peds.2008-1127

Marshall, H. S., Clarke, M. F., Evans, S., Piotto, L., & Gent, R. J. (2013). Randomized trial using ultrasound to assess intramuscular vaccination at a 60° or 90° needle angle. *Vaccine*, *31*(23), 2647-2652. https://doi.org/10.1016/j.vaccine.2013.03.037

Mayer, K. P., Thompson Bastin, M. L., Montgomery-Yates, A. A., Pastva, A. M., Dupont-Versteegden, E. E., Parry, S. M., & Morris, P. E. (2020). Acute skeletal muscle wasting and dysfunction predict physical disability at hospital discharge in patients with critical illness. *Critical Care*, *24*(1), 637. https://doi.org/10.1186/s13054-020-03355-x

Ministry of Health. (2023). *Immunisation handbook 2020*. Ministry of Health. https://www.health.govt.nz/system/files/documents/publications/immunisation-handbook-2020-v23_0.pdf

Nagy, T. R., & Pappas, L. E. (2019). The translation of age-related body composition findings from rodents to humans. *European Journal of Clinical Nutrition*, *73*(2), 172-178. https://doi.org/10.1038/s41430-018-0324-6

Nakajima, Y., Mukai, K., Takaoka, K., Hirose, T., Morishita, K., Yamamoto, T., Yoshida, Y., Urai, T., & Nakatani, T. (2017). Establishing a new appropriate intramuscular injection site in the deltoid muscle. *Human Vaccines and Immunotherapeutics*, *13*(9), 2123-2129. https://doi.org/10.1080/21645515.2017.1334747

Nakajima., Y., Fujii, T., Mukai, K., Ishida, A., Kato, M., Takahashi, M., Tsuda, M., Hashiba, N., Mori, N., Yamanaka, A., Ozaki, N., & Nakatani, T. (2020). Anatomically safe sites for intramuscular injections: A cross-sectional study on young adults and cadavers with a focus on the thigh. *Human Vaccines & Immunotherapeutics*, *16*(1), 189-196. https://doi.org/10.1080/21645515.2019.1646576

Nakayama, T., Sekino, H., Aihara, H., & Kino, M. (2022). Appropriate needle length determined by ultrasonic echography for intramuscular injection in Japanese elderly over 50 years. *Healthcare*, *10*(5), 800. https://doi.org/10.3390/healthcare10050800

Ozen, O., Gunaydin, M., Tosun, A., Coskun, Z. U., Aytekin, K., & Takir, S. (2019). Assessment rate of true dorsogluteal intramuscular drug injection using ultrasonography. *Pakistan Journal of Medical Sciences*, *35*(4), 1132-1137. https://doi.org/10.12669/pjms.35.4.313

Ozone, K., Kokubun, T., Takahata, K., Takahashi, H., Yoneno, M., Oka, Y., Minegishi, Y., Arakawa, K., Kano, T., Murata, K., & Kanemura, N. (2022). Structural and pathological changes in the

enthesis are influenced by the muscle contraction type during exercise. *Journal of Orthopaedic Research*, *40*(9), 2076-2088. https://doi.org/10.1002/jor.25233

Poland, G. A., Borrud, A., Jacobson, R. M., McDermott, K., Wollan, P. C., Brakke, D., & Charboneau, J. W. (1997). Determination of deltoid fat pad thickness. Implications for needle length in adult immunization. *JAMA*, *277*(21), 1709-1711. https://doi.org/10.1001/jama.1997.03540450065037

Rahamimov, N., Baturov, V., Shani, A., Zoor, I. B., Fischer, D., & Chernihovsky, A. (2021). Inadequate deltoid muscle penetration and concerns of improper COVID mRNA vaccine administration can be avoided by injection technique modification. *Vaccine*, *39*(37), 5326-5330. https://doi.org/10.1016/j.vaccine.2021.06.081

Reed, D., Cathers, I., Halaki, M., & Ginn, K. A. (2016). Does Load influence shoulder muscle recruitment patterns during scapular plane abduction? *Journal of Science and Medicine in Sport*, *19*(9), 755-760. https://doi.org/10.1016/j.jsams.2015.10.007

Shankar, N., Saxena, D., Lokkur, P. P., Kumar, N. M., William, N. C., & Vijaykumar, N. (2014). Influence of skin-to-muscle and muscle-to-bone thickness on depth of needle penetration in adults at the deltoid intramuscular injection site. *Medical Journal Armed Forces India*, *70*(4), 338-343. http://doi.org/10.1016/j.mjafi.2014.08.005

Takahashi, Y., Kikuchi, K., Miura, N., & Ishida, Y. (2014). BMI kara asesumento suru kinniku nai chusha ji no tekisetsuna chusha bari shinyu shindo no kento [Appropriate needle insertion depth for intramuscular injection based on assessment of BMI]. *Journal of Japan Academy of Nursing Science*, *34*(1), 36-45. https://doi.org/10.5630/jans.34.36

Wood, C. T., & Ilyas, A. M. (2022). Shoulder injury related to vaccine administration: diagnosis and management. *Journal of Hand Surgery Global Online*, *4*(2), 111-117. https://doi.org/10.1016/j.jhsg.2021.12.009

Yuen, W. L. P., Loh, S. Y. J., & Wang, D. B. (2022). SIRVA (shoulder injury related to vaccine administration) following mRNA COVID-19 vaccination: Case discussion and literature review. *Vaccine*, *40*(18), 2546-2550. https://doi.org/10.1016/j.vaccine.2022.03.037

Original Research

Quantitative indices for assessing mobility in patients during the acute postoperative period following total hip and knee arthroplasties

Fumitake Yamaguchi, MSN, RN, PHN[1] (iD), Chiho Nakashima, RN[2] (iD), Takumi Kiyonaga, RN[1] (iD), Chiho Kawasaki, RN[2] (iD), Tsubasa Kawaguchi, RPT[3] (iD), Shigeaki Miyazaki, MMS, RPT[3] (iD), Amy Hombu, PhD[4] (iD), Yoshinori Fujii, PhD[5] (iD), Kurumi Tsuruta, MSN, RN, PHN[1] (iD), Etsuo Chosa, PhD, MD[6] (iD), and Hirotake Sawada, PhD, MD[1] (iD)

[1]Department of Nursing, Faculty of Medicine, University of Miyazaki, Miyazaki, Japan, [2]Department of Nursing, Faculty of Medicine, University of Miyazaki Hospital, Miyazaki, Japan, [3]Department of Rehabilitation, Faculty of Medicine, University of Miyazaki Hospital, Miyazaki, Japan, [4]Center for Language and Cultural Studies, University of Miyazaki, Miyazaki, Japan, [5]Department of Mathematics Education, Faculty of Education, University of Miyazaki, Miyazaki, Japan, and [6]Department of Orthopaedic Surgery, Faculty of Medicine, University of Miyazaki, Miyazaki, Japan

Abstract
Objective: This study evaluated new indices for quantitative assessment of mobility in orthopedic patients who underwent total hip and knee arthroplasties. **Methods:** This observational study evaluated three new indices, the 5-m walker gait, sitting-rising, and supine-to-sitting and sitting-to-supine times, for assessing the ambulatory function of 33 orthopedic patients after total hip and knee arthroplasties in the immediate postoperative period. The validity of these indices was verified using the functional independence measure, and their effectiveness was examined by comparing them with previously reported indices. **Results:** The 5-m walker gait time had the highest sensitivity, and Youden's index was the most valid model fit. These new indices demonstrate greater sensitivities and specificities than previously reported indices. **Conclusions:** The 5-m walker gait time is a clinically valid and effective index of independent mobility.

Keywords
ambulation, mobility, total hip arthroplasty, total knee arthroplasty

Introduction

The global prevalence of osteoarthritis (OA) is approximately 303.1 million, with an age-standardized prevalence of 3,754.2 per 100,000 people (Safiri et al., 2020). OA impairs mobility, requires assistance in performing various activities of daily living (ADLs), and can cause patients to become bedridden. Bedridden status and lack of standing time can lead to various complications, including impaired motor and cognitive function, dementia (Laurin et al., 2001), deep vein thrombosis, pulmonary embolism, and urinary tract infection, all of which have a significant bearing on life expectancy and quality of life (Rogers et al., 2008; Teasell & Dittmer, 1993; Brown et al., 2004).

Total hip arthroplasty (THA) and total knee arthroplasty (TKA), which are performed for end-stage OA, can improve "mobility function" related to various ADLs (Miyazaki et al., 2022). Postoperative care, early ambulation, and inde-

pendent mobility acquisition are important for restoring mobility and enabling earlier discharge (Oberfeld et al., 2021; Amano et al., 2016). Therefore, it is important to assess the patient's mobility function from the acute postoperative period to allow the patient to move independently as early as possible and to promote physical activity (Kronborg et al., 2016).

Several cutoff values have been used to assess a patient's mobility independence, including ≥2.5 times (Iwase et al., 2014) on the 10-s chair stand test (Frail CS-10), ≥26.0 cm (Morio et al., 2007) on the functional reach test (FRT), ≥2.334 N/kg (Katoh & Kaneko, 2014) on the isometric knee extension muscle strength test, and score of ≥6 (Hall et al., 1999) on the functional independence measure (FIM), which comprehensively and objectively evaluates mobility. These indices are intended for use in patients in the chronic recovery stage, in whom conditions change slowly. When these indices are used for patients in the acute postoperative period, during which ambulatory function can significantly change daily (such as in patients after orthopedic surgery), daily assessments can be burdensome for both patients and medical care providers. Additionally, these indices were not developed to account for assistive devices used by orthopedic patients in the acute postoperative period.

The cumulated ambulation score (CAS) was used to assess mobility in the acute postoperative period after orthopedic surgery (Ferriero, 2018). CAS has been validated for evaluating mobility in the early postoperative period among patients with hip fractures. It comprises three items that assess activities that characterize a patient's basic mobility on a 3-point scale: 0 indicates "not possible even with human assistance or verbal cues," 1 indicates "possible with human assistance or verbal cues," and 2 indicates "safe to do without human assistance or verbal cues" (Kristensen et al., 2009). However, judgment on points 1 and 2 is qualitative and is made by physical therapists (PTs). This judgment between points 1 and 2 for assessing patient mobility independence may differ among nurses who do not specialize in assessing ambulation in daily clinical practice because of the lack of standardized diagnostic measurements and cutoff values.

Nurses have been reported to not allow patients to move independently because of fear of falling, forcing them to be on bed rest for longer than necessary (Zegelin, 2008; Doherty-King & Bowers, 2013). This study indicates that assessing patient mobility independence can be challenging for nurses. Much of the postoperative care, essential to the success of the surgical procedure, is the responsibility of the nurse and is directed toward the correct mobilization and education of the patient (Wallis & Taylor, 2011). To address these issues, clinical providers should quantitatively assess ambulatory function.

This study aimed to develop more quantitative indices for assessing improvements in ambulatory function among patients undergoing THA or TKA surgery. We specifically focused on quantifying walking time, time taken to sit from a standing position, and time taken to lie down from sitting position. This approach enhances our understanding of postoperative patient recovery and mobility. As a first step in developing these new mobility function measures, we evaluated their cutoff values and validated their use in patients who underwent pilot THA or TKA surgery.

Materials and Methods

Study Design and Participants

This study had a prospective, observational design. Potential participants included those admitted to the orthopedic ward of the same hospital for unilateral THA or TKA surgery between June 19, 2019, and October 31, 2020. The selection criteria were as follows: (1) aged ≥20 years, (2) undergoing surgery on a Monday (to equalize rehabilitation), and (3) ability to walk and transfer independently at the time of admission with locomotion-FIM (L-FIM) and transfers-FIM (T-FIM) values of ≥6. The exclusion criteria included limited weight bearing on the lower limbs postoperatively, diagnosis of severe brain dysfunction, and cognitive decline. To include various participants, this study did not limit the age or detailed disease background (e.g., bilateral or unilateral OA) other than a history of unilateral THA/TKA surgery.

Thirty-eight patients initially provided informed consent; however, several patients were excluded postoperatively, including one, one, and three patients with severe inactivity delirium, a suspected peroneal nerve palsy, and intraoperative fracture or bone fragility requiring substantial postoperative relief, respectively. As a result, 33 patients were included in this study (Figure 1). The sample size was confirmed to be sufficient according to the sample size tables reported by Hsieh (1989).

Ethical Considerations

This study was conducted in accordance with the ethical standards for human experimentation established in the Declaration of Helsinki (as revised in Fortaleza, Brazil, October 2013). The institutional research ethics board of our institution approved this prospective observational study (approval number: 0-0512). All subjects were informed of the following: (1) the purpose and methods of this study, (2) anticipated duration of participation in the study, (3) expected clinical advantages and disadvantages, (4) that participation in the study was at the subjects' own will and that the subjects could refuse or withdraw from the study at any time without causing any adverse treatment, (5) data management methods, (6) how the results would be handled both orally and in writing, and (7) that the privacy of the subjects would be protected even though the results were made pub-

```
┌─────────────────────────────────────────────────────────────────────┐
│        THA/TKA    between June 19, 2019, and October 31, 2020    N = 207 │
└─────────────────────────────────────────────────────────────────────┘
```

Inclusion criteria (*n* = 47)
1. aged 20 years or older,
2. undergoing surgery on a Monday,
3. ability to walk and transfer independently at the time of admission

Exclusion criteria (*n* = 9)
➢ limited weight-bearing on the lower limbs after surgery (*n* = 5)
➢ diagnoses of severe brain dysfunction or cognitive decline (*n* = 3)
➢ Non-consent to participate in research (*n* = 1)

Obtaining consent
n = 38

Difficult to continue for the study (*n* = 5)
➢ suspected peroneal nerve palsy (*n* = 1)
➢ severe inactivity delirium (*n* = 1)
➢ intraoperative fracture or bone fragility (*n* = 3)

Undergoing surgery

Analysis target *n* = 33

Figure 1. Flowchart of the included patients.
Note: Abbreviations: THA = total hip arthroplasty; TKA = total knee arthroplasty.

lic. Written informed consent was obtained from all participants. All measurements and evaluations were performed with the utmost consideration of the subjects' conditions and intentions. Measurements were not performed if they were determined to be inappropriate on the basis of the subjects' conditions or if the subjects did not wish to continue with the measurements.

Terminology

In this study, "independence with mobility" referred to a condition in which the patient had sufficient motor function, could independently perform ambulation, and could transfer from the bed to the standing position. In contrast, "nonindependence with mobility" referred to a condition in which the patient had inadequate motor function and required the assistance of medical staff when ambulating or transferring.

Measurement and Evaluation

The 5-m walker gait time is an application of gait speed and has been validated as a highly reproducible measure of fall risk among community residents (Kyrdalen et al., 2019). The 5-m walker gait time was measured by determining a patient's walking time across a 5-m measurement area using a walker. Additionally, two 3-m sections were measured and indicated using tape at each end of the 5-m measurement area (spare section, −3-m line; measurement section, 0- to 5-m line; and spare section, 3-m line). With reference to previous studies (Afilalo et al., 2016), the test was standardized according to the following instructions: the patient was positioned with their heels behind and the toes just touching,

and the 3-m start line. The patient was then instructed to "walk at a comfortable pace" until a few steps past the 5-m mark without starting to slow down until after the 5-m mark. The trial began with the word "go," and the timer was started at the first footfall after the 0-m line. The timer was then stopped at the first footfall after the 5-m line. (The start and end points of the measurement were determined when the subject first stepped into and out of the 5-m measurement area.) An ARUCO-SK (Seiko Medical Instruments Co., Ltd. Japan) walker was used, with a gas-spring adjustable height function to adjust the elbow to a 90° position while standing.

The sitting-rising and supine-to-sitting and sitting-to-supine times were evaluated on the basis of the time required to perform the transfer activities essential during ambulation, such as repositioning in bed, standing up, and rising from a chair or bed, based on the time required. The sitting-rising time was measured as the time required to move from a sitting position with the soles of the feet on the floor while wearing shoes to a standing position and then immediately return to the sitting position. The bed height was adjusted to a height below the knees so that the knees could bend to a 90°. Because this measurement was designed to be user friendly for the accommodation of ADLs, no restrictions were placed on the positions or movements of the upper or lower limbs. The supine-to-sitting and sitting-to-supine times were measured separately. The supine-to-sitting time was measured as the time required to sit up at the edge of the bed on the unoperated side and place both feet on the floor. The sitting-to-supine time was

Table 1. Specific assessment items of L-FIM and T-FIM.

FIM for locomotion (L-FIM)	
Level 7 (complete independence):	The patient can walk safely without assistance and without assistive devices.
Level 6 (modified independence):	The patient can walk independently but requires an assistive device.
Level 5 (supervision or setup):	The patient requires supervision or setup help but no physical assistance.
Level 4 (minimal assistance):	The patient requires minimal physical assistance (<25% help).
Level 3 (moderate assistance):	The patient requires moderate physical assistance (25%–50% help).
Level 2 (maximal assistance):	The patient requires maximal physical assistance (>50% help).
Level 1 (total assistance):	The patient cannot walk and requires full physical assistance.
FIM for transferring (T-FIM)	
Level 7 (complete independence):	The patient can independently transfer (e.g., bed to chair) without assistance or assistive devices.
Level 6 (modified independence):	The patient can transfer independently but can use an assistive device.
Level 5 (supervision or setup):	The patient requires supervision or setup help but no physical assistance.
Level 4 (minimal assistance):	The patient requires minimal physical assistance (<25% help).
Level 3 (moderate assistance):	The patient requires moderate physical assistance (25%–50% help).
Level 2 (maximal assistance):	The patient requires maximal physical assistance (>50% help).
Level 1 (total assistance):	The patient cannot transfer and requires full physical assistance.

Note: Abbreviations: FIM = functional independence measure; L-FIM = locomotion-FIM; T-FIM = transfers-FIM.

measured as the time required to move from sitting with both feet on the floor to the supine position with the entire body completely lying on the bed. The bed was always in a flat position.

The 5-m walker gait, sitting-rising, and supine-to-sitting and sitting-to-supine times were measured daily from post-operative day 1 to day 5 by nurse co-researchers who were not involved in the data analysis and who were familiar with the measurement methods. Measurements were taken during the day according to the patient's condition and schedule rather than at set times due to ethical considerations. All subjects were instructed to relax before performing the measurements at their usual and comfortable speeds. These methods have been commonly used in previous studies to assess walking speed in the elderly (Graham et al., 2008; Muñoz-Mendoza et al., 2010); all measurements were performed twice each time, with sufficient rest in between, and the best values were used for analyses to capture the individual's best performance. Measurements were performed using an electric medical examination bed (Takara Belmont Corporation, Japan).

To identify the effectiveness of the new indices, we also measured standard indices generally used to determine patient independent walking ability during the chronic postoperative period. The research collaborators measured the Frail CS-10, FRT, and isometric knee extension muscle strength test on the day of admission to the hospital ward and on postoperative day 3, taking into consideration the patients' conditions. The measurements were performed twice, and the maximum values were obtained using previously described measurement methods (Iwase et al., 2014; Morio et al., 2007; Katoh & Kaneko, 2014). All procedures were performed with the permission of the attending physician;

nurses accompanied the patients and carefully performed the procedures.

The gold standard for determining independent mobility using a walker is the FIM, a reliable and valid instrument that evaluates 18 ADLs on a scale of 1-7, with 1 indicating total assistance and 7 indicating complete independence (Ottenbacher et al., 1996). In this study, we evaluated L-FIM and T-FIM. If both the L-FIM and T-FIM values were ≥6, the patient was considered to have independent mobility. In contrast, if the L-FIM and/or T-FIM were <6, the patient was considered to have limited mobility requiring nursing supervision. Both L-FIM and T-FIM were rigorously evaluated by the PT in charge before surgery and from postoperative day 1 to day 5. The PTs in charge were limited to those familiar with the measurement methods. The FIM evaluation and measurement results for each index were blinded. The specific assessment items of L-FIM and T-FIM are listed in Table 1.

Statistical Analysis

Mobility measurement results are shown as median values (interquartile range 25%-75%). Logistic regression analyses were performed using the 5-m walker gait, sitting-rising, and supine-to-sitting and sitting-to-supine times and previously reported indices as explanatory variables and L-FIM and T-FIM values of ≥6 as dependent variables. The likelihood ratio and Hosmer-Lemeshow test were used to validate the explanatory variables in the logistic regression analysis. To consider multicollinearity, correlation matrices were created for each variable to confirm a significant linear correlation. Additionally, the generalized estimating equation was analyzed for repeated use of the data, and the results were confirmed to have no differences. In this analysis, data that

could not be obtained because of pain, fatigue, or perioperative symptoms were excluded. The level of significance was set at 5%, and statistical analyses were conducted using JMP Pro 14.2.0 (SAS Institute Inc., Cary, NC, USA).

Results

Demographic and Baseline Characteristics

Of the 33 cases analyzed in this study, 18 (54.5%) and 15 (45.5%) underwent unilateral THA and TKA, respectively; 16 (48.5%) and 17 (51.5%) patients were men and women, respectively. The median age was 69.0 (62.0-76.0) years, and the median body mass index was 25.0 (23.5-27.1) kg/m^2. The median operative time was 107 (96.0-121.0) min. The prehospital rate of falls was 18.2% among patients who underwent THA or TKA; however, falls did not occur during the study period. None of the subjects had a history of other musculoskeletal or neurological conditions affecting mobility. The median duration of hospitalization was 16.0 (15.0-17.0) days. Among the study participants, 39.4% and 60.6% were discharged home and transferred to other hospitals, respectively. All subjects were mobilized starting on postoperative day 1 or 2 (Table 2).

5-m Walker Gait, Sitting-rising, and Supine-to-sitting and Sitting-to-supine Times

Preoperative evaluations showed the following median values for the new indices: 6.4 (5.3-7.2), 9.1 (7.5-13.8), 3.4 (3.0-4.7), and 3.3 (2.6-4.7) s for the 5-m walker gait, sitting-rising, supine-to-sitting, and sitting-to-supine times, respectively. The longest times for the indices were on postoperative days 1 and 2 and gradually declined thereafter (Figure 2).

Frail CS-10, Isometric Knee Extension Muscle Strength, and FRT Results

The median Frail CS-10 result was 5.0 (3.0-7.0) and 2.0 (0.0-4.0) times on the preoperative assessment and postoperative day 3, respectively, which was a significant reduction ($p < .05$) from the preoperative value. The median isometric knee extension muscle strength of 0.034 (0.025-0.048) N/kg on postoperative day 3 was also significantly reduced ($p < .05$) from the preoperative value of 2.3 (1.9-2.6) N/kg. There were no significant differences between the median preoperative FRT value of 30.2 (25.0-35.1) cm and the median postoperative day 3 value of 30.3 (21.5-34.1) cm.

FIM

Both the L-FIM and T-FIM were 3.0 (2.0-3.0) days postoperatively, with 72.7% being able to use walkers independently (L-FIM and T-FIM ≥ 6) within 3 days postoperatively.

Table 2. Characteristics of the participants ($N = 33$).

Characteristics	
Age (years), median (IQR)	69.0 (62.0–76.0)
Sex, n (%)	
Male	16 (48.5)
Female	17 (51.5)
Surgery, n (%)	
THA	18 (54.5)
TKA	15 (45.5)
BMI (kg/cm^2), median (IQR)	25.0 (23.5–27.1)
Operating time (min), median (IQR)	107.0 (96.0–121.0)
Prehospital falls, n (%)	
Yes	6 (18.2)
No	27 (81.8)
Hospitalized falls, n (%)	
Yes	0 (0.0)
No	33 (100.0)
Hospitalization (day), median (IQR)	16.0 (15.0–17.0)

Note: Abbreviations: IQR = interquartile range; THA = total knee arthroplasty; TKA = total hip arthroplasty; BMI = body mass index.

Verifying the Validity and Efficacy of the Clinical Judgment Value

There were no significant differences in the results of the measurement indices between patients who underwent THA or TKA, including in the FIM results. Thus, this study's method of combining THA and TKA data was considered valid.

Correlation of Each Index with FIM and Clinical Judgment Value

In the logistic regression analysis, all three newly developed indices were significant ($p < .05$) for independently determining the mobility of walkers. Additionally, the previously used measurement index, Frail CS-10, was confirmed to be significant. However, the isometric knee extension muscle strength test and FRT were not significant indices for determining transition to independence with mobility in the acute period after THA or TKA.

When evaluating the clinical judgment value using receiver operating characteristic (ROC) curves and Youden's index (sensitivity + specificity − 1), a cutoff value of 8.60 s for the 5-m walker gait time had sensitivity, specificity, Youden's index, and AUC of 90.5%, 86.7%, 0.772, and 0.90, respectively. This index was demonstrated to be the most predictive index for determining the transition to independence with mobility in the acute period after THA or TKA. Furthermore, on the basis of a logistic regression analysis that limited the explanatory variables to L-FIM and T-FIM alone, this index showed the highest predictability for ambulation, whereas T-FIM had the highest predictability for transferring (Table 3). Moreover, a similar analysis was per-
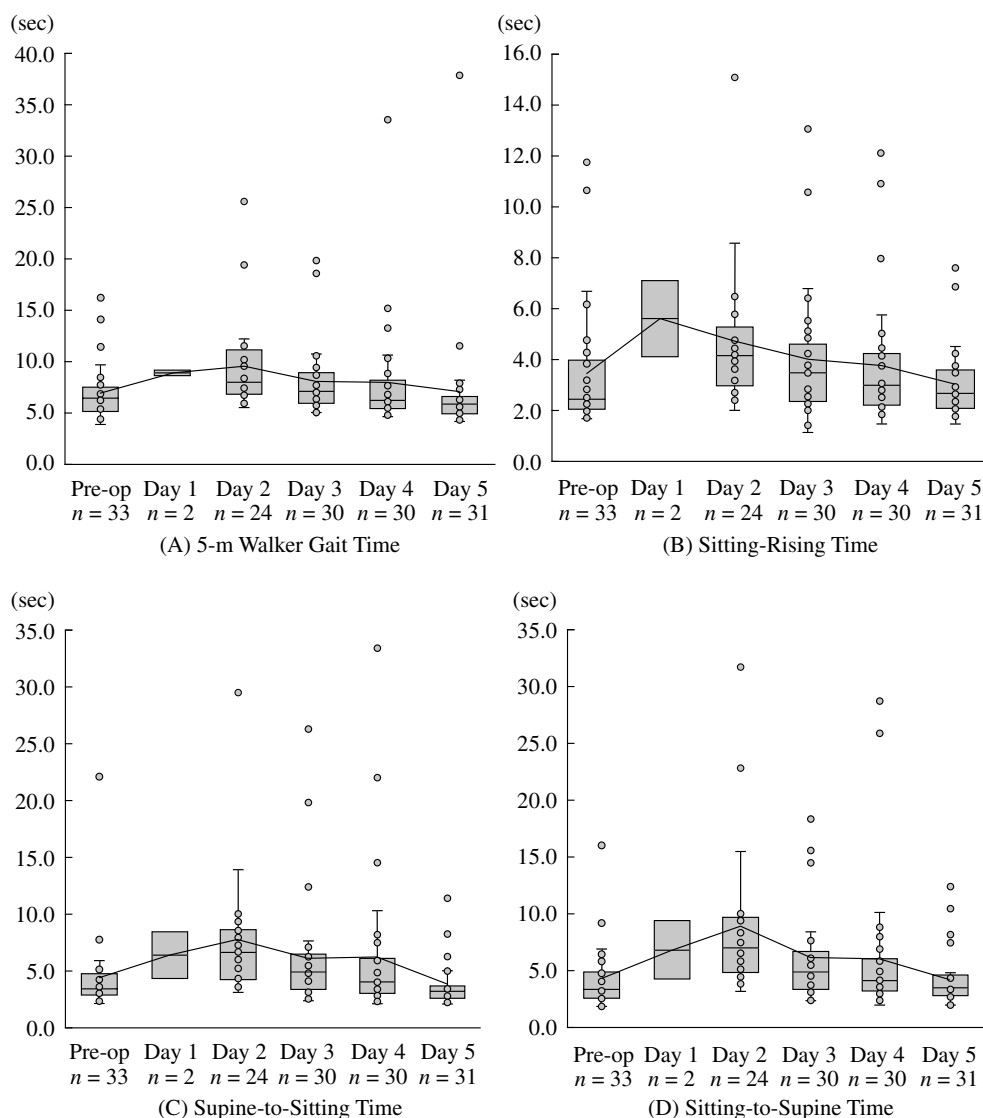
Figure 2. Daily changes in new indices.

Note: (A) The 5-m walker gait, (B) sitting-rising, (C) supine-to-sitting, and (D) sitting-to-supine times were measured on the preoperative day and daily from postoperative day 1 to day 5 according to the patient's condition and schedule rather than at set times due to ethical considerations. Data are expressed as median values (IQR 25%–75%). The longest time (sec) was on postoperative day 1 and gradually declined thereafter. Abbreviation: IQR = interquartile range.

formed by separating only THA and TKA. The results showed that the new index also demonstrated higher predictive ability than the previous index.

Discussion

In this study, as a first step to validate the new indices, the cutoff values and validity of the following three indices were tested: 5-m walker gait, sitting-rising, and supine-to-sitting and sitting-to-supine times. The results of our multiple logistic regression analysis using L-FIM and T-FIM results as dependent variables and ROC curves indicated that these new indices have equivalent or even better model fit,

sensitivity, and specificity than previously reported indices, indicating their high clinical effectiveness. The 5-m walker gait time (with ≤8.82 s considered independent) had the highest Youden's index (sensitivity + specificity − 1) and AUC, indicating that this is the most appropriate evaluation for determining independence with mobility.

Mobility comprises multiple components, including muscular strength, endurance, flexibility, balance, speed, reaction time, and power. Therefore, the tools used for mobility assessment should be carefully selected after considering the purpose and utility of the assessment results (Nakamura & Ogata, 2016). For the assessment of gait-related parameters, gait speed (Abella et al., 2009; Peel et al., 2013) and maxi-

Table 3. Regression analysis of new and old indices.

FIM: dependent variables	Indices: explanatory variables	Observed times	*p*-value	Youden's index	Cutoff	Sensitivity	Specificity	AUC
L-FIM and T-FIM ≥ 6 Independence with mobility L-FIM and/or T-FIM < 6 Nonindependence with mobility	5-m Walker gait time	110	<.0001***	0.772	8.60	0.905	0.867	0.90†
	Sitting-rising time	110	<.0001***	0.688	3.78	0.821	0.867	0.85†
	Supine-to-sitting time	110	<.0001***	0.481	3.78	0.547	0.933	0.81†
	Sitting-to-supine time	110	.0006**	0.639	4.52	0.705	0.933	0.80†
	Frail CS-10	75	<.0001***	0.738	1.00	0.738	1.000	0.87†
	Operative-side leg press	33	.360	0.308	0.049	0.308	1.000	0.57
	FRT	32	.325	0.423	33.40	0.423	1.000	0.66
L-FIM ≥ 6 Independence with mobility L-FIM < 6 Nonindependence with mobility	5-m Walker gait time	110	<.0001***	0.772	8.60	0.905	0.867	0.90†
	Sitting-rising time	110	<.0001***	0.688	3.78	0.821	0.867	0.85†
	Supine-to-sitting time	110	<.0001***	0.481	3.78	0.547	0.933	0.81†
	Sitting-to-supine time	110	.0006**	0.639	4.52	0.705	0.933	0.80†
T-FIM ≥ 6 Independence with mobility T-FIM < 6 Nonindependence with mobility	5-m Walker gait time	110	<.0001***	0.687	8.60	0.869	0.818	0.85†
	Sitting-rising time	110	.0004**	0.707	3.78	0.768	0.909	0.83†
	Supine-to-sitting time	110	.0002**	0.444	4.76	0.717	0.727	0.78†
	Sitting-to-supine time	110	.0039*	0.586	4.52	0.677	0.909	0.76†

Note: *p*-values were obtained using the likelihood ratio and Hosmer-Lemeshow tests. *p <.05; **p <.001; ***p <.0001

‡AUC = 1.0–0.9, high accuracy; †AUC = 0.9–0.7, moderate accuracy. Abbreviations: FIM = functional independence measure; Frail CS-10 = 10-s chair stand test; FRT = functional reach test; L-FIM = locomotion-FIM; T-FIM = transfers-FIM.

mal step length, the ability to maximally step out and return to the initial position (Abellan et al., 2009) is used. In this study, a 5-m walking time was established to identify walking speeds that are less burdensome for acutely ill patients. The 5-m walker gait time can be easily measured during usual nursing practice, such as when patients go to the restroom or for rehabilitation. Furthermore, it can be used repeatedly because of its minimal patient burden. A patient's mobility function can be monitored frequently, enabling timely judgment of when it is appropriate for the patient to transition to walking independently. Additionally, it is a versatile tool, requiring only a portable watch to measure gait time, without the need for a stopwatch or other special devices.

To determine whether the 5-m walker gait time can be used to estimate not only ambulation but also transferability, the dependent variables of L-FIM (ambulation) and T-FIM (transferring) were analyzed separately. These results indicated that the 5-m walker gait time was strongly associated with both L-FIM and T-FIM. The proposed 5-m walker gait time in this study is presumably a parameter of various physical functions, including balance ability and trunk function, and may have predictive ability not only for ambulation but also for transfers.

Miyazaki et al. (2022) reported that the stand-up test is a useful index for determining whether locomotive syndrome improves after THA. Standing and rising movements require a sufficient range of motion, flexibility, and balance of the joints, in addition to muscle strength of the lower limbs, trunk, and other parts of the body, and can be comprehen-

sively assessed in terms of locomotor functions. In this study, sitting-rising and supine-to-sitting and sitting-to-supine times were established to quantitatively measure these functions. The results of this study demonstrate that the sensitivity and specificity of sitting-rising and supine-to-sitting and sitting-to-supine times for independent mobility were comparable with those of the Frail CS-10. Because transfer motion is a cause of pain in patients undergoing THA or TKA, the Frail CS-10, which requires multiple sitting and rising movements within 10 s, can be a burdensome condition in the early postoperative period after THA and TKA and can increase the risk of hip dislocation in patients undergoing THA. The fact that the sitting-rising and supine-to-sitting and sitting-to-supine time indices proposed in this study can be measured in a single movement demonstrates their clinical value. In clinical practice, measurements are expected to be performed while the patient is in bed. Therefore, mattress firmness might influence the versatility of these indices, and further consideration and verification of this factor are necessary.

The limitations of this study include the following: (1) the small sample size and the need for further data collection while limiting the disease in detail for generalization; (2) the single-center design of the study and the need for the findings to be validated in a multicenter setting; (3) lack of validation of these measures for reproducibility by clinical nurses; and (4) lack of validation of patient safety in performing these measures. Regarding safety, the 5-m walker gait time is associated with a significant burden in patients with difficulty walking. After THA and TKA, the sitting-

rising and supine-to-sitting and sitting-to-supine times may place stress on the surgical site and should be performed with caution. Furthermore, the indices evaluated in this study did not directly assess falls but were rather quantitative evaluations of a patient's mobility function for walking independently. Therefore, these indices do not directly guarantee falling safety. If these study limitations cannot be overcome, it would not be possible to use the research findings in clinical settings.

As a future direction based on our findings, we propose that the reproducibility and safety of this measure be verified, the new cutoff values be combined with the CAS, and their correlation with fall risk and safety be examined comprehensively. Such an approach can considerably improve the ability of medical staff members, including nurses, to objectively assess a patient's mobility and manage fall risks thereby promoting safer and more effective gait practices during postoperative care.

###To conclude, the cutoff values of these new indicators, the 5-m walker gait, sitting-rising, and supine-to-sitting and sitting-to-supine times, have been shown to be clinically valid and more effective than those of conventional indicators. In particular, the 5-m walker gait time (independent mobility <8.6 s) may be a clinically valid and effective index that enables postoperative patients who underwent THA or TKA to optimally progress in their ADLs according to their ambulatory function.

Acknowledgments

Author Contributions
FY, TK, CN, CK, SM, AH, YF, KT, EC, and HS contributed to the study conception and design. FY, TK, CN, CK, and SM acquired the data. FY and AH performed the statistical analysis and drafted the manuscript. YF, KT, EC, and HS interpreted the data and critically reviewed the manuscript. HS supervised the entire study process. All authors have read and approved the final version of the manuscript.

Declaration of Conflicting Interests
The authors declare no conflicts of interest.

Ethical Approval
This study was conducted in accordance with the ethical standards for human experimentation established in the Declaration of Helsinki (as revised in Fortaleza, Brazil, October 2013). This prospective observational study was approved by the institutional research ethics board of the authors' institution (approval O-0512). All subjects were informed of the following: (1) the purpose and methods of this study, (2) anticipated duration of participation in the study, (3) expected clinical advantages and disadvantages, (4) that participation in the study was at the subjects' own will and that the subjects could refuse or withdraw from the study at any time without causing any adverse treatment, (5) data management methods, (6) how the results would be handled both orally and in writing, and (7) that the privacy of the subjects would be protected even if the results were made public. Written informed consent was obtained from all participants. All measurements and evaluations were performed with the utmost consideration of the subjects' conditions and intentions. Measurements were not performed if they were determined to be inappropriate on the basis of the subjects' conditions or if the subjects did not wish to continue with the measurements.

Funding

Data Availability Statement
The data supporting the findings of this study are available upon request from the corresponding author. The data are not publicly available for privacy and ethical reasons.

References
Abellan van Kan, G., Rolland, Y., Andrieu, S., Bauer, J., Beauchet, O., Bonnefoy, M., Cesari, M., Donini, L. M., Gillette Guyonnet, S., Inzitari, M., Nourhashemi, F., Onder, G., Ritz, P., Salva, A., Visser, M., & Vellas, B. (2009). Gait speed at usual pace as a predictor of adverse outcomes in community-dwelling older people an International Academy on Nutrition and Aging (IANA) Task Force. *Journal of Nutrition, Health and Aging*, *13*(10), 881-889. https://doi.org/10.1007/s12603-009-0246-z

Afilalo, J., Kim, S., O'Brien, S., Brennan, J. M., Edwards, F. H., Mack, M. J., McClurken, J. B., Cleveland, J. C., Jr., Smith, P. K., Shahian, D. M., & Alexander, K. P. (2016). Gait speed and operative mortality in older adults following cardiac surgery. *JAMA Cardiology*, *1*(3), 314-321. https://doi.org/10.1001/jamacardio.2016.0316

Amano, T., Tamari, K., Uchida, S., Ito, H., Tanaka, S., Morikawa, S., & Kawamura, K. (2016). Jinkohizakansetsuzenchikanjutsu tekiyokanja no bariansu hassei ni taisuru haikeiinshi to jutsugosoki no kinokaifuku no chigai [Differences in background factors and functional recovery during the early postoperative period and their effect on the variance in gait acquisition of patients undergoing total knee arthroplasty]. *The Japanese Journal of Rehabilitation Medicine*, *53*(9), 723-731. https://doi.org/10.2490/jjrmc.53.723

Brown, C. J., Friedkin, R. J., & Inouye, S. K. (2004). Prevalence and outcomes of low mobility in hospitalized older patients. *Journal of the American Geriatrics Society*, *52*(8), 1263-1270.

https://doi.org/10.1111/j.1532-5415.2004.52354.x

Doherty-King, B., & Bowers, B. J. (2013). Attributing the responsibility for ambulating patients: A qualitative study. *International Journal of Nursing Studies*, *50*(9), 1240-1246.
https://doi.org/10.1016/j.ijnurstu.2013.02.007

Ferriero, G., Kristensen, M. T., Invernizzi, M., Salgovic, L., Bravini, E., Sartorio, F., & Vercelli, S. (2018). Psychometric properties of the Cumulated Ambulation Score: A systematic review. *European Journal of Physical and Rehabilitation Medicine*, *54*(5), 766-771.
https://doi.org/10.23736/S1973-9087.18.04822-0

Graham, J. E., Ostir, G. V., Fisher, S. R., & Ottenbacher, K. J. (2008). Assessing walking speed in clinical research: A systematic review. *Journal of Evaluation in Clinical Practice*, *14*(4), 552-562.
https://doi.org/10.1111/j.1365-2753.2007.00917.x

Hall, K. M., Cohen, M. E., Wright, J., Call, M., & Werner, P. (1999). Characteristics of the functional independence measure in traumatic spinal cord injury. *Archives of Physical Medicine and Rehabilitation*, *80*(11), 1471-1476.
https://doi.org/10.1016/s0003-9993(99)90260-5

Hsieh, F. Y. (1989). Sample size tables for logistic regression. *Statistics in Medicine*, *8*(7), 795-802.
https://doi.org/10.1002/sim.4780080704

Iwase, H., Murata, S., Murakami, T., & Madoba, K. (2014). Frail CS−10 wo mochiita byotonai jiritsuhoko wo kyokasuru tame no hanteikijun [Standards to determine whether or not to permit independent walking within ward using Frail CS−10]. *Japanese Journal of Health Promotion and Physical Therapy*, *4*(3), 107-112.
https://doi.org/10.9759/hppt.4.107

Katoh, M., & Kaneko, Y. (2014). An investigation into reliability of knee extension muscle strength measurements, and into the relationship between muscle strength and means of independent mobility in the ward: Examinations of patients who underwent femoral neck fracture surgery. *Journal of Physical Therapy Science*, *26*(1), 15-19.
https://doi.org/10.1589/jpts.26.15

Kristensen, M. T., Andersen, L., Bech-Jensen, R., Moos, M., Hovmand, B., Ekdahl, C., & Kehlet, H. (2009). High intertester reliability of the cumulated ambulation score for the evaluation of basic mobility in patients with hip fracture. *Clinical Rehabilitation*, *23*(12), 1116-1123.
https://doi.org/10.1177/0269215509342330

Kronborg, L., Bandholm, T., Palm, H., Kehlet, H., & Kristensen, M. T. (2016). Physical activity in the acute ward following hip fracture surgery is associated with less fear of falling. *Journal of Aging and Physical Activity*, *24*(4), 525-532.
https://doi.org/10.1123/japa.2015-0071

Kyrdalen, I. L., Thingstad, P., Sandvik, L., & Ormstad, H. (2019). Associations between gait speed and well-known fall risk factors among community-dwelling older adults. *Physiotherapy Research International*, *24*(1), article e1743.
https://doi.org/10.1002/pri.1743

Laurin, D., Verreault, R., Lindsay, J., MacPherson, K., & Rockwood, K. (2001). Physical activity and risk of cognitive impairment and dementia in elderly persons. *Archives of Neurology*, *58*(3), 498-504.
https://doi.org/10.1001/archneur.58.3.498

Lindemann, U., Lundin-Olsson, L., Hauer, K., Wengert, M., Becker, C., & Pfeiffer, K. (2008). Maximum step length as a potential screening tool for falls in non-disabled older adults living in the community. *Aging Clinical and Experimental Research*, *20*(5), 394-399.
https://doi.org/10.1007/BF03325143

Miyazaki, S., Tsuruta, K., Yoshinaga, S., Yamaguchi, Y., Fujii, Y., Arakawa, H., Ochiai, M., Kawaguchi, T., Unoki, A., Sakamoto, T., Tajima, T., Nakamura, Y., Funamoto, T., Hiyoshi, M., & Chosa, E. (2022). Effect of total hip arthroplasty on improving locomotive syndrome in hip disease patients: A prospective cohort study focused on total clinical decision limits stage 3. *Journal of Orthopaedic Science*, *27*(2), 408-413.
https://doi.org/10.1016/j.jos.2020.12.028

Miyazaki, S., Yoshinaga, S., Tsuruta, K., Hombu, A., Fujii, Y., Arakawa, H., Sakamoto, T., & Chosa, E. (2021). Total knee arthroplasty improved locomotive syndrome in knee osteoarthritis patients: A prospective cohort study focused on total clinical decision limits stage 3. *BioMed Research International*, 2021, article 3919989.
https://doi.org/10.1155/2021/3919989

Morio, Y., Izawa, K., Watanabe, S., Omori, Y., Hiraki, K., Nishiyama, M., & Kawama, K. (2007). Koreishindaikekkankanja ni okeru kashikinryoku [Relationship between lower limb muscle strength, reach forward distance, and walking independence in elderly patients with cardiovascular diseases]. *Journal of Japanese Association of Cardiac Rehabilitation. Zenporichikyori to Hokojiritsudo Tono Kanren Ni Tsuite*, *12*(1), 113-117.

Muñoz-Mendoza, C. L., Cabrero-García, J., Reig-Ferrer, A., & Cabañero-Martínez, M. J. (2010). Evaluation of walking speed tests as a measurement of functional limitations in elderly people: A structured review. *International Journal of Clinical and Health Psychology*, *10*, 359-378.

Nakamura, K., & Ogata, T. (2016). Locomotive syndrome: Definition and management. *Clinical Reviews in Bone and Mineral Metabolism*, *14*(2), 56-67.
https://doi.org/10.1007/s12018-016-9208-2

Oberfeld, J., von Hertzberg-Boelch, S. P., Weissenberger, M., Holzapfel, B. M., Rudert, M., & Jakuscheit, A. (2021). Effect of mobilization on the day of surgery after total hip arthroplasty in elderly, obese, and severely diseased patients. *The Journal of Arthroplasty*, *36*(11), 3686-3691.
https://doi.org/10.1016/j.arth.2021.06.024

Ottenbacher, K. J., Hsu, Y., Granger, C. V., & Fiedler, R. C. (1996). The reliability of the functional independence measure: A quantitative review. *Archives of Physical Medicine and Rehabilitation*, *77*(12), 1226-1232.
https://doi.org/10.1016/s0003-9993(96)90184-7

Peel, N. M., Kuys, S. S., & Klein, K. (2013). Gait speed as a measure in geriatric assessment in clinical settings: A systematic review. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, *68*(1), 39-46.
https://doi.org/10.1093/gerona/gls174

Rogers, M. A., Fries, B. E., Kaufman, S. R., Mody, L., McMahon, L. F., & Saint, S. (2008). Mobility and other predictors of hospitalization for urinary tract infection: A retrospective cohort study. *BMC Geriatrics*. Fries: BE. Kaufman, TX: SR, *8*, 31.
https://doi.org/10.1186/1471-2318-8-31

Safiri, S., Kolahi, A. A., Smith, E., Hill, C., Bettampadi, D., Mansournia, M. A., Hoy, D., Ashrafi-Asgarabad, A., Sepidarkish, M.,

Almasi-hashiani, A., Collins, G., Kaufman, J., Qorbani, M., Moradi-Lakeh, M., Woolf, A. D., Guillemin, F., March, L., & Cross, M. (2020). Global, regional and national burden of osteoarthritis 1990-2017: A systematic analysis of the Global Burden of Disease Study 2017. *Annals of the Rheumatic Diseases*, *79*(6), 819-828.
https://doi.org/10.1136/annrheumdis-2019-216515

Sall, J. (2002). Monte Carlo calibration of distributions of partition statistics.
https://www.jmp.com/content/dam/jmp/documents/en/white-papers/montecarlocal.pdf. Cary, NC: SAS Institute p. 18.

Teasell, R., & Dittmer, D. K. (1993). Complications of immobilization and bed rest. part 2: Other complications. *Canadian Family Physician Medecin de Famille Canadien*, *39*, 1440-1442, 1445-1446.

Wallis, J. A., & Taylor, N. F. (2011). Pre-operative interventions (non-surgical and non-pharmacological) for patients with hip or knee osteoarthritis awaiting joint replacement surgery − A systematic review and meta-analysis. *Osteoarthritis and Cartilage*, *19*(12), 1381-1395.
https://doi.org/10.1016/j.joca.2011.09.001

Zegelin, A. (2008). 'Tied Down' - The process of becoming bedridden through gradual local confinement. *Journal of Clinical Nursing*, *17*(17), 2294-2301.
https://doi.org/10.1111/j.1365-2702.2007.02261.x

Brief Report

Relationship among death conferences, willingness and confidence in end-of-life care, and practice of grief care in Japanese home-visit nursing stations

Ayumi Sugimura, PhD, RN, PHN[1] (iD), Naoko Nakashima, MSN, RN[2] (iD), Rika Hayashi, MSN, RN[3] (iD), and Shoko Ando, PhD, RN[4] (iD)

[1]Department of Comprehensive Health Sciences, Nagoya University Graduate School of Medicine, Nagoya, Japan, [2]Sugiyama Jogakuen University School of Nursing, Nagoya, Japan, [3]Nagoya City University Hospital, Nagoya, Japan, and [4]Ichinomiya Kenshin College School of Nursing, Ichinomiya, Japan

Abstract

This study aimed (1) to clarify the actual operation of death conferences in Japanese visiting nursing stations and (2) to clarify the relationship between death conferences and willingness and confidence for end-of-life care and the practice of grief care. We randomly selected 1522 facilities from 9557 visiting nursing stations nationwide registered as "providing 'end-of-life care' services" using the Long-Term Care Services Information Disclosure System. The number of selected facilities was determined according to the number of nursing stations visited in each prefecture. Request letters and survey forms were sent to the concerned facilities, and one nurse manager was asked to respond to these forms. Of the 1496 nursing stations that featured end-of-life care in Japan, we received responses from 247 individuals, making 220 valid responses. Of these, 113 facilities (51.4%) responded that they hold death conferences. Univariate analysis showed correlations between death conferences and willingness and confidence in end-of-life grief care practices. These results suggest that holding death conferences may increase nurses' confidence and willingness for end-of-life care and the practice of grief care.

Introduction

Death conferences in Japan are case studies of end-of-life care for dying patients. However, unlike the morbidity and mortality conferences in Europe and the United States, these are highly developed in Japan. These conferences aim to clarify care issues, educate staff ethically, and provide grief care for the staff by allowing them to express their feelings about the case. In Japan, the practice of death conferences has been adopted by palliative care wards, general hospital wards, and home healthcare settings. The Japan Visiting Nursing Foundation (2021) states that holding death conferences influences the high level of proactive end-of-life care and recommends holding death conferences to improve the quality of end-of-life care. However, its implementation rate at visiting nursing stations is insufficient, at approximately 50%, and its actual status and effectiveness are unclear.

A patient's bereavement is an experience of loss of the relationship with the patient and a negative experience driven by regret and remorse about whether one could fulfill one's role as a nurse (Guo & Zheng, 2019). In contrast, it has been highlighted that bereavement experiences can increase

self-confidence and self-affirmation in dealing with dying patients (Gillman et al, 2015). One effective way to connect these growths is through "debriefing," in which painful experiences are processed by talking to others about them (Zheng et al., 2018). Debriefings are offered to those who have experienced bereavement. Recently, it has been reported to help nurses accept their bereavement experience by expressing their grief and promoting motivation for future end-of-life care. (Phillips et al., 2021; Rice et al., 2014). In other countries, processing debriefing sessions and support groups based on these factors have helped providers grow (Yazdan et al., 2023). We hypothesized that death conferences contribute to debriefing in Japan, increasing nurses' willingness and confidence in their care. Therefore, we hypothesized that holding death conferences would be related to nurses' willingness and confidence in end-of-life care and the practice of grief care. We attempted to test this hypothesis and believed that the results of this study would expand the use of death conferences and find organizational psychological support for nurses involving end-of-life care in difficult situations.

This study aimed to clarify (1) the actual situation of death conferences at visiting nursing stations and (2) the relationship between death conferences and willingness, confidence, and the practice of grief care.

Materials and Methods

1) Definition of Terms

End-of-life care: the care provided for dying persons, including patients' deathbed care, in this research.

2) Study Design

This study adopted a cross-sectional study design.

3) Study Subjects

In this study, the nurse managers of visiting nursing stations registered as featuring end-of-life care services were included. Nurse managers who participated only in managing visiting nursing stations were excluded.

There were two reasons for selecting this study subject. Because it was anticipated that awareness of death conferences in visiting nursing stations would be low, nursing managers with the highest level of knowledge and skills in the facility and those who accurately recognize the facts were targeted. Furthermore, to clarify the relationship between end-of-life care practice and death conferences, the participants were nursing managers involved in care and administrative duties.

4) Survey Method

From the 9557 visiting nursing stations (as of August 31, 2021) registered as providing "end-of-life care" services in each prefecture's long-term care service information disclosure system, 1522 facilities were randomly selected according to the ratio of the number of facilities in each prefecture. Request letters and survey forms were sent to the facilities concerned, and one nurse manager was asked to respond.

5) Survey Contents

It was hypothesized that holding death conferences would be associated with visiting nurses' willingness and confidence for end-of-life care and the practice of grief care. We included the following items in the survey:

(1) Subjects' background: Sex, age, number of experiences in providing deathbed care at home, professional qualifications, and attitudes toward the care of dying patients. We selected the Japanese version of the Frommelt attitude toward care of the dying scale Form B (FATCOD) (Nakai et al., 2006) for attitudes toward the care of dying patients. FATCOD shortened version comprised six items by two domains. This scale has two domains: "positive attitude toward caring for the dying patient" and "perception of patient- and family-centered care." It is evaluated by a 5-Lickert scale and calculates the total score by each domain.

(2) Facility background: The number of years since its establishment, number of deathbed cases per year, and management parent, etc.

(3) Willingness and confidence for end-of-life care: To measure visiting nurses' confidence and willingness for end-of-life care, we used the attitude toward terminal homecare scale (Shimizu, 2016). This scale comprised 12 items in four domains. This scale has four domains: "confidence in staff support," "confidence in communication with physicians," "willingness to provide home palliative cancer care," and "confidence in home palliative cancer care." It is evaluated by a 5-Lickert scale and calculates the total score by each domain.

(4) Grief care: Grief care after the patient's death scale (Ono, 2011) was used to measure the quality of care after bereavement because grief care for family is one of the most important care after the patient's death. This scale comprised 21 items in three domains. This scale has three domains: "sharing and support of the family's experience of the patient's death," "psychosocial support for rebuilding life," and "grasping of state for resuming social activities." It is evaluated by a 5-Lickert scale and calculates the total score by each domain.

(5) Whether or not a death conference is held.

(6) Methods of managing death conferences: whether or not they are held, the frequency of holding death conferences, the number of participants, the types of jobs that participate, etc.

Table 1. Personal and institutional background of the research subjects.

	Total (N = 220)			Death conference held (n = 113)			No Death conference (n = 107)			p	d	φ
	n	%	M ± SD	*n*	%	M ± SD	*n*	%	M ± SD			
Age (years)												
30–39	20	9.1		12	10.6		8	7.5				
40–49	68	30.9		31	27.4		37	34.6		.64		.09
50–59	110	50.0		58	51.3		52	48.6				
>60	22	10.0		12	10.6		10	9.3				
Final Educational Background												
Vocational school 2-year program	56	25.5		22	19.5		34	31.8				
Vocational school 3-year program	115	52.3		66	58.4		49	45.8				
College	24	10.9		12	10.6		12	11.2		.15		.18
University	12	5.5		5	4.4		7	6.5				
Graduate school	10	4.5		7	6.2		3	2.8				
NA	3	1.4		1	0.9		2	1.9				
Years of nursing experience			26.5 ± 8.3			27.2 ± 8.4			25.6 ± 8.2	.17	.19	
Years of visiting nurse experience			10.8 ± 7.1			11.4 ± 6.9			10.1 ± 7.3	.20	.18	
Years of experience as a general ward manager			2.6 ± 5.6			3.1 ± 6.1			2.1 ± 5.0	.21	.18	
Years of experience as a visiting nurse manager			5.6 ± 5.1			6.1 ± 5.2			5.2 ± 5.0	.19	.18	
Number of experience that provided deathbed care at home												
<10	27	12.3		12	10.6		15	14.0				
10–20	40	18.2		15	13.3		25	23.4				
20–30	37	16.8		17	15.0		20	18.7		.11		.17
>30	110	50.0		64	56.6		46	43.0				
NA	6	2.7		5	4.4		1	0.9				
Certified Nurse Specialist (Fields: Cancer Nursing, Infection Control Nursing, Gerontological Nursing)												
I have	6	2.7		4	3.5		2	1.9		.68		.05
Certified Nurse (Palliative Care, Dementia Nursing, Visiting Nursing, Dysphagia Nursing) /Certified Nurse Administrator												
I have	20	9.1		16	14.2		4	3.7		.01		.19
Training history												
Palliative care	164	74.5		89	78.8		75	70.1		.27		.09
End-of-life care	180	81.8		98	86.7		82	76.6		.08		.12
Death Conference	55	25.0		35	31.0		20	18.7		.04		.14
FATCOD-B-J												
Positive attitude toward caring for the dying patient			12.4 ± 1.6			12.4 ± 1.7			12.4 ± 1.5	.99	<.01	
Perception of patient- and family-centered care			10.7 ± 1.9			10.5 ± 2.0			10.9 ± 1.6	.16	.22	
Facilities attached to the hospital												
Yes	69	31.4		31	27.4		38	35.5		.24		.02
Affiliation of Certified Nurse Specialist/Certified Nurse												
Yes	35	15.9		24	21.2		11	10.3		.04		.15
Management parent												
Independent business	40	18.2		17	15.0		23	21.5				
Medical corporation	70	31.8		33	29.2		37	34.6				
Corporate management	32	14.5		15	13.3		17	15.9		.27		.14
Others	72	32.7		43	38.1		29	27.1				
NA	6	2.7		5	4.4		1	0.9				
Addition of visiting nursing system enhancement												
Yes	13	5.9		9	8.0		4	3.7		.25		.09
Number of years of visiting nursing			13.1 ± 9.5			14.3 ± 9.7			11.8 ± 9.2	.05	.26	
Number of deathbed case per year			15.0 ± 16.6			15.5 ± 11.3			14.4 ± 21.2	.67	.07	
Number of full-time nurses			5.2 ± 3.3			5.7 ± 3.7			4.6 ± 2.8	.03	.33	

Note: Statistical analysis was analyzed using the chi-square and t-test.

Table 2. Actual Status of death conferences.

n = 113

		n	%			n	%
Frequency	1–3 times/week	2	1.8	Time required (min)	≤15	18	15.9
	Once/2 weeks	2	1.8		16–30	55	48.7
	Once/month	16	14.2		31–45	21	18.6
	Irregular	89	78.8		46–60	14	12.4
	NA	4	3.5		>60	2	1.8
Number of participants	≤5	49	43.4		NA	3	2.7
	6–10	50	44.2	Case (multiple answers)	All	22	19.5
	11–15	6	5.3		Difficult case	24	22.1
	16–20	1	.9		Difficult to respond to	23	20.4
	>20	3	2.7		Sense of inadequacy remains	24	21.2
	NA	4	3.5		Difficult to form relationships	15	13.3
Moderator (multiple answers)	Nurse in charge of DC	30	26.6		Home-visit nursing was interrupted	1	.9
	Leader nurse	15	13.3		People could not be taken care of at home	8	7.1
	Nurse manager	51	45.1		Multidisciplinary collaboration was possible	12	10.6
	Doctor	6	5.3		Meet the wishes of patients and their families	9	8
	Other	10	8.8		High satisfaction	4	3.5
	NA	5	4.4		Decision-making was difficult	13	11.5
Minute taker (multiple answers)	Nurse in charge of DC	36	31.9		Others	5	4.4
	Leader nurse	16	14.1	Timing	Within one week of passing away	21	18.6
	Nurse manager	18	15.9		Within one month of passing away	57	50.4
	Doctor	0	0		Within 3 months of passing away	21	18.6
	Other	38	33.6		Within six months of passing	6	5.3
	NA	8	7.1		Within one year of passing away	2	1.8
Participants (multiple answers)	Doctor	31	27.4		Others	2	1.8
	Psychiatrist	1	.9		NA	4	3.5
	Pharmacist	7	6.2	Expected effects (multiple answers)	Care reflection	103	91.2
	PCT member	11	9.7		Find the next challenge	100	88.5
	Nutritionist	6	5.3		Bereavement family care	20	17.7
	Physiotherapist	30	26.5		Staff education	75	66.4
	Occupational therapist	20	17.7		Information sharing	50	44.2
	Medical social worker	11	9.7		Reduction of psychological fatigue	69	61.1
	Nursing assistant	5	4.4		Staff grief care	72	63.7
	Ward nurse	10	8.8		Increased team cohesion	44	38.9
	Cancer counselor	1	.9		Increased staff confidence	69	61.1
	Hospital clerk	4	3.5		Understanding among multiple professions	35	31
	Other	20	17.7		Deepening the bond with the deceased	10	8.8
Time slot of conference	Day shift	72	63.7		Sharing nursing views	56	49.6
	After day shift	12	10.6		Fostering a view of life and death	50	44.2
	Occasional/Tailored to Participants	26	23		Others	1	.9
	NA	3	2.7				

6) Analysis

Descriptive statistics were used to determine the actual status of the subject background and how death conferences were operated. To clarify the relationship between the presence or absence of death conferences and background factors, we analyzed the relationship between facility background and individual background and the presence or absence of death conferences using chi-square and t-tests. Furthermore, t-tests were used to clarify the association between the presence or absence of death conferences and the attitude toward terminal homecare scale, a grief care after the patient's death scale. Statistical analyses were performed using the Statistical Package for the Social Sciences, version 23, and the significance level was set at $p < .05$.

7) Ethical Considerations

This study was approved by the Graduate Bioethics Review

Table 3. Association between death conferences and grief care after the patient's death scale and attitude toward terminal home care scale.

	Total (N = 220)		DC held (n = 113)		No DC (n = 107)		*p*	*d*
Items	M	*SD*	M	*SD*	M	*SD*		
Grief care after the patient's death scale								
F1: sharing and support of the family's experience of the patient's death	37.20	6.17	38.14	5.34	36.22	6.83	.02	*.32*
F2: psychosocial support for rebuilding life	28.24	7.39	29.13	7.32	27.29	7.38	.03	*.25*
F3: grasping of state for resuming social activities	11.40	2.77	11.74	2.49	11.03	3.00	.03	*.26*
Attitude toward terminal home care scale								
F1: confidence in home palliative cancer care	11.31	2.76	11.55	2.52	11.06	2.98	.19	*.18*
F2: confidence in staff support	10.93	2.70	11.23	2.42	10.61	2.94	.04	*.24*
F3: confidence in communication with physicians	10.85	2.53	10.89	2.33	10.81	2.73	.83	*.03*
F4: willingness to provide home palliative cancer care	12.73	2.39	13.04	2.16	12.39	2.58	.04	*.27*

Note: Statistical analysis was analyzed using the t-test.

Committee of Nagoya University. All study participants were informed in writing about the confidentiality of their anonymity, the voluntary nature of their participation in the study, and the airtightness of data management, and their consent was obtained.

Results

Of the 1522 facilities, the survey was mailed to 1496 facilities, excluding 26 that could not be mailed due to unknown addresses. Overall, 247 facilities responded (collection rate: 16.5%), and 220 facilities were considered to have valid responses (valid response rate: 89.1%).

Study Subjects and Facility Background

Table 1 shows the study subjects and facility background. Regarding age, most respondents were in their 50s (50.0%), and the second most common age group was 40s (30.9%). Nurses with 26.5 ± 8.3 years of nursing experience, visiting nurses with 10.8 ± 7.1 years of experience, and visiting nurse managers with 5.6 ± 5.1 years of experience were more likely to be certified nurses and have attended death conference training than those in facilities that did not hold death conferences (*p* <.05).

The number of full-time nurses was 5.2 ± 3.3, and the number of deathbed cases per year was 15.0 ± 16.6.

Operational Status of Death Conferences

Of the 220 facilities, 113 (51.4%) responded that they hold death conferences. The actual status of holding death conferences is shown in Table 2.

Correlation between Holding a Death Conference and the Attitude toward Terminal Homecare Scale, the Grief Care after the Patient's Death Scale

Table 3 shows the association between holding a death con-

ference and attitude toward terminal home and grief care. There was an association between whether a death conference was held and the three factors of grief care after the patient's death scale and the "confidence in staff support" and "willingness to provide home palliative cancer care" of the attitude toward Terminal Home Care Scale (*p* <.05).

Discussion

1) Actual Conditions for Holding Death Conferences at Visiting Nursing Stations

Death conferences were held at approximately half of the facilities. At the facilities surveyed in this study, death conferences primarily aimed to clarify the steps for difficult cases that left the staff feeling inadequate, including providing grief care and reassuring the staff. This indicates that death conferences function similarly to debriefing (see above). Alternatively, compared with 96.7% of palliative care wards and 72.7% of general wards where death conferences were held (Nakashima, 2021; Hayashi, 2021), the prevalence of death conferences at visiting nursing stations is still insufficient. The fact that many full-time nurses were affiliated with facilities that hold death conferences in this survey suggests that visiting nursing stations are currently engaged in care with a smaller fixed staff than that of hospitals, making it difficult to hold conferences with a limited number of staff.

From the above, it can be said that death conferences at visiting nursing stations are not widespread enough; however, it is desirable to establish a unique method for reviewing end-of-life care at home, tailored to the characteristics of each facility.

2) Effectiveness of Holding Death Conferences

There were correlations between death conferences and grief care after the patient's death scale, confidence in staff sup-

port, and willingness to provide home palliative cancer care. A typical death conference primarily comprises a case study of a deceased patient and the staff's grief care. We considered that the reason associated with grief care practice is the deep understanding of patients through case studies and reaffirming the need for care for the family and patient. Additionally, end-of-life care is an emotionally exhausting experience, causing nurses and others to feel helpless and hopeless (Cross, 2019). We believe that those who have had painful experiences and have emotionally opened up and validated their experiences through storytelling are the reasons associated with high willingness for end-of-life care. Additionally, we believe these results support our hypothesis that death conferences are as effective as debriefings, which have been shown to be effective in grief care for overseas staff. Ludwig et al. (2022) stated that sharing good and painful emotions increases mutual closeness and collaboration. The shared feelings of accomplishment and pain through the above process increased the sense of closeness and collaboration among staff members, leading to the association between high confidence in staff support and death conferences found in this study. Additionally, this study's results might be influenced by the fact that the study population comprised administrators from each facility. The high confidence of the administrators might be influenced by their ability to understand the feelings of their staff members through death conferences. Hirose (2010) describes the significance of death conferences as (1) deep understanding of patients and their families through care evaluation, (2) planning care for the bereaved families, (3) sharing ideas and thoughts among staff members, and (4) restoring confidence and motivation as a professional. In this study, because death conferences have been found to be associated with high levels of grief care practice, confidence and willingness suggest the effectiveness and support the significance of death conferences as described by Hirose et al. With the recent shift of the place of care to home in Japan, homecare nurses are increasingly becoming involved in end-of-life care. Conversely, visiting nurses reportedly have difficulties and skill shortages related to end-of-life care (Heydari et al., 2019; Lai et al., 2019). The findings in this study suggest that death conferences are associated with grief care practices and nurses' willingness and confidence, suggesting death conferences as an effective strategy to support homecare nurses involved in end-of-life care.

However, there are some limitations of this study. Because this study was a cross-sectional survey, fully examining the causal effects of holding death conferences on nurses' confidence, willingness, and grief care practice was impossible. Furthermore, we cannot rule out relationships among explanatory variables, such as grief care, confidence, and willingness. It is also possible that unknown variables may have affected nurses' confidence, willingness, and grief

care practice. This should be further verified in intervention studies, and further analysis should include other variables. In addition, differences in the impact of death conferences depending on the operation system and their content must be verified. In this study, self-confidence, willingness, and grief care practice indicated growth from the bereavement experience; however, the effects may become clear for other psychological indicators, such as grief. Furthermore, since the study was conducted during the coronavirus disease 2019 pandemic, it may not fully reflect the usual practice.

Conclusions

A self-administered questionnaire survey was administered to visiting nursing stations nationwide, with the following results: Of the 220 visiting nursing stations that responded, 113 (51.4%) held death conferences. Death conferences and willingness and confidence for end-of-life care were correlated, suggesting that holding death conferences may improve the quality of end-of-life care by visiting nurses.

Author Contributions
All authors conceived the idea of the study. SA developed the statistical analysis plan, conducted statistical analyses, and drafted the original manuscript. AS supervised this study. All authors approved the final version of the manuscript to be published.

Declaration of Conflicting Interests
We have no conflict of interest to disclose.

Ethical Approval
This study was approved by the Bioethics Review Committee, Nagoya University Graduate School of Medicine (No.: 2021-0329)

Informed Consent
Informed consent was obtained from all participants involved in this study.

References
Cross, L. A. (2019). Compassion fatigue in palliative care nursing: A concept analysis. *Journal of Hospice and Palliative Nursing*, *21* (1), 21-28.
https://doi.org/10.1097/NJH.0000000000000477

Gillman, L., Adams, J., Kovac, R., Kilcullen, A., House, A., & Doyle, C. (2015). Strategies to promote coping and resilience in oncology and palliative care nurses caring for adult patients with malignancy: A comprehensive systematic review. *JBI Database of Systematic Reviews and Implementation Reports*, *13*(5), 131-204.

Guo, Q., & Zheng, R. (2019). Assessing oncology nurses' attitudes to-

wards death and the prevalence of burnout: A cross-sectional study. *European Journal of Oncology Nursing*, *42*, 69-75.

Hayashi, R., Nakashima, N., Sugimura, A., & Ando, S. (2021, Dec 4-5). Ippanbyoutou to kanwakeabyoutou ni okeru death conference no uneijyoukyou [Comparison of the operation of death conferences in general wards and palliative care wards] [Poster session]. *The Japanese Journal of Clinical Research on Death and Dying 45th*, Fukuoka, Japan.

Heydari, H., Hojjat-Assari, S., Almasian, M., & Pirjani, P. (2019). Exploring health care providers' perceptions about home-based palliative care in terminally ill cancer patients. *BMC Palliative Care*, *18*(1), 66.

Hirose, H. (2018). *Hitan to gurifukea: Desukanfarensu*. Igaku-Shoin Ltd.

Japan visiting nursing foundation (2021, Mar). *Mitori he no torikumi ni kansuru youin [Effective factors of end-of-life care]. Houmon kangoshi muke zaitaku mitori kyouiku puroguramu no kaihatu jigyou houkokusho* [Report on a project to develop a home end-of-life care education program for visiting nurses]. https://www.jvnf.or.jp/katsudo/kenkyu/2020/mitorihoukokusyo.pdf

Lai, X. B., Chen, L. Q., Chen, S. H., & Xia, H. O. (2019). An examination of home-based end-of-life care for cancer patients: A qualitative study. *BMC Palliative Care*, *18*(1), 115.

Ludwig, V. U., Berry, B., Cai, J. Y., Chen, N. M., Crone, D. L., & Platt, M. L. (2022). The impact of disclosing emotions on ratings of interpersonal closeness, warmth, competence, and leadership ability. *Frontiers in Psychology*, *13*, 989826. https://doi.org/10.3389/fpsyg.2022.989826

Nakai, Y., Miyashita, M., Sasahara, T., Koyama, Y., Shimizu, Y., & Kawa, M. (2006). Frommelt no taminarukea taido shakudo nihongobann (fatcid-b-j) no inshi kozo to shinraisei no kento [Factor structure and reliability of the Japanese version of the frommelt attitudes toward care of the dying Scale (FATCOD-B-J)]. *Gan Kango*, *11*(6), 723-729.

Nakashima, N., Hayashi, R., Sugimura, A., & Ando, S. (2021, Dec 4-5). Death conference no unei ni oite kanwakea byoutousichou ga kokorogaketeiru koto [Strategy related to the death conference as practiced by the head nurse of the palliative care unit] [Poster session]. The Japanese Journal of Clinical Research on Death and Dying 45th, Fukuoka, Japan.

Ono, W. (2011). Conceptualizing actions and outcomes of grief care for bereaved caregivers: Survey of visiting nurses in Japan. *Journal of Japan Academy of Nursing Science*, *31*, 25-35.

Phillips, C. S., Volker, D. L., Becker, H., & Davidson, K. L. (2021). Storytelling through music to improve well-being in oncology nurses: A feasibility study. *Cancer Nursing*, *44*(6), 473-481.

Rice, K. L., Bennett, M. J., & Billingsley, L. (2014). Using second life to facilitate peer storytelling for grieving oncology nurses. *Ochsner Journal*, *14*(4), 551-562.

Shimizu, M., Nishimura, M., Ishii, Y., Kuramochi, M., Kakuta, N., & Miyashita, M. (2016). Development and validation of scales for attitudes, self-reported practices, difficulties and knowledge among home care nurses providing palliative care. *European Journal of Oncology Nursing*, *22*, 8-22.

Zheng, R., Lee, S. F., & Bloomer, M. J. (2018). How nurses cope with patient death: A systematic review and qualitative meta-synthesis. *Journal of Clinical Nursing*, *27*(1-2), e39-e49.

Brief Report

Sense of coherence in the life experiences of persons with schizophrenia living in the community

Aya Kuramoto, RN, PHN, MSN(iD), and Kumi Watanabe, RN, PHN, PhD(iD)

School of Nursing, Faculty of Medicine, Kagawa University, Miki, Japan

Abstract

The purposes of this study were to clarify the life experiences of persons with schizophrenia living in the community that form their sense of coherence (SOC) and to examine how support for community transition and settlement should be provided, focusing on SOC. Semiconstructive interviews were conducted with six participants. Interview data were qualitatively analyzed for content using a deductive approach. The SOC constructs of comprehensibility, manageability, and meaningfulness were used as predefined categories for interpreting participants' descriptions. The meaning of the data was interpreted and coded into concise expressions, using the participants' own words as much as possible. Multiple codes were collected, abstracted, and categorized. Comprehensibility consisted of three categories: uncertain outlook, outlook on the course of illness and symptoms, and feeling of being able to make a living. Manageability consisted of four categories: restructuring of life based on the activities of the facility, searching for ways to cope with illnesses and symptoms, relationships built through trial and error, and regrets and problems related to schoolwork and employment. Meaningfulness consisted of two categories: life unencumbered by schizophrenia and longing for being an "ordinary person" and having an "ordinary life." The participants' narratives included factors that both increased and decreased their comprehensibility, manageability, and meaningfulness, and meaningfulness was considered the most important. The participants told us what they gave up and gained because of the onset of schizophrenia. Our findings indicate that support is necessary for people with schizophrenia to find meaning in their current life.

Keywords

sense of coherence (SOC), comprehensibility, manageability, meaningfulness, schizophrenia

JINR 2024, *3*(2), e2023-0044

Introduction

Transitioning and settling persons with mental disorders into the community is a major issue being addressed as a national policy. A factor that may hinder the transition of patients with schizophrenia into the community is their vulnerability to stress, which is a characteristic of the illness. Therefore, it is desirable to provide support that focuses on coping with stressors, especially a coping strategy that promotes personal recovery.

We focused on the sense of coherence (SOC) proposed by Antonovsky (1987/2001). SOC consists of the three subconcepts of: "comprehensibility," "manageability," and "meaningfulness." These subconcepts are not only protection against stressors and crises that are present in everyone's life but also a source of growth, development, and happiness (Yamazaki et al., 2019) and are thought to promote personal recovery for persons with schizophrenia. We focused on this concept because the more a person can understand and integrate (comprehensibility), handle (manageability), and make

sense (meaningfulness) of an experience or disease, the greater their potential to successfully cope with the situation or disease (Hammond & Niederman, 2010).

A study on the SOC of people with schizophrenia reported that health level, age, and life satisfaction affect SOC scores (Nakamura et al., 2008). Additionally, a conceptual analysis of recovery for people with schizophrenia living in the community (Narita & Kobayashi., 2015) defined recovery as follows: "the process in which such patients act subjectively and build mutual relationships in the community with hopes and goals, in order to improve the quality of life while improving adherence." Thus, the process of understanding and coping with one's condition and symptoms toward one's hopes and goals reflects the three concepts of SOC.

There are few qualitative studies on SOC. Previous studies have investigated oral health in healthy older adults (Shmarina et al., 2022) and self-care in older adults living in rural areas (Söderhamn et al., 2011). In Japan, studies on family caregivers of persons with mental disabilities have been conducted (Sakai & Mizuno, 2014), but no studies have examined persons with schizophrenia themselves. Persons with schizophrenia in the community who use psychiatric daycare have reported both positive and negative life outlook experiences (Kasuga & Shimizu, 2018). These encounters could be interpreted as individuals having abundant or insufficient coping resources. Antonovsky (1987/2001) refers to these coping resources as generalized resistance resources (GRRs). Evaluating the lives of the parties involved from the perspective of GRRs and SOC will lead to the consideration of new community life support. The purposes of this study were to clarify the life experiences of individuals with schizophrenia living in the community that form their SOC and to examine how support for community transition and settlement should be provided, focusing on SOC.

Methods

Participants

The participants were persons with schizophrenia who met the following criteria: (1) lived in a prefecture in the Shikoku region of Japan and used facilities for persons with mental disabilities; (2) had never been hospitalized in a psychiatric institution, or if they had been hospitalized, it had been >1 year since their discharge; (3) understood that their illness was schizophrenia; and (4) were adults. The administrators of the facility were briefed on the outline of the study, and those who were confirmed by the facility administrators as having no obstacles to participation were asked to enroll in the study. Community activity support centers (hereinafter, Facility A) and type B continuous employment support facilities (hereinafter, Facility B) cooperated in this study. Facility A incorporates light work into its activities,

whereas Facility B conducts indoor and outdoor work and is adjacent to a community activity support center that is different from Facility A.

Data Collection

We conducted semiconstructive interviews once with each participant using an interview guide that we developed. We asked about their basic attributes, life experiences (such as past and memorable events, decisions, and their evaluation of those events), living conditions in the community (such as living pattern and rhythm, support situation, and satisfaction with living conditions), and future life and life plans. The focus of the interviews was how the participants viewed their own lives and life plans. Before the interviews, we visited each facility once every 1 to 2 weeks for approximately 6 months to form relationships with the users of each facility. Interviews were conducted in an environment where privacy was maintained, at a location of the participant's choice, and were recorded with a digital voice recorder with the participant's consent. The data collection period was from February to March 2020.

Data Analyses

The data were qualitatively analyzed for content using a deductive approach. We used the SOC components (comprehensibility, manageability, and meaningfulness) as predefined categories for the interpretation of the participants' accounts. We first transcribed all the recorded interview data into a verbatim transcript, which was repeatedly read to obtain an overview of the narratives. Subsequently, the parts of the transcripts that were considered to represent comprehensibility, manageability, and meaningfulness were extracted from the transcripts in meaningful chunks by comparing their content with the question items. The data were repeatedly read, and their meanings were interpreted and coded into a concise expression using the participant's own words as much as possible. Multiple codes were collected, abstracted, and categorized. The results were discussed among the authors until agreement was reached and then subjected to member checking by the participants to ensure their rigor and truthfulness.

Ethical Considerations

The Research Ethics Committee of Kagawa University Faculty of Medicine approved all study procedures (approval no.2019-225).

Results

Summary of the Participants

Participants were five males and one female, with a mean age of 53.5 years. They had been diagnosed with schizophrenia for approximately 20-35 years. The number of hos-

Table 1. Summary of participants.

Partic-ipants	Sex	Age	Facility used	Medical history (approximate, years)	Number of psychiatric hospitalizations	Number of years living in the community (approximate, years)	Living with someone	Interview time (minutes)
A	Male	60s	Facility A	35	3	30	No	37
B	Male	50s	Facility A	25	1	25	Yes (Parents)	36
C	Male	40s	Facility B	20	3	6	Yes (Parents)	43
D	Female	50s	Facility B	25	0	50	No	34
E	Male	40s	Facility B	20	1	20	No	59
F	Male	50s	Facility B	30	0	50	Yes (Parents)	38

pitalizations ranged from 0 to 3, and the number of years they had been living in the community ranged from approximately 6 to >30 years. Three participants lived with their parents, and three were living alone. The average interview time was 41.2 min (minimum of 34 min and maximum of 59 min; Table 1).

Life Experiences Constituting the SOC

Categories and subcategories are in square brackets and double quotation marks, respectively, and typical narratives are italicized. We supplemented the narratives in parentheses.

Comprehensibility consists of three categories and eight subcategories. The [uncertain outlook] category consisted of "anxiety about the future after the death of parents (*If my father or mother were to die, become ill, or do something else, I do not know how I could help them or how I should live my life.*)," "anxiety about one's own old age," and "economic uncertainty." The [outlook on the course of illness and symptoms] category included "understanding of the ups and downs of symptoms (*But it becomes better or worse. If I had a funeral or a memorial service for a family member, it would become worse.*)" and "predictions based on the course of family members' illnesses." The [feeling of being able to make a living] was defined by "support for meals (*My mother buys me food. She also cooks lunch and dinner for me. I feel blessed.*)," "financial stability," and "optimism about the future" (Table 2). Participants were anxious about their own and their parents' aging and the waves of symptoms, but they also felt that they could live with schizophrenia.

Manageability consists of 4 categories and 13 subcategories. The [restructuring of life based on the activities of the facility] category consisted of "finding a place of one's own through the encounter with the facility ([*The existence of the facility is*] *big, big, big. I am very happy that I could come here.*)," "a fixed schedule to some extent," "changing lifestyle due to financial burden," and "caring for and seeing off parents." The [searching for ways to cope with illnesses and symptoms] category consisted of "complicated procedures for applying for services," "devising ways to manage medications ([*For medication management*] *I use a notebook, buy*

a calendar, and check my medications. I do not forget to take them.)," "coping with auditory hallucinations," and "my own approach to health." The [relationships built through trial and error] category consisted of "dependable surroundings (*There is support. There is quite a lot, including the people in the community. I feel blessed. It is pretty good.*)," "ways to get along with others," and "review of previous relationships." The [regrets and problems related to schoolwork and employment] category consisted of "high hurdles in study and employment (*I was unemployed until I was over 40 years old. I did not even know that this kind of facility existed, and I just could not aim for employment because finding a job was very difficult.*)" and "regrets from my school days" (Table 3). Through their past life experiences, the participants could find their way to deal with schizophrenia and make a living.

Meaningfulness consists of two categories and seven subcategories. The [Life unencumbered by schizophrenia] category consisted of "broadening of perspective gained through the illness (*I have made more friends since I became ill. I am starting to think that it is a matter of how I think*)," "positive acceptance of the current situation," and "hopes for future work and hobbies." [Longing for being an "ordinary person" and having an "ordinary life"] category consisted of "comparison with others," "experience of setbacks associated with the illness," "giving up on marriage and child-rearing," and "realization that parents have given up on them ([*My parents*] *gave up on me as far as finding a job. As for other things, in the past, playing games, watching TV, and things like that were not allowed in the middle of the day, but they have been more accepting recently, or rather … they stopped telling me not to do so*)" (Table 4). The participants embraced a life that was not limited by schizophrenia, but they also felt unable to live lives similar to those of ordinary people.

Discussion

The narratives in this study included factors that both increased and decreased "comprehensibility," "manageability," and "meaningfulness." We found that the parties involved

Table 2. Comprehensibility category.

Category	Subcategory	Participants' narratives (supplement in parentheses)
Uncertain outlook	Anxiety about the future after the death of parents	Both my mother and father are around 80 years old, so if my father gets sick or my mother gets sick, it would be difficult, but I think it will happen because both my parents are around 80 years old. I can't think of what to do if that happens. What should I do? If my father or mother were to die, become ill, or something else, I don't know how I could help them or how I should live my life. I still don't have a clear picture of what it will be like to be in my 50s. I still feel like I am 30 or 40 years old. I'm still in a kind of a daze, not thinking about my own future. But I have no idea what I should do if my mother or father dies, or if they get sick, or what I should do. (B)
		(About his mother's aging) Yes, I do. I think there are people who have a place they can go where they will live alone after their mother dies. There is a nursing home in XX (name of the place), but there is a home for the elderly in XX. But I don't have money. I don't have 130,000 yen a month. (F)
	Anxiety about one's own old age	(On a scale of 1 to 100,) I would rate my current life as about 60. I am satisfied with my life itself, but I am a little worried about the future. I wonder how much longer I can come here (Facility B) and not become bedridden. (D)
	Economic uncertainty	I'm living off my savings right now. So, I don't know how long it will last and how long I will be able to live. I am worried about my financial situation. I'm thinking of getting welfare in the end. I'm still fine. (Even to my cousin, who is my key person) I don't talk to her about financial matters. (D)
		My brother sends me 20,000 yen every month, and it helps me a lot. The maintenance fee is about 20,000 yen, which is very expensive, and the parking fee was 6,000 yen, so I quit driving because I couldn't afford it. I wish I didn't have any illnesses. I must pay about 5,000 yen a month for medicine. (F)
Outlook on the course of illness and symptoms	Understanding the ups and downs of symptoms	(The period before rekindling) is 12 years? That's a lot of time. But it gets better or worse. If I had a funeral or a memorial service for a family member, it would get bad. It is inevitable. Yes. There were waves. It was quite a lot. (C)
		I have managed to stay in the hospital even though I have had my ups and downs. Well, there have been some things that have happened. Fortunately, I have been doing well for about a year so far. On the contrary, I don't think I would have been in this kind of state of mind if I had not become ill. I think I would have been very strong, or rather, I would have been proud and bullish. I think I was a proud, headstrong person until I got sick. I don't know if it is going in the right direction. I think it is going in the right direction, but I don't know. Well, you know. It's not so easy. It's complicated, isn't it? Yes, it is complicated. I don't know if the disease can be cured as it is, well, there is probably no cure for this disease. Well, I think the disease is in remission, well, maybe. I think my current state is probably the best. I think it's the best state. (E)
	Predictions based on the course of a family member's illness	My mother had schizophrenia, and it happened before I was born. (My mother's onset was) when she got married at 24, and I have an older sister, and she was stillborn. And from that time, from the time of the stillbirth, my mother was in bad shape. So, when I was born, she was in and out of the hospital a lot. By the time she died, she had been in the hospital for more than 30 years. I only lived with her for about one-third of my life. I tried to avoid getting sick as much as possible. I lived my life trying not to stand out. I was shocked when I found out I had the same disease as my mother, although my condition is different from hers. (D)
Feeling of being able to make a living	Support for meals	I have a disability pension. I haven't had to put it down again for a long time. I have a level 2 disability certificate. My mother buys me things to eat. She also cooks lunch and dinner for me. I feel blessed. That's why I don't have a hungry spirit. That's the way it is, isn't it? I can't help it. I'm thinking that I must do something about it in the future. Yes, I am spoiled by my parents. (C)
	Financial stability	I am not in trouble financially. I have my father's support. (B)
	Optimism about the future	My father and mother are probably the same age, in their 70s. The house we live in now is about 34 or so years old, so we have had to replace the roof and spend 1,000,000 to 2,000,000 yen to repair the walls many times. The house itself will be destroyed after 50 years or so. If you think about it simply, it will be another 15 to 16 years from now. In 15 years, my father and mother would be in their mid-80s if they were still alive. At that time, my father and mother would tell me to put some money in a savings account. I also must consult with my older brother, and I was asked the same question the other day about what I should do. I was asked the same question by a member (of the same facility). But it will be 15 years from now, so we can take our time and think about it slowly. You never know how things will change. Even if you decide now, it may change in 15 years or 6 years from now. I'm thinking a little hard about what I want to think about, and what I don't know, I don't know. I can't make a firm decision. It may change. I think I must go about it in a haphazard way. (C)

Note: The letter at the end of each narrative indicates each participant. The same applies to Tables 3 and 4.

were living with the support of the institution and the surrounding community, even though they felt that the future was difficult to predict.

Regarding comprehensibility, the participants mainly talked about their own and their parents' old age and their financial concerns. Half of the participants lived with their

Table 3. Manageability category.

Category	Subcategory	Participants' narratives (supplement in parentheses)
Restructuring of life based on the activities of the facility	Finding a place of one's own through encounters with the facility	(The existence of the facility is) big, big, big. I am very happy that I was able to come here. (A)
		The fact that such a facility existed was a bit of a surprise to me after I turned 20. I had not made many friends until then, but there were a lot of people like me there, and I wondered what they would say about that. It is not a place where people work, but a place where you can be at ease and have someone to talk to. That's the kind of place I like. I am glad I came here. (B)
		(Reason for coming to the facility) My father passed away, and I was alone and lonely. (Reason for choosing the facility) Because it was the closest to my house. I called my cousin and asked if I could go there. (D)
		Two years and eight months before I came to Facility B, I spent a year at the adjacent community activity support center. Well, I thought it would be impossible for me to do it, but after I had been there for a while, I decided to give it a try. When I was thinking about going to a type B continuous employment support facility, there was one near my house, but Facility B was next to it, and I knew some people there.
		I thought I'd try it out, and after visiting and experiencing it, I took the plunge and came. (C)
	A fixed schedule to some extent	Facility usage is usually from Monday to Friday. So, I get to the facility a little after 8:00. It takes me 35 minutes from my house, so I leave before 8:00 a.m. Then, at 8:20 or 8:25 a.m., I enter the facility, rest with a cup of tea, and light exercise from 9:00 a.m. After that, I start working. From morning until about 12:00 noon, I finish and go home. After that, I go shopping for lunch, buy udon noodles, or go to the drugstore. After that, sometimes I go to the library. I can't read the newspaper these days, but I go to the library. Or I go for a little walk, just a short one. I also listen to the radio and watch TV at home, and sometimes read books. That's about all I do. (C)
		I hardly have any hobbies now. I work until about 3:00 p.m., come home at 4:00 p.m., eat dinner, take a bath, and go to bed around 9:00 p.m. Other than that, I watch TV. (On days when I don't come to the facility,) I go shopping. (D)
		Every day, I come to Facility B, work, go home, wash dishes, do laundry, and buy things. My parents do the cleaning. A helper and a rehabilitation worker for my mother's legs also come to help us. The helper cooks for us, and... (after thinking for a while) I have a smartphone, so I look at it. Also, I come here every day except for the days I go to get my medicine. I get picked up around 9:00 a.m., so I arrive at 9:30 a.m. and work until around 3:30 p.m. On weekends, I go out to eat with my parents and hang around the neighborhood. I would go to the park and play. I used to go fishing, but I can't anymore. It's too dangerous. I can kill time by looking at my smartphone, watching TV, and cleaning, so I'm fine with that. (F)
	Changing lifestyle due to financial burden	I used to drive a car, and I was rear-ended four times. Each time, I had to call the police for an on-the-spot inspection. I was told not to drive anymore, because it would cost me a lot of money and maintenance. If I filled up my car with gas and drove it every day, it would cost me about 300,000 yen a year. I sold my car and gave up my driver's license because I thought it was a waste of money. With a bicycle, I can roam around town just fine. There is everything around for shopping. There is a supermarket and three or four convenience stores. I don't buy big things. I haven't bought a car since I lost my car. ...I don't. In the end, I must pay about 18,000 yen a month for the management fee of the apartment. Water and other expenses are not included. I must pay for my smartphone, landline phone, insurance, newspapers, and food, and I must spend 90,000 to 100,000 yen every month. It's hard to raise the money. (F)
	Caring for and seeing off parents	I also take care of my parents. I change diapers and pants. A helper used to come twice a week, but now she comes once a day. It was hard to pay for it. A rehabilitation worker comes twice a week. I have been taking care of my mother for a long time now. She injured her leg. She was hit by a car while pushing her motorcycle and had to have surgery. She was swaying, and she was getting old. I must help her when she walks. I went to see the day service, but she said she didn't like it as it was dirty, and she didn't like strangers coming in. She said that she did not need to pay a lot of money every month to go there and that she would be better off going to a coffee shop or other inexpensive places. (F)
		Even when I had a fever, my mother would leave me alone and encourage me to sleep it off. When I was menstruating and had abdominal cramps, she would say, "Don't worry." When she passed away, I remembered good things about her. (D)
		Cancer. Both of my parents died of cancer. I don't have many pictures left. When I look at them, I feel pain. On the contrary, sometimes I think it would be better if I didn't have them. On the other hand, I am busy here (at Facility B), so I guess it's okay. (E)
		I wasn't aware of it at the time, but I decided on whether to give my mother life-prolonging treatment. Even before she died, she always said that she did not want to have life-prolonging treatment like that. So, I said, "No. I won't. I won't do it." Looking back on it now, I think she probably said she didn't want to do it because her mother said she didn't want to. Well, I think that was a big decision. We didn't have many relatives, so there was no influence from them, so there was nothing to worry about. But I think it was a good thing for my mother. Just one examination is painful. It was painful for me to watch. When my father passed away, I was lucky that my mother was still alive. When my mother got ill, it was as if I was all she had left. I had to go to the hospital every day. (E)

parents; thus, their parents' health problems may negatively affect their lives, and it is necessary to prepare in advance. There are still few studies on bereavement among persons with schizophrenia; therefore, further research is needed.

Regarding manageability, it was obvious that the facility activities play a crucial role in the lives of the participants. The facility served as a "place to stay" and a place to manage their medications and health to continue using the facility. The age of onset of schizophrenia is from around puberty to early adulthood, which is an important period in the participants' academic and professional lives. It is also a period when people gradually move away from their parents and form their relationships with the people around them as they move from high school to college and into the workforce. Because the content related to mental illnesses will be included in the high school curriculum guidelines starting in 2022 (Ministry of Education, Culture, Sports, Science and Technology, 2018), it is expected that awareness will gradually expand in the future.

Of the three constructs of SOC, "meaningfulness" is the

Table 3. Manageability category (continued).

Category	Subcategory	Participants' narratives (supplement in parentheses)
Searching for ways to cope with illness and symptoms	Complicated procedures for applying for services	Sometimes I am busy because I must do the procedures myself such as paying 10% of the disability beneficiary card. If I am hospitalized, the hospital will take care of it, but the clinic where I go for treatment does not have an in-patient facility. I must go to the city hall and do all these things by myself. First, I had to go to the clinic, fill out this year's beneficiary certificate, the doctor's certificate, and other documents, then go to the Disability Welfare Division of the City Hall, go through the procedures, and come back home. That is a little bit difficult. (B)
	Devising ways to manage medications	As for what I take care of... well, I just take my medicine regularly if I can and try not to do anything weird that would make me quit this place. If I do anything too weird here, I'll get fired. Haha. (B)
		I can take care of my medications by myself. They are packaged in one container. I take out the one labeled "after breakfast" from the bag. I take it after breakfast and dinner and before bed. It is packaged in one container. It is very convenient these days. (C)
		I can use my old cell phone to set off an alarm to tell me when it's time to take my medicine. (E)
		(For medication management) I use a notebook, buy a calendar, and check my medications. I don't forget to take them. (F)
	Coping with auditory hallucinations	Sometimes the auditory hallucination tells me to "play the game" or "don't play the game," and other times it tells me to do various things that make me move to the left and right. When I was at home, the auditory hallucination would come in and say, "Have high aspirations!" I thought to myself, "There's nothing I can do about it." I am the type of person who cares, and when I start to care, I can't stop. Sometimes I get sick because of that, so I consulted with the director (of Facility B). The director told me, "Your high aspiration is to come to Facility B, work, do your best, and continue to do so." When I heard that, I couldn't hear the hallucination anymore. (E)
		The auditory hallucinations are a bit (audible). It's not as bad as before. Even the director (of Facility B) says, "Mr. F, you hear them, don't you?" So, I went in. (The content of the auditory hallucination is) what I was told at my former company: that I was a moron. (F)
	My own approach to health	It takes about 35 minutes one way (to the facility). I'm already coming by bicycle for training as well. For exercise. It's tough when I'm tired, and lately, it's been tough a lot, but when I come here, I feel like I can rest and then work. I have been coming to Facility B for about 2 years and 8 months now, so I am getting used to it. (C)
		In my daily life, what I value most is my diet. I believe that the food I eat is important. I have high natural fat, so I am told not to drink sugary juices. Sugar is not good. They tell me to eat vegetables. Black coffee is fine. (F)
		When I go to Facility B the next day, I usually take my medicine between 9:00 p.m. and 10:00 p.m. and go to bed. If I can't sleep, I get up a little bit and go to my room to make a mess, and when I feel sleepy again, I go back to my bed and get into it again. (E)
		It's not so much stress, but rather the loss of a family member and the need to do my best when it comes to funerals and memorial services. When there are events like that, I don't get enough sleep. I get a little sick. I try to do my best. I try to avoid stress. If I don't do that, my daily life becomes difficult. I must do something. (C)
Relationships built through trial and error	Dependable surroundings	Right now, most (the people I rely on) are Facility A staff. Then, there are the members who come to Facility A. I respect them all. Everyone is a good person. I was the only one who was bad. I am the only one who doesn't know anything about the world. I think of them as real, born-again adults. (A)
		The people I rely on are my father, mother, brother, brother's wife, and their children. Then, there are my relatives, my father's siblings, and my mother's siblings. There is also support from the members and staff of Facility B, as well as from the community activity support center. There are quite a lot of activities. I also go on Saturdays (to the community support center). The staff also helped me with monitoring. Even the table tennis players (people who share my hobby) send New Year's cards to each other. There is much support, including the people in the community. I feel that I am blessed. It's pretty good. Yes, it is. (C)
		I am blessed with the staff and members of Facility B and the adjoining community activity support center, and, well, I am also blessed with private friends. I don't think I can consult with all of them, though. I think I can do so when I feel like going home. But, you know, they listen to everything I say. I am grateful for that. There was a book or something in the past that said that people gain something positive when they lose something, even if they lose their parents. I feel that if I don't live my life with a sense of thankfulness, I will be punished for it. (E)
	Ways to get along with others	As the staff said, people should not speak ill of each other. Of course, it is not good to say it out loud, but even if I think about it in my heart, it will turn into a fight, and the whole country, the whole world, will be in a mess. That is all I remember. I feel like I'm saying a lot of bad things (in my heart), but I'm not going to say it (to the outside world). (A)
		I wonder if the people who play table tennis know about my illness. Some of them might know that I used to go to Facility B. I don't know how they know. But I don't think ordinary people know about it. Well, I'm trying to cover it up somehow. I don't want to say too much. It's not that we hide it too much, but we don't tell each other too much about our private lives, so if it's just table tennis, we don't tell each other. So, it's like that. (C)
	Review of previous relationships	When I went to work, I felt like I had closed the door to my mind because of the revelation of my illness, so I thought it would have been better if I had been more open. Now, everyone around me is like that, so I can do whatever I want without any declarations at all, but I didn't have that, which was a little disappointing. (D)
		There was a time when I worked part-time after the onset of the illness. I had a variety of part-time jobs, some of which I quit after about three months. The longest one I had was for two years. The last part-time job I had was at a convenience store, which also happened to be owned by the parent of a high school classmate. She tried to understand my illness, even though she didn't understand it. She encouraged me, and I was able to work in a good environment, but even so, two years was my limit because of human relations and the worsening of my illness. (E)
		Right after graduating from high school at 18, I got a job in sales, which I quit after less than a year and a half. After that, I became a factory worker, and I had the onset of the illness at the factory there. Looking back on it now, I never talked to people at all, and it was like a 3-shift system. There was the night shift, and then there was the day shift. I was not sure if I would be able to get along with the other workers. When I went home, I was so depressed that I didn't even talk to my parents. I don't know if it was because of that or not, but I felt the onset of the illness. Even in high school, there were many times when I felt that I was at fault for the dark side of my personality, including work relationships. But at that time, I couldn't get myself into that kind of frame of mind. (E)

Table 3. Manageability category (continued).

Category	Subcategory	Participants' narratives (supplement in parentheses)
Regrets and problems related to schoolwork and employment	High hurdles in study and employment	(After returning from a leave of absence from college,) I met with friends and said, "Ah, it's been a long time," but they looked away from me because I kept looking at one point. I didn't have any friends to begin with. That may not have been the cause of my illness. So, well, it wasn't something that bothered me that much. I had just gotten sick. So, as expected, I had to get used to it. I had to get used to life and all that. (C)
		(Regarding auditory hallucinations) My previous doctor diagnosed my illness, and when I read more about it in my own way, I thought about it and talked to the doctor about it. But he just said, "Yeah, that's right." And that was the end of it. I asked my friends about it, and they said, "Well, it's a good thing you found out it was just a hallucination." I may have heard something like that in high school. I think it was because my school life wasn't going so well. (E)
		I thought I was a good student until junior high school. But in the middle of high school, I started to fail. I used to be able to do it in the past, but I became like that. I quit due to an autonomic imbalance between high school and university. In high school, I was criticized and bullied, and I could not handle my studies at that time. So, if I had not been bullied back then, and if I had studied properly in high school, I would have been accepted to a better university, and I would have found a better job. That was in high school. I was able to get through junior high school without any problems. My regret is that I could not study in high school. Looking back on the past, I guess that was the turning point. After I became ill, my life did not have such ups and downs. Until high school, my parents told me to study. Do this, do that, study, study, study. But nothing happened. When I was in my 20s, I dropped out of university and was just hanging around, my parents told me to get a job. I didn't want to find a job. I wanted to take the entrance exam again and enter another university. I was spoiled, wanting to have fun. My parents told me to get a job, and it was my fault, but things became noisy and tense in the house. (B)
		It took me 6 years to graduate from college. I couldn't do well on exams because I was taking medication that suppressed my brain function, but I had to earn attendance points. I couldn't do well on exams, so I just managed to write as much as I could. I wouldn't even be able to find a job if I was suppressed like this. My parents told me to just aim for graduation. I managed to graduate in six years. From then on, I was unemployed until I was over 40 years old. I didn't even know that this kind of facility existed, and I just couldn't aim for employment because the hurdles to finding a job were so high. Getting a job, you know, that kind of thing is hard, isn't it? Even now it is hard, and even in the past, going to a facility itself was hard. In my case, I had trouble sleeping because I was sick. I thought I would just have to get used to it. I had to take medicine for that. So, to say it was difficult would be an understatement. (C)
		My previous company paid well, but they were always ragging on me because I made mistakes. I was sorted by number and sent all over the country. I was beaten up and punched with a board. My salary was about 200,000 yen, but the branch manager told me to stop because I kept making mistakes, and I was "restructured" … There were about 100 people in the company, but most of them were already "restructured." After the "restructuring," I received unemployment benefits for a year, but I went to Hello Work, and they introduced me to Facility B, and I had contacts. I've been here for about seven years now. (F)
	Regrets from my school days	When I was in junior high school, I ran for the captain of the table tennis club, but I should not have done so. It's a trivial story. I was pretty much stuck. I ran for the captaincy, but I was a nuisance to everyone around me. I was a nuisance to my fellow club members, juniors, seniors, teachers, and advisors. I regretted it a little, and a guy who seemed to be a more suitable captain than me became vice-captain. Junior high school students have interpersonal relationships unique to junior high school students, and they are often lightly bullied or excluded from the group. It is difficult to sum it up like this. If he had been the captain instead of me, he would have done better because he was smart, could study well, and had good interpersonal relationships. I think he would have done better in human relations. He had more experience. Even though he was in junior high school, he had a good future in high school and university. So, I just left it to him. But I also felt that I could have played in the table tennis club for three years because I did not want to lose to him. So, it's complicated. Those three years in junior high school were a big part of my life. I have some regrets, but I think it was a good experience. I have regrets, I have remorse, and I think it was something I shouldn't have done. I caused a lot of trouble. It was a big deal for me. For me. For my life. It's an exaggeration, but a little bit. But in return, I think it was something I had to do with a sense of responsibility. (C)

most important, and a high or low meaningfulness is reported to affect comprehensibility and manageability (Antonovsky, 1987/2001). In meaningfulness, the participants considered themselves different from "ordinary people/life," as indicated by their [longing for "ordinary people" and an "ordinary life"]. In recent years, marriage and child-rearing have become choices that the individual makes; however, the participants in this study were in their 40s-60s and may not have a clear image of what a typical family is like. Furthermore, some said that they gave up because of economic reasons. The average monthly wage at a type B facility for continuous employment support centers was 16,507 yen in FY2021 (Ministry of Health, Labour and Welfare, 2022); thus, marriage and child-rearing would be financially difficult.

Many narratives also described the involvement of supporters. Supporters can be GRRs whose role is to find positive aspects of the life of a person with schizophrenia and provide feedback to them. We found evidence of benefit finding (BF) that describes gains from developing an illness and is reported to be related to recovery (Chiba et al., 2021). Those classified as "other" in a previous study on BF of persons with mental disabilities (Chiba et al., 2010) gave responses such as "I realized that life is difficult" and "I realized how hard it is to live." In a study on SOC among drug-induced human immunodeficiency virus survivors, several participants answered that they had "come to realize that life is full of hard things," and their SOC was reported to be very high (Yamazaki & Togari, 2017). SOC and BF are similar and are thought to change depending on how the individual makes sense of the experience. Finding meaning from experience requires intervention from others. Supporters are expected to help the person take charge of his/her life.

Table 4. Meaningfulness category.

Category	Subcategory	Participants' narratives (Supplement in parentheses)
Life unencumbered by schizophrenia	Broadening of perspective gained through the illness	I don't feel like I should have had schizophrenia. It was another experience that broadened my understanding and perspective. Even when I was in college, I didn't have a part-time job at all, and I couldn't do anything about it because of my naivete about the world and my resume. I was blessed with money to send home. I didn't have much of a "hungry spirit." I didn't think I would be able to do it. I wanted to try it, but I don't know if I can do it now. There's nothing I can't do, even now. (C)
		I have made more friends since I became ill. I'm starting to think that it's a matter of how I think. I only thought about it recently. I think I became better after I got sick. I think things haven't been so good since I was in high school. In fact, in a strange way, I am thankful for my illness. From the time when I was a child to the time when I was 20 years old, things were not so good. I think it's the reverse of what happened to me. Of course, there are inconveniences. Since I became ill. Still, I can live a life of gratitude. I think I am better off after I got sick. (E)
	Positive acceptance of the current situation	I think I'd score a perfect 100 points with or without my illness. In my case, if I didn't have the illness, I would have other different problems. Even healthy people have problems. That's what I think, and that may be a reason. I have no choice but to live with it. I watch TV and read books or newspapers. I have been gathering information and thinking in my own way; gaining experience, including in table tennis; and listening to other people's lives, and I have come to this way of thinking. Well, in my own way, that's what I think. Well, whether it is correct or not, I guess I came up with it. (C)
		Basically, I believe that there is no life without regrets. So, I don't think I am conscious of that (regrets of what I should have done). (E)
		(As for his future) I'm thinking of coming to Facility B and doing some work. I want to lead an ordinary life. (F)
		What I value: sleeping and eating. Heh. Other than that, I don't have anything else. If there was something, I think it would be nice. (D)
		I still play table tennis in the club. I think table tennis is a big part of my life. It's a hobby. About twice a week, at night, in the gymnasium of the elementary school near my house. From 7:30 to 9:00 p.m. on Wednesdays and Saturdays. I'm the only young person there. Most of them are past retirement age. The younger ones work a lot of overtime. Most of the others are in their 60s and 70s. We seem to be having a good time. That's what made me happy to come to Facility B. I couldn't do it with a regular job. And I can't do that if I don't have this kind of illness, especially when I am in my 40s. Table tennis is impossible. So, in that respect, I feel blessed despite my illness. Yes, I really think so. (C)
		Of course, I was in my 20s when I developed the illness, and I felt that I could no longer live unless I went to a place where no one knew me. I thought about what I would do if people started to hate me or something like that, but it wasn't true. Then, at the age of 25 or 6, I could play soccer (my hobby), and I gradually made some friends. I started to appreciate the joy of being able to play with friends. I don't know for sure, but it was a gradual process. (E)
		If I compare my score after I got illness to my score before I got illness, it would be 10 or 20 out of 100. But recently, my score is, well, 70 or 80 (out of 100). Compared to before I became ill, my score dropped dramatically, but now that I have this place (Facility A), and with this life, my score is 70 or 80. (B)
	Hopes for future work and hobbies	As for my future job hopes, I would like to do something like cleaning apartments. I've never had much of a part-time job. To be frank, I'd like to do something like dishwashing, although it's busy. I'd be interested in working in a restaurant like that, but my father and mother are busy at that time of the day, and I'm not sure I'd like it. There are many udon noodle shops around here, and I know it's hard to keep an udon shop busy, but I do have ambitions to try it. (C)
		I am on welfare now. For the time being, I can manage to make a living. If I exceed a certain amount of wages here, the city office will collect the money. I hope to be able to do so as much as possible because it is a sign of a person's energy to be able to work or receive wages more than a certain amount every month. I will continue to come to the facility with the hope that I can do so. (E)
		I value my feelings the most. Anyway, I want to work along with other people like everyone else here and get along with everyone. I want to get along with the ladies as well. That's the bottom line. (A)
		I heard that the retirement age for Type B continuous employment support facilities is 65, but I heard that it is no longer the case, so I want to work hard and stay here until I am strong enough. I heard that I will receive a disability pension or something at age 62. So, I am thinking about what I will do when that comes in. (D)
		(On resuming soccer, which is currently on hiatus) Yes, even if I can move. No, I think it's hard to be like a manager. You mean the management. That's not easy. It's amazing, isn't it? Even though I am getting older, there are leagues where people around me are often in their 40s or older who play late at night. When there are people over 40 who are still playing soccer, it's like they are all monsters, ha ha ha. I could go to the league, even if it was just for a little while, and it wasn't a face-to-face meeting. It would be nice if they would let me go, even if it's just for a little while. Maybe when the weather gets a little warmer. (E)

The two participants who were unique in this study were C and E, both of whom had been living with schizophrenia for approximately 20 years and were younger than the other participants. Because both participants belonged to multiple organizations, the number of people with whom they associated without being defined by their illness increased. When working with them, the supporters at each facility interacted with them with their schizophrenia in mind; thus, they became aware of their "selves with schizophrenia." Although there are times when such awareness is necessary, the findings of this study indicate the importance of treating people as "one person" without interacting with them solely based on their schizophrenia.

Limitations

In discussing the history associated with their schizophrenia, we investigated the progress of people with schizophrenia and their current lives. However, the period we studied included the outbreak of the new coronavirus infection at the end of 2019; thus, the facilities used by the parties with mental disabilities were forced to suspend or reduce their activities and make changes. Originally, we planned to in-

Table 4. Meaningfulness category (continued).

Category	Subcategory	Participants' narratives (Supplement in parentheses)
Longing for being an "ordinary person" and having an "ordinary life"	Comparison with others	Life has not been as I expected. From now on, I will not speak ill of anyone, and all the members of Facility A, I will think of them as my teachers. My goal now is not to speak ill of them anymore, not even in my heart. I want to be an ordinary person, or rather, I want to be an ordinary person like everyone else. Do you know what an ordinary person is? I think that cleaning (the work of Facility A) is my calling. (A)
	Experience of setbacks associated with the illness	My own decision... I don't have any. I don't think so. I tried various things, such as getting an electrical license and working in the electrical field, learning bookkeeping to improve myself, and learning a little about the world economy and its mechanisms, but all of them were unsuccessful. If I had gone further, I think it would have been very difficult to get a job. But now that I live like this every day, it has never been so difficult. (B)
		I never (wish I had not returned my driver's license). No more. I've been rear-ended all the time. I have been rear-ended myself... I can't do it anymore because I'm too lazy to get into accidents. The other party must deal with it, too. Losses and so on. (F)
		If I hadn't gotten ill, I don't know if I would have continued as a full-time employee. I think I would probably have gone part-time. So, I can still work for about 10 years. I have been working for about 10 years, net. Since I graduated from high school. So, I wish I had worked a little longer. (D)
	Giving up on marriage and child-rearing	I don't know if it was love or an arranged marriage, but I got married, and I didn't have any illnesses at first. I won't say so clearly, but even if I do say so clearly, there were no painful illnesses. I got married normally, had a child normally, built a small house normally, and until the child grew up, we rented an apartment together at first and worked together. In the past, there was no such thing as working together, but I think it is necessary to work together. Salaries were small at first, so it was difficult to make a living. Then, after the baby was born, raising a child required money, so the two of us needed to make more money together. So, I wanted to build a slightly larger house with a nursery or something like that. I wanted to live there happily. I wanted to be able to take care of my grandchildren when I was old enough, to take care of them together, to take them to and from school, and so on. I have given up on that now. (A)
		I wanted to get married, and there were many things I wanted to do, but I couldn't afford it financially. I had to buy food for daily life, clothes, and maintenance fees for my apartment, which I couldn't afford. When I get married and have children, it will be very difficult, won't it? When I went to XXX (the name of a children's goods store) and looked at baby strollers, they cost 70,000 to 80,000 yen. I wonder if I must buy one like that. I thought, "I can't afford to buy three cardboard boxes of diapers for 5,000 yen. When I send my child to elementary school, I read in the newspaper that I would have to spend 25,000 to 30,000 yen every month for crafts and field trips. I also have to provide for my family." (F)
	Realization that parents have given up on them	(My parents) gave up on me as far as finding a job. As for other things, in the past, playing games, watching TV, and things like that were not allowed in the middle of the day, but recently they have been more accepting, or rather...they stopped telling me not to do so. (B)

clude approximately 15 participants; however, it was difficult to conduct online interviews, and we had to suspend data collection. Because of the changes in lifestyle that occurred before and after the pandemic, data from six participants obtained before the pandemic were used in the analysis. Furthermore, interviews were conducted after forming relationships with users of each facility; however, many candidates did not want to talk about their backgrounds. Consequently, the results were skewed toward participants aged 40-60 years, and only one female participant was included. Therefore, it is difficult to generalize the results. Further studies with more participants are needed to investigate the universal elements that constitute SOC.

Author Contributions

AK and KW conceived the study and study design; AK collected the data; and AK and KW analyzed and interpreted the data and drafted and critically revised the manuscript for important intellectual content. All authors have read and approved the final version of the manuscript.

Declaration of Conflicting Interests

The authors declare that there are no conflicts of interest.

Ethical Approval

This study was approved by the Research Ethics Committee of Kagawa University Faculty of Medicine (approval number: 2019-225).

Informed Consent

We explained the purpose and content of the study; the freedom to participate, refuse, or discontinue the study; and the protection of anonymity and privacy to the study participants orally and in writing and obtained their consent in writing. We also promised that the results of the study would not be used for any purpose other than that of this study and that we would take precautions to ensure that individuals could not be identified when writing papers or re-

porting at academic conferences.

References

Antonovsky, A. (2001). Kenko no nazo wo toku [Unraveling the mystery of health: How people manage stress and stay well] (Yamazaki, Y. & Yoshii, K. Trans.). *Yushindo Kobunsha* (original work published 1987).

Chiba, R., Miyamoto, Y., & Funakoshi, A. (2010). Seishin shikkan wo motsu hito ni okeru benefitto faindingu no tokusei [Characteristics of benefit-finding in people with mental illness], *Journal of Japan Academy of Nursing Science*, *30*(3), 32-40. https://doi.org/10.5630/jans.30.3_32

Chiba, R., Yamazaki, Y., Miyamoto, Y., & Funakoshi, A. (2021). Related changes in personal recovery, benefit finding, and sense of coherence among people with chronic mental illness: A two-wave study, *The Journal of Psychology*, *155*(3), 292-308. https://doi.org/10.1080/00223980.2021.1880360

Hammond, A. & Niedermann, K. (2010). Chapter 6. Patient education and self management. In K. Dziedzic, & A. Hammond (Eds.), *Rheumatology: Evidence-based practice for Physiotherapists and occupational therapists* (pp. 77-97). Churchill Livingstone. https://doi.org/10.1016/B978-0-443-06934-5.00006-1

Kasuga, A. & Shimizu, K. (2018). Chiiki de seikatsu shi dei kea ni tusho suru togoshittyosho sha ga seikatsu no mitoshi wo tateru taiken [Experiences of community: Dwelling schizophrenics who use psychiatric day care services in developing life prospects], *Journal of Japan Academy of Psychiatric and Mental Health Nursing*, *27*(1), 63-74. https://doi.org/10.20719/japmhn.17-003

Ministry of Education, Culture, Sports, Science, and Technology. (2018). Gakusyu shido yoryo ikiru chikara koto gakko gakusyu shido yoryo kaisetu hoken taiiku hen taiiku hen *[Courses of study "the power to live" - explanation of courses of study for senior high schools: Health and physical education, physical education].*

https://www.mext.go.jp/content/1407073_07_1_2.pdf

Ministry of Health, Labour and Welfare (2022). *Reiwa 3 nendo kochin chingin no jisseki ni tsuite* [Actual wages in FY2021]

https://www.mhlw.go.jp/content/12200000/001042285.pdf

Nakamura, Y., Yamazaki, T., Nukanobu, N., & Onuma, I. (2008). Mansei togoshittyosho kanjya no syubi ikkan kankaku (sense of coherence) no tokutyo to sono kanren yoin [Distinctive characteristics of SOC in patients with schizophrenia and related factors], *Journal of Japanese Society of Nursing Research*, *31*(4), 41-48. https://doi.org/10.15065/jjsnr.20080521003

Narita, T. & Kobayashi, K. (2015). Chiiki de seikatsu suru togoshittyosho kanjya no rikabari no gainen bunseki [Analysis of the concept of recovery in community living schizophrenia patients], *Journal of Japan Academy of Community Health Nursing*, *20*(3), 35-44. https://doi.org/10.20746/jachn.20.3_35

Sakai, I. & Mizuno, E. (2014). Zaitaku seishin shogaisha no kazoku kaigosha no seikatsu taiken kara toraeru sense of coherence ni kansuru kijyututeki kenkyu [Descriptive research of the sense of coherence of family caregivers of persons with mental disorders], *Journal of Japan Academy of Nursing Science*, *34*(1), 280-291. https://doi.org/10.5630/jans.34.280

Shmarina, E., Ericson, D., Franzén, C., & Götrick, B. (2022). Self-perceived oral health-related salutogenic factors in orally healthy older Swedes. A qualitative interview study, *Acta Odontologica Scandinavica*, *80*(5), 354-362. https://doi.org/10.1080/00016357.2021.2014068

Söderhamn, U., Dale, B., & Söderhamn, O. (2011). Narrated lived experiences of self-care and health among rural-living older persons with a strong sense of coherence, *Psychology Research and Behavior Management*, *4*, 151-158. https://doi.org/10.2147/PRBM.S27228

Yamazaki, Y. & Togari, T. (2017). Kenko seisei ryoku SOC to jinsei shakai zenkoku daihyo sanpuru tyosa to bunseki *[Sense of coherence, life, and society: National representative sample survey and analysis]*. Yushindo Kobunsha.

Yamazaki, Y., Togari, T., & Sakano, J. (2019). Sutoresu taisho ryoku SOC kenko wo seisei shi kenko ni ikiru chikara to sono oyo *[Introduction to the sense of coherence and salutogenesis-mechanism and application of salutogenic model and approach]*. Yushindo Kobunsha.

Brief Report

Relationship between oil massage of infants and maternal stress using physical and online modes

Yoko Takahata, RN, PHN, PhD[1,2] iD, and Mio Hirai, RN, PHN, RM, MS[3] iD

[1]Faculty of Nursing, Baika Women's University, Toyonaka, Japan, [2]School of Nursing, Tokyo Women's Medical University, Tokyo, Japan, and [3]Faculty of Nursing, Junshin Gakuen University, Fukuoka, Japan

Abstract

This study was conducted to evaluate the following factors: (a) whether baby massage has a stress-reducing effect on mothers, (b) whether baby massage positively affects babies' body mechanisms, and (c) whether mothers can form friendships after massage sessions when given the opportunity to communicate with other mothers. This one-month intervention study enrolled 24 mothers and babies (14 face-to-face sessions and 10 Zoom sessions). We conducted weekly sessions regularly for one-month in each group. Data were collected using the coping scale, maternal consciousness scale, and parenting stress scale. The maternal negative consciousness score was significantly lower at two and three weeks from baseline (*p*=.042) whereas the maternal positive consciousness score was significantly higher at three weeks from baseline (*p*=.026) in the "Zoom" group. The number of daily bowel movements among infants had significantly changed by the end of the one-month session in both the "face-to-face" group (*p*=.01) and the "Zoom" group (*p*=.039). We suggest the use of remote video as a new method for supporting mothers and babies. We found that baby massage improved maternal understanding and ameliorated maternal stress. This also constitutes a way to support mothers and babies under restricted conditions.

Introduction

The number of child abuse cases has been increasing annually in inverse proportion to the number of births. According to the number of child abuse-related consultations with child consultation centers in Japan, 205,029 cases were reported in 2020 (MHLW, 2021), constituting a 5.8% increase over the previous year. Mothers were the perpetrators in more than half of the child abuse cases, followed by fathers.

There are several reasons for the occurrence of child abuse, such as feelings of insecurity, depression, and isolation (Mochizuki et al., 2014; Tambelli et al., 2019), and parents of children aged three months to three years (Watanabe,

2015; Shimizu, 2017). Maternal depression or stress itself also has a negative effect on newborn growth and potentially leads to larger problems later in life (Hernandez-Reif et al., 2006; Yoshida et al., 2012).

Okumura and Matsuo (2011) reported that baby massage reduced parental stress and maternal depression. Porreca et al. (2017) reported that mothers could better understand their babies through baby massages. Baby massage also elicited positive reactions from babies toward their mothers, including relaxation (Okumura & Matsuo, 2011) and smiling (Porreca et al., 2017). Furthermore, Mindell et al. (2018) reported that baby massage made it easier for babies to sleep and that they tended to sleep well after a baby massage.

(Used scales in questionnaire at Session 1)
‣Coping behavior
‣Maternal positive/negative consciousness

(Used scales in questionnaire at Session 2-4)
‣Maternal positive/negative consciousness
‣Parenting stress of mothers

(Session 1st: 1 hour)
‣Explanation of the aims of this study
‣Doing Baby massage
‣Gathering (sharing worries etc.)

(Session 2nd: 1 hour)
‣Introduction & doing Baby massage
‣Gathering (sharing worries etc.)

(Session 3rd: 1 hour)
‣Introduction & doing Baby massage
‣Gathering (sharing worries etc.)

(Session 4th: 1 hour)
‣Introduction & doing Baby massage
‣Gathering (sharing worries etc.)

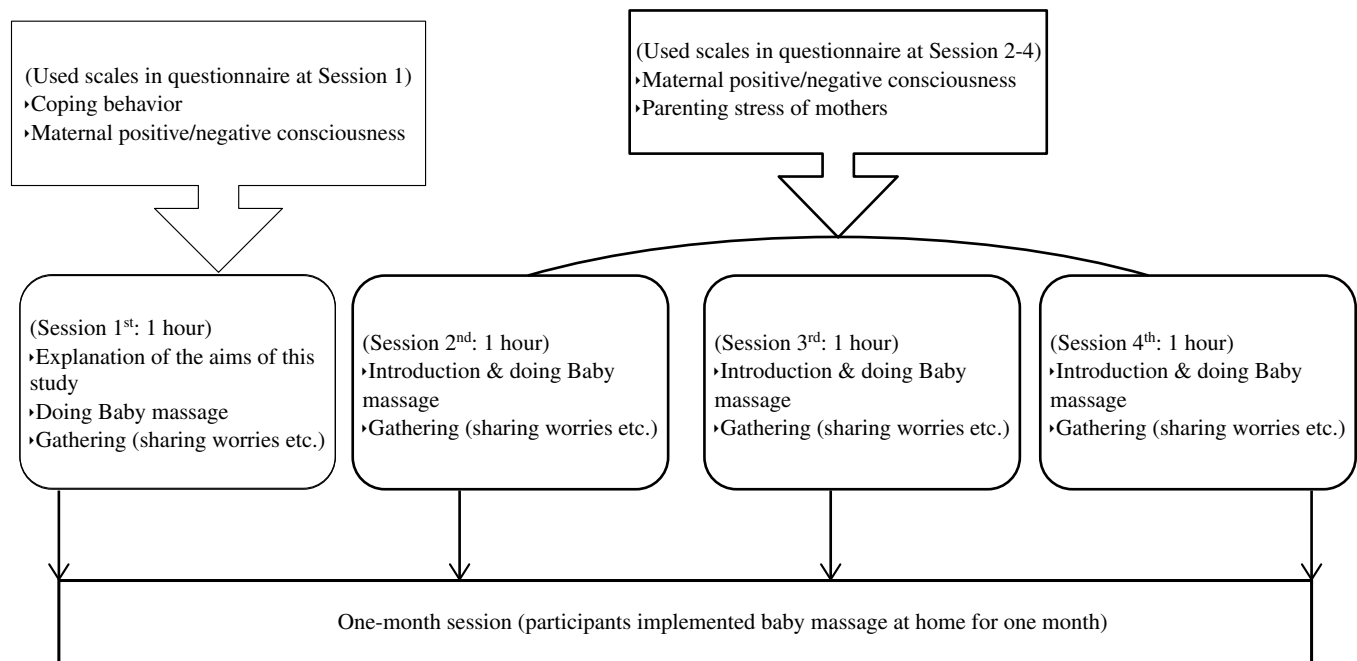One-month session (participants implemented baby massage at home for one month)

Figure 1. Study framework.

Baby massage also improves parasympathetic nerve activity (Diego et al., 2009; Guan et al., 2014). This in turn allowed mothers to sleep better, and their ability to control their babies' sleep and vagal activity improved their confidence in child-rearing.

As noted above, one of the solutions to the problems of Japanese children and mothers can be baby massage.

In addition, the novel coronavirus disease (COVID-19) became a pandemic after its initial report in China in late December 2019. This disease caused lockdowns and rendered outings dangerous, leaving mothers feeling even more isolated than in previous years. We also focused on preventing the isolation of mothers.

Given the above, the present study evaluated the effects of baby massage on mothers' stress reduction and the body mechanisms of babies. In addition, we examined whether mothers could form friendships with other participating mothers after massage sessions when the opportunity was given.

Material and Methods

The study participants were babies who were four months or more but less than six months old and their mothers as we wanted to have the baby hold up their own head to avoid any risks.

· Participants 1 (face-to-face session): In 2018, a total of 14 mothers and their babies were recruited for the study. The number of mothers in each group (the one-month course was completed within the same group) ranged from two to four, and all participants completed the one-month course.

· Participants 2 (Zoom session): In 2021, a total of 11 mothers and their babies were recruited for the study. One participant dropped out in the third of the four sessions. Therefore, data from 10 participants were used for analyses. Each group was arranged as in the face-to-face session.

Informed consent was obtained from all subjects before the initial investigation in accordance with the Declaration of Helsinki. This study was approved by the ethics review boards of the authors' institutions (#0010-0146 for 2018 and #20-05 for 2021).

This was a one-month intervention study. Baby massage sessions were held once a week for four weeks (a total of four sessions) (Figure 1). The participants were asked to continue the baby massage (even a short version of the massage) at home.

· For participants 1 (face-to-face session): At the initial session of the baby massage course, the protocol was explained to each participant in detail to confirm that she had given her informed consent. The patch test was conducted at every session before the baby massage. A gathering was held after the massage session to allow the mothers to talk regarding any problems that they had with their babies or other issues that they wanted to share with the researchers or other participants in the group. Researchers only answered questions when the participants asked for the specialist's advice. Participants who participated in baby massage sessions and face-to-face gatherings after the sessions were considered the "face-to-face" group in this study.

- For participants 2 (Zoom session): Before the initial session of the baby massage course, the protocol was explained to each participant in detail to confirm that she had given her informed consent. The patch test was conducted at every session before the baby massage and gatherings. Participants who participated in baby massage sessions and gatherings after the session over Zoom were considered the "Zoom" group in this study.
- (Q-1) Questionnaire administered in the first session.

The questionnaire asked regarding the following points: mother's date of birth, employment status, number of children, family structure, smoking status, drinking habits, existence of advisors, baby's status at birth, and birth date. The questionnaire included the coping scale and maternal consciousness scale.

- (Q-2) Questionnaire administered during the second to fourth sessions.

The questionnaire asked the following questions: whether participants had formed any friendships with others in the group, whether their baby had started sleeping better at night, and whether their baby's bowel movements (BMs) had improved. The questionnaire comprised the maternal consciousness scale and parenting stress scale.

- Coping scale (Hori & Matsui, 2001): This scale was created by Ozeki on the basis of the scale developed by Sakata Sakata (1989) and a shorter version of the scale. It comprises three subscales: "problem focus type," "emotion focus type," and "evasion/escape type." In these subscales, "problem focus type" and "emotion focus type" indicate that the person has a positive coping style. The Cronbach's alpha value was 0.83. The other subscale's "evasion/escape type" indicates that the person has a negative coping style. The Cronbach's alpha value was 0.80. Construct validity was also measured and proven.
- Maternal consciousness scale (Ohinata, 1988): This scale was created by Ohinata on the basis of her previous research. It comprises two aspects: a six-point mother's positive feelings and a six-point mother's negative feelings toward being a mother. Each aspect was calculated separately on the basis of the answers. The Cronbach's alpha value for positive feelings was 0.86, whereas that for negative feelings was 0.75. Construct validity was also measured and proven.
- Parenting stress scale (Sato et al., 1994): This scale was developed by Sato et al. (1994) on the basis of the depressive severity scale (Zung, 1965) and the psychological stress model (Lazarus & Folkman, 1987). It comprises 12 items concerning parenting stress experienced by mothers in relation to their children and 10 items concerning parenting stress experienced by mothers in relation to themselves. These two aspects can be calculated separately, and the sum of all scores is calculated. A high score indicates that the mother has high-stress levels. The Cron-

bach's alpha value of the mother's stress related to the child was 0.86, and that of the mother's stress related to herself was 0.90. Construct validity was also measured and proven.

Statistical Analyses

The Mann-Whitney U test was used to compare the results between the "face-to-face" group and the "Zoom" group. Wilcoxon's signed rank test was used to determine how "the maternal consciousness scale" and "parenting stress scale" changed with time. Wilcoxon's signed rank test was used to determine how the number of daily BMs of the babies changed over time. Fisher's exact test was used to determine how the sleep duration of the infants changed and how many mothers could cultivate friendships during the session. $p<.05$.

Statistical analyses were performed using the IBM SPSS 23.0 software (version 23.0 for Windows; IBM Corp., Armonk, NY, USA).

Results

Subjects' Characteristics

There were no significant differences in the subjects' characteristics between the "face-to-face" group and the "Zoom" group (Table 1). There were no significant differences between the "face-to-face" group and the "Zoom" group at the beginning of the one-month course, but significant differences between the groups were noted at the end of the course according to the Mann-Whitney U test (Table 2). The significantly different factors were the parenting stress experienced by mothers in relation to themselves ("face-to-face" group, 16.1±3.80; "Zoom" group:12.7±3.55; $p=.038$) and mothers' total parenting stress ("face-to-face" group, 39.3± 7.04; "Zoom" group, 31.9±6.39; $p=.031$).

The changes in maternal consciousness score over time using Wilcoxon's signed rank test are shown in Table 3. In the "face-to-face" group, the maternal positive consciousness/maternal negative consciousness scores were relatively unchanged, although the maternal negative consciousness scores changed slightly at three weeks from baseline. There were no significant differences over time in the "face-to-face" group for any factor. By contrast, in the "Zoom" group, the maternal positive consciousness scores increased with time whereas the maternal negative consciousness scores gradually decreased. Indeed, the average maternal positive consciousness score at three weeks from baseline was 3.5 (baseline score: 3.3), showing a significant difference ($p=.026$), and the average maternal negative consciousness scores at two and three weeks from baseline were 1.7 (the baseline score: 2.0), showing a significant difference ($p=.042$).

In both groups, the parenting stress scores were slightly

Table 1. Characteristics of the subjects ($N = 24$).

Factors	Subjects		p
	Face-to-face[*1] ($n = 14$)	Zoom[*2] ($n = 10$)	
Age of mothers (years)	32.5±3.76	35.3±4.83	n.s.
Age of infants (months)	5.9±0.59	5.7±0.58	n.s.
Neonatal height (cm)	49.4±1.88	49.3±1.48	n.s.
Neonatal weight (g)	3,113.7±375.98	3,068.3±206.16	n.s.
Duration of gestation (day)	267.8±25.05	280.0±8.84	n.s.
Multipara/primipara	3/11	2/8	-
Smoker/nonsmoker	0/14	0/10	-
Habitual drinker/nondrinker	0/14	2/8	-
Nuclear family/expanding family	14/0	10/0	-

Note: Means ± SD (range); *p* value indicates the result of the t test between the face-to-face and Zoom groups.

[*1] Subjects had baby massage sessions and gatherings after the sessions in person in the face-to-face group.

[*2] Subjects had baby massage sessions and gatherings after the sessions on Zoom in the Zoom group.

Table 2. Differences in measurement data by several scales between subjects in the two groups (face-to-face and Zoom) by the Mann-Whitney U test.

Factors	Subjects		p
	Face-to-face[*1] ($n = 14$)	Zoom[*2] ($n = 10$)	
Coping behavior (problem-focused coping type)	9.0±2.83	9.1±2.67	1.000
Coping behavior (emotion-focused coping type)	4.9±1.61	4.3±1.60	.488
Coping behavior (avoidance coping type)	9.6±2.50	10.7±4.03	.322
Maternal positive consciousness (baseline)	3.2±0.58	3.3±0.41	.856
Maternal positive consciousness (1 week later)	3.2±0.62	3.3±0.43	.856
Maternal positive consciousness (2 weeks later)	3.2±0.61	3.4±0.43	.636
Maternal positive consciousness (3 weeks later)	3.2±0.64	3.5±0.36	.197
Maternal negative consciousness (baseline)	1.9±0.39	2.0±0.45	.913
Maternal negative consciousness (1 week later)	1.9±0.48	1.9±0.59	1.000
Maternal negative consciousness (2 weeks later)	1.9±0.51	1.7±0.48	.287
Maternal negative consciousness (3 weeks later)	1.8±0.44	1.7±0.65	.636
Parenting stress of mothers in relation to themselves (baseline at the 2nd session)	16.9±3.77	13.6±4.61	.067
Parenting stress of mothers in relation to themselves (1 week later at the 3rd session)	16.0±3.01	13.1±2.91	.067
Parenting stress of mothers in relation to themselves (2 weeks later at the last session)	16.1±3.80	12.7±3.55	**.038**
Parenting stress of mothers in relation to their children (baseline at the 2nd session)	23.4±4.81	20.1±4.63	.128
Parenting stress of mothers in relation to their children (1 week later at the 3rd session)	22.8±6.00	18.6±3.69	.11
Parenting stress of mothers in relation to their children (2 weeks later at the last session)	23.2±4.54	19.2±4.02	.079
Total parenting stress of mothers (baseline at the 2nd session)	40.3±6.39	33.7±7.06	.067
Total parenting stress of mothers (1 week later at the 3rd session)	38.8±7.83	31.7±5.86	.067
Total parenting stress of mothers (2 weeks later at the last session)	39.3±7.04	31.9±6.39	**.031**

Note: [*1] Subjects had baby massage sessions and gatherings after the sessions in person in the face-to-face group.

[*2] Subjects had baby massage sessions and gatherings after the sessions on Zoom in the Zoom group.

lower at the end of the one-month course compared to the scores at baseline. However, no significant differences were observed between groups (Table 3).

Improvements among Babies

The mean daily number of BMs in both groups improved

significantly ("face-to-face" group: baseline, 0.79; at the end of the one-month course, 1.17; *p*=.01; "Zoom" group: baseline, 1.50; at the end of the one-month course, 2.03; *p*=.039) (Table 3).

The changes in the sleep duration of the infants after a one-month course are shown in Table 4. In both the "face-

Table 3. Differences in the data by maternal positive/negative consciousness scales, parenting stress scale, and changes in the number of BMs among infants per day over time in two groups by Wilcoxon's signed rank test.

		Baseline		1 week later			2 weeks later			3 weeks later		
		M	SD	M	SD	p	M	SD	p	M	SD	p
Face-to-face group[1], n = 14	Maternal positive consciousness	3.2	0.58	3.2	0.62	.973	3.2	0.61	.7	3.2	0.64	.975
	Maternal negative consciousness	1.9	0.39	1.9	0.48	.779	1.9	0.51	.777	1.8	0.44	.196
Zoom group[2], n = 10	Maternal positive consciousness	3.3	0.41	3.3	0.43	.317	3.4	0.43	.109	3.5	0.36	**.026**
	Maternal negative consciousness	2.0	0.45	1.9	0.59	.23	1.7	0.48	**.042**	1.7	0.65	**.042**
Face-to-face group[1], n = 14	Parenting stress of mothers in relation to themselves	-	-	16.9	3.77	-	16.0	3.01	.072	16.1	3.80	.178
	Parenting stress of mothers in relation to their children	-	-	23.4	4.81	-	22.8	6.00	.726	23.2	4.54	.798
	Total of parenting stress of mothers	-	-	40.3	6.39	-	38.8	7.83	.531	39.3	7.04	.575
Zoom group[2], n = 10	Parenting stress of mothers in relation to themselves	-	-	13.6	4.61	-	13.1	2.91	.598	12.7	3.55	.288
	Parenting stress of mothers in relation to their children	-	-	20.1	4.63	-	18.6	3.69	.458	19.2	4.02	.61
	Total of parenting stress of mothers	-	-	33.7	7.06	-	31.7	5.86	.207	31.9	6.39	.348
Face-to-face group[1], n = 14	Mean number of BMs among infants per day	0.79	0.496	-	-	-	-	-	-	1.17	0.430	**.01**
Zoom group[2], n = 10	Mean number of BMs among infants per day	1.5	1.029	-	-	-	-	-	-	2.03	1.243	**.039**

Note: SD, standard deviation

-: means that we did not start using the scale in the questionnaire or did not ask the question on that timing.

[1] Subjects had baby massage sessions and gatherings after the sessions in person in the face-to-face group.

[2] Subjects had baby massage sessions and gatherings after the sessions on Zoom in the Zoom group.

Table 4. Changes in the sleep duration of infants between the beginning and end of the sessions in the two groups by Fisher's exact test.

		1 week later	2 weeks later	3 weeks later	p
Face-to-face group[1], n = 14	Improved sleep duration	2 (14.3%)	4 (28.6%)	7 (50.0%)	.033
	Unimproved sleep duration	12 (85.7%)	10 (71.4%)	7 (50.0%)	
Zoom group[2], n = 10	Improved sleep duration	3 (30.0%)	4 (40.0%)	6 (60.0%)	.033
	Unimproved sleep duration	7 (70.0%)	6 (60.0%)	4 (40.0%)	
Face-to-face group[1], n = 14	Number of mothers who made friends through the sessions	6 (42.9%)	8 (57.1%)	10 (71.4%)	.01
	Number of mothers who did not make friends through the sessions	8 (57.1%)	6 (42.9%)	4 (28.6%)	
Zoom group[2], n = 10	Number of mothers who made friends through the sessions	8 (80.0%)	9 (90.0%)	10 (100%)	-
	Number of mothers who did not make friends through the sessions	2 (20.0%)	1 (10.0%)	0 (0%)	

Note: -: means that we could not show the statistical changes as all participants said that they had friends through the session.

[1] Subjects had baby massage sessions and gatherings after the sessions in person in the face-to-face group.

[2] Subjects had baby massage sessions and gatherings after the sessions on Zoom in the Zoom group.

to-face" group and "Zoom" group, the sleep duration significantly improved at the end of the one-month course (*p* =.033).

Cultivation of Companionship

Only in the "face-to-face" group did mothers significantly cultivate friendships at the end of the one-month course (*p* =.01). All mothers felt that they had made friends during the session in the "Zoom" group at the end of the one-month course. Therefore, we could not show statistical changes in the "Zoom" group (Table 4).

Discussion

In this study, we used two scales related to maternal stress. We then examined how the scores on these two scales changed over time in both groups. Wilcoxon's signed rank test revealed significant differences in maternal positive/negative consciousness between the baseline and subsequent sessions in the "Zoom" group. Okumura and Matsuo (2011) reported that baby massage has positive effects on stress and depression in mothers and babies. The present study showed that continuing baby massage helped in further reducing maternal negative consciousness and increasing maternal positive consciousness in the "Zoom" group. Differences in the results were observed between the groups. Forming friendships might instill confidence in mothers in child-rearing by allowing them to share their problems with childcare in a similar situation. This might be responsible for the changes in the maternal positive/negative consciousness scores because all participants in the "Zoom" group felt like they had made companions at the end of the one-month course.

The differences between the two groups may be attributed to the fact that babies were calmer in their own place in the "Zoom" group, so it was easier for mothers to talk and share problems with other mothers.

In addition, the tool used in the "Zoom" group might have influenced the changes in maternal positive/negative consciousness. We used the software "Zoom" in the research conducted in 2021 because of the COVID-19 pandemic, which necessitated the avoidance of crowded spaces. Although the participants in the "face-to-face" group needed to physically come to the place where the weekly session was held, those in the "Zoom" group simply joined from home. This means that the participants in the "face-to-face" group needed to leave home to participate in each session, which might have caused fatigue, especially for mothers who were the primary caretakers of their babies.

All participants in the "Zoom" group continued the baby massage for at least one-month in their home environment, where baby massage was expected to be more comfortable to perform. Babies and mothers appeared more at ease in the "Zoom" group as it was held in their own familiar environment, potentially increasing maternal positive awareness. We found no previous studies using remote video tools, such as Zoom, to instruct and perform baby massage. Therefore, the present findings may promote a new way of helping mothers avoid feeling isolated.

We found that these massage sessions helped in reducing the parenting stress of mothers, although there were no significant differences between the groups. Porter et al. (2015) also reported that baby massage reduced parenting stress and maternal depression. Hernandez-Reif et al. (2006) and Yoshida et al. (2012) reported that maternal depression had a negative effect on the attachment of mothers to their newborns and mothers without depression were more likely to deepen their bond with their newborn babies. Continuing to perform baby massage after the session likely helped in further reducing the parenting stress of mothers in this study. It must have been stressful for mothers to be at home with their babies alone because of the COVID-19 pandemic, so they might have felt less stress when they could connect to other mothers even online in the "Zoom" group.

In the present study, mothers were asked regarding any improvements in their babies' sleep habits or BMs since the start of the baby massage program. Some babies did not have any problems sleeping or performing BMs, but these changed significantly in both groups. These results were also reported in previous studies on the effects of baby massage (Diego & Field, 2009; Guan et al., 2014). Such improvements will help in reducing maternal stress, especially in relation to babies. Lack of sleep is also a cause of stress in many mothers. Mindell et al. (2018) reported that baby massage reduced night-waking in babies, with mothers reporting improved confidence in managing their baby's sleep. In the present study, the sleep time of babies improved likely because of reduced negative consciousness or stress among the mothers.

The above improvements, especially in sleep duration, were observed in both groups. It has been proven that learning a technique for baby massage is sufficient online.

It succeeded in cultivating friendships after massage sessions when given the opportunity to communicate with other mothers in both groups. All mothers in the "Zoom" group felt that they made friends through the sessions, but this did not happen in the "face-to-face" group. Holding a tea break at a table or a similar mini-event at the end of each session may help mothers form friendships. Again, babies were calmer in their own places, which made mothers talk with other mothers easily. This small-scale study will require further research to confirm its findings in the future.

References

Diego, M.A., & Field, T. (2009). Moderate pressure massage elicits a parasympathetic nervous system response. *International Journal of Neuroscience*, *119*(5), 630-638. https://doi.org/10.1080/00207450802329605

Guan, L., Collet, J.P., Yuskiv, N., Skippen, P., Brant, R., & Kissoon, N. (2014). The effect of massage therapy on autonomic activity in critically ill children. *Evidence-Based Complementary and Alternative Medicine: eCAM*, *2014*, 656750. http://doi.org/10.1155/2014/656750

Hernandez-Reif, M., Field, T., Diego, M., & Ruddock, M. (2006). Greater arousal and less attentiveness to face/voice stimuli by neonates of depressed mothers on the Brazelton Neonatal Behavioral Assessment Scale. *Infant Behavior and Development*, *29*(4), 594-598. https://doi.org/10.1016/j.infbeh.2006.05.003

Hori, H., & Matsui, Y. (2001). *Shinri shakudoshu 3* [Series of psychological scale 3 of Japanese]. Saiensu-Sha [in Japanese]

Lazarus, R.S., & Folkman, S. (1987). Transactional theory and research on emotions and coping. *European Journal of Personality*, *1*(3), 141-169.

Mindell, J.A., Lee, C.I., Leichman, E.S., & Rotella, K.N. (2018). Massage-based bedtime routine: Impact on sleep and mood in infants and mothers. *Sleep Medicine*, *41*, 51-57. https://doi.org/10.1016/j.sleep.2017.09.010

Ministry of Health, Labor and Welfare (2021). *Jidou soudansho deno jido gyakutai soudan taiou kensu* [The number of consultations about child abuse]. Kousei Roudou Shou. https://www.mhlw.go.jp/content/000824359.pdf [retrieved 31 Aug. 2023 in Japanese]

Mochizuki, Y., Tanaka, E., Shinohara, R., Sugisawa, Y., Tomisaki, E., Watanabe, T., & Anme, T. (2014). *Youikusha no ikujifuan oyobi ikujikankyou to gyakutai tono kanren* [The influence of caregivers' anxiety and the home environment on child abuse; A study of children attending child-care centers]. *Japanese Society of Public Health*, *61*(6), 263-274. https://doi.org/10.11236/jph.61.6_263 [in Japanese]

Ohinata, M. (1988). *Boseino kenkyu*. [Maternity research of Japanese]. Kawashima-Shoten [in Japanese]

Okumura, Y., & Matsuo, H. (2011). *Bebi massage ga boshi souhou no stores hannou ni kansuru kenkyu* [The effect of baby massage on stress reactions in mother and infant]. *Japanese Journal of Maternal Health*, *51*(4), 545-556. [in Japanese]

Porreca, A., Parolin, M., Bozza, G., Freato, S., & Simonelli, A. (2016). Infant massage and quality of early mother-infant interactions: Are there associations with maternal psychological wellbeing, marital quality, and social support?. *Frontiers in Psychology*, *7*, 2049. https://doi.org/10.3389/fpsyg.2016.02049

Porter, L.S., Porter, B.O., McCoy, V., Bango-Sanchez, V., Kissel, B., Williams, M., & Nunnewar, S. (2015). Blended infant massage-parenting enhancement program on recovering substance-abusing mothers' parenting stress, self-esteem, depression, maternal attachment, and mother-infant interaction. *Asian Nursing Research*, *9*(4), 318-327. http://doi.org/10.1016/j.anr.2015.09.002

Sakata, S. (1989). *Shinri stress ni kansuruichikennkyu: Coping scale (SCS) no sakuseino kokoromi* [One of the phycology stress related research: Trial of Coping scale (SCS)]. *The scientific researches of education of Waseda university*, *38*, 61-72. [in Japanese]

Sato, T., Sugawara, M., Toda, M., Shima, S., & Kitamura, T. (1994). *Ikuji ni kansuru stores to sono yokuutsu jushodo tono kanren* [Rearing related stress and depressive severity] *The Japanese Journal of Psychology*, *64*, 409-416. [in Japanese]

Shimizu, Y. (2017). *Nyuyouji no hahaoya no shinshin no jotai ni kansuru oudan kenkyu* [A longitudinal study of the physical and mental conditions of mothers of children]. *Journal of Japan Academy of Midwifery*, *31*, 120-129. https://doi.org/10.3418/jjam.JJAM-2017-0004 [in Japanese]

Tambelli, R., Trentini, C., Trovato, A., & Volpi, B. (2019). Role of psychosocial risk factors in predicting maternal and paternal depressive symptomatology during pregnancy. *Infant Mental Health Journal*, *40*(4), 541-556. https://doi.org/10.1002/imhj.21791

Watanabe, M. (2015). *Ninpu ga idaku gyakutai fuan no hassei kijo no kentou -Shussan keiken ni chakumokushite* [The factors affecting pregnant mothers' abuse anxiety] *Hyougo: Human Developmental Research*, *9*, 127-142. [in Japanese]

Yoshida, K., Yamashita, H., Conroy, S., Marks, M., & Kumar, C.A. (2012). A Japanese version of Mother-to-Infant Bonding Scale: Factor structure, longitudinal changes and links with maternal mood during the early postnatal period in Japanese mothers. *Ar-*

chives of Women's Mental Health. 15, 343-352. https://doi.org/10.1007/s00737-012-0291-1

Zung, W.W.K. (1965). *A self-rating depression scale. Archives of General Psychiatry*, *12*(1), 63-70.

Japanese translation of the shortened information technology attitude scale for health: Evaluation of the reliability and validity of the translated version

Yuma Ota, MSN, RN🆔, Ayako Nishimura, PhD, RN🆔, Yoko Adachi, M Med Sci, RN🆔,
Yasuyo Kasahara, PhD, RN🆔, and Miki Yokoyama, PhD, RN🆔

Faculty of Healthcare, Division of Nursing, Tokyo Healthcare University, Tokyo, Japan

Abstract

This study aimed to translate the shortened Information Technology Attitude Scale for Health (ITASH) into Japanese and to evaluate its validity and reliability. The shortened ITASH was translated into Japanese, and a cross-sectional survey was conducted to assess its content validity and a confirmatory factor analysis was conducted to assess its construct validity. Internal consistency was estimated by determining Cronbach's alpha reliability coefficient. The study period was from July to September 2021. A total of 85 first-year nursing students responded to our survey based on the translated version of the shortened ITASH. Item-level content validity was confirmed by undergoing clarity evaluation. Multiple fit indices showed an acceptable fitting model. Cronbach's alpha reliability coefficient was 0.871, indicating acceptable internal consistency. The results suggest that the Japanese version of the shortened ITASH could be of excellent validity and reliability.

Introduction

Information and communication technology (ICT) has greatly impacted and contributed to the healthcare sector around the world. Its use reduces healthcare costs and improves the quality of patient care (Ibrahim et al., 2019; McGonigle & Mastrian, 2009; Parente & McCullough, 2009; Sligo et al., 2017; Warshawski, 2019). Nurses working in clinical settings are expected to use ICT effectively (Lee & Clarke, 2015; Ward et al., 2006). To use new technologies in clinical practice, it is important to explore nurses' attitudes toward these technologies (Huryk, 2010; Piscotty et al., 2015; Rahimi et al., 2018) since the attitudes toward the use of ICT play a crucial role during the acquisition process of technology necessary in clinical settings (Kaya, 2011; Salameh et al., 2019). In addition, the attitudes toward ICT are important not only to nurses but also to those who provide nursing care alongside nurses in clinical practice (Lee & Clarke, 2015). A negative attitude toward ICT among nursing students may adversely affect their future use of ICT in clinical practice, in information gathering and further in their professional learning activities.

In other countries, several scales have been developed to measure factors that influence ICT-related attitudes and competencies of nurses and nursing students (Chang et al., 2011; Günbatar, 2014; Kaminski, 2007). In the UK, in 2007, the Information Technology Attitude Scales for Health (ITASH), which consists of 48 items grouped into four factors, namely, efficiency of care, education, training and development, and control, was developed as a scale to evaluate

the attitudes of nurses and other healthcare professionals toward ICTs and tested for reliability and validity (Ward et al., 2007). However, since there were a lot of questions (48 items) and issues not targeting students, a shortened version of the ITASH was developed for students in 2014 (Lee & Clarke, 2015). The short version of the ITASH consists of 19 items with four factors: care value of ICT, training of ICT skills, ICT confidence, and workload value of ICT. English, Korean, and Portuguese versions are currently being developed and tested for reliability and validity (Lee & Clarke, 2015; Oliveira et al., 2019). It has been shown that the use of a shortened version of the ITASH can lead to reflection on students' attitudes toward ICT and to identify appropriate issues based on the results of the scale (Oliveira et al., 2019). However, at present in Japan, a few research has been conducted to assess nursing students' attitudes toward ICT, and no reliable and validated scale has been developed. Moreover, in Japan, there is a need for a validated and reliable scale that can assess nursing students' attitudes toward ICT.

This study aimed to examine the reliability and validity of the shortened Japanese version of the Information Technology Attitude Scale for Health (shortened ITASH-J), which was developed by Lee and Clarke to measure attitudes toward information communication technology.

Materials and Methods

Study Design

The shortened ITASH was translated into Japanese and evaluated for content validity, construct validity, and internal consistency. A cross-sectional questionnaire survey was administered to Japanese nursing students whose native language is Japanese.

Translation Process of Shortened ITASH-J

Written consent was obtained from Lee and Clarke, the authors of the original version. To ensure linguistic and cultural equivalence, the translation followed a back-translation method based on guidelines (Wild et al., 2005). The translation team consisted of four researchers in the field of nursing education and two bilinguals whose native language was Japanese and who were familiar with nursing education. Three of the researchers on nursing education had experienced incorporating ICT into nursing education research.

The translation process consisted of four steps, such as an assessment of content validity.

Step 1: Sequential Translation
The translation of ITASH from English to Japanese was conducted independently by two nursing-education researchers. The two translated contents were integrated into one preliminary version through in-depth discussion between the two translators. The translation team assessed the semantic compatibility between the original and translated versions and critically evaluated the understandability of each translation for Japanese nursing students.

Step 2: Back Translation
One native translator with experience in translation in the medical field, including nursing education, and research in nursing education, who had not reviewed the original ITASH, back-translated the ITASH from Japanese to English. The other native translator compared the original version with the translated one and evaluated the accuracy of terminology, clarity of expression, and consistency in meaning.

Step 3: Review of the Back Translation
To evaluate the quality of the forward translation, Lee & Clarke, the authors of the original version, were asked to compare the back-translated version with the original one and review the two for equivalence. Lee & Clarke reported in writing that the back-translated and original versions were equivalent.

Step 4: Evaluation of Clarity
A cognitive debriefing was conducted with the current nursing students to evaluate the understandability and cognitive equivalence of the items in the Japanese version. The survey targeted ten fourth-year nursing students (nine female, one male) whose native language is Japanese. They were asked to rate each item by selecting "clear" or "unclear" in a web-based questionnaire. As a result, it was confirmed that there were no "unclear" items. Following the above steps, shortened ITASH-J was developed.

Participants

A total of 115 first-year students enrolled in the Department of Nursing at University A were included in this study. All participants had taken a course in "daily living assistance skills" and experienced on-site practical training. In "daily living assistance skills," ICT was employed to promote learning activities, such as creating and submitting study assignments, discussing among students, viewing video materials, taking the final exam, and exchanging messages with the instructor. The researcher explained the purpose of the study both orally and in writing to the participating students at the time of orientation. Those who were willing to participate were given access to an electronic, unsigned, self-administered questionnaire and asked to respond.

The sample size required for this study was established by referring to the structural validity in the COSMIN Risk of Bias checklist (Mokkink et al., 2018). When using factor analysis, the adequate sample size is five times the number of items in the scale and at least 100 subjects. The scale developed in this study has 19 items, and the target number of subjects is 100. The study period was from July to September 2021; the study was conducted at the Department of Nursing, University A.

Data Collection

Data collection was conducted using the translated shortened ITASH-J items and by inquiring about study participant characteristics. Shortened ITASH-J is a four-factor scale consisting of the value of care with ICT (four items), of the training in ICT skills (six items), of confidence in ICT (four items), and of the value of workload with ICT (five items), a 4-point rating scale ranging from "strongly agree" to "strongly disagree." Higher scores indicate a more accepting attitude toward ICT. Gender was asked as one characteristic of the study participants.

Ethical Consideration

The Ethics Committee of REDACTED approved the study. To protect the rights of the research participants, we assured them that their participation in the study was voluntary, that they could withdraw from the study anytime during the research period, and that they would not suffer any academic disadvantages in such cases. In addition, the survey was anonymous, because non-anonymity was inappropriate from the standpoint of protecting the privacy of the participants and unnecessary for analytical purposes. Concurrently, we explained the significance of submitting the findings of this study to an academic journal and obtained their consent.

Data Analysis

The distribution state of the responses to the shortened ITASH-related items was presented to identify characteristics of attitudes toward ICT and possible response bias to the items. The scores for each item in the shortened ITASH were as follows: 4 for "strongly agree," 3 for "agree," 2 for "disagree," and 1 for "strongly disagree." After confirming normality by Shapiro-Wilk test (p=.802), the responses for each item in the shortened ITASH were reported as mean score and SD.

If there should be even one missing response, the related item was excluded from the data set. For inverted items, scores were inverted before analysis.

Cronbach's alpha reliability coefficients were obtained to check for internal consistency. The validity of shortened ITASH-J was evaluated by examining whether the factor structure of shortened ITASH-J was comparable to that of the original version of the scale and also from the aspect of factor modeling. The original version of ITASH was developed using an orthogonal model; therefore, an orthogonal model was first constructed after which the confirmatory factor analysis (CFA) was performed for goodness-of-fit index calculations. Comparative fit index (CFI) and root mean square error of approximation (RMSEA) were used to determine the fit of the data to the model, with CFI > 0.95 and RMSEA < 0.08 as goodness-of-fit criterion (Hu & Bentler, 1999; Hair et al., 2010). The significance level was set at

5%. Participant characteristics are presented in percentages (rates).

The above data were analyzed by factor analysis using the statistical package SPSS version 27 (SPSS Inc., Chicago, IL, USA) and Amos version 26 (SPSS Inc., Chicago, IL, USA) for CFA.

Results

Subjects and Attributes

The target population consisted of 115 first-year nursing students enrolled at University A in Tokyo, Japan, 85 of whom responded (response rate 75.9%). No responses with missing items in the questionnaire were accepted, and 85 responses were included in the analysis (valid response rate, 75.9%). Of 85 participants, 83 (97.6%) were women.

Characteristics of Shortened ITASH-J Responses

Table 1 shows the distribution of responses, with an overall mean of 2.82 (SD 0.50) for shortened ITASH-J questionnaire items, which was greater than the mid-grading-range value; however, no items showed a ceiling effect.

Eighty percent of the respondents answered "strongly agree" or "strongly disagree" in one of the items; meanwhile, there was certain bias in the responses for "Care value of ICT" and "Training of ICT skills," with "strongly agree" and "agree" responses exceeding 80% of the respondents. Regarding their confidence in ICT, to the item "I can easily learn new ICT skills." (item 13), more than 20% of the respondents indicated "strongly disagree" and about 50% "disagree"; however, to the item "When using ICT devices, I often feel at a loss what to do." (item 14, invert scale), more than 20% of the respondents answered "strongly disagree" and more than 40% "disagree."

Examination of Reliability and Validity in Shortened ITASH-J

Table 2 shows Cronbach's alpha for all factors; Cronbach's alpha for the entire shortened ITASH-J and for all factors was 0.871 and above 0.80, respectively, indicating acceptable internal consistency.

Figure 1 shows the results of the diagonal model constructed and examined. The model fit was CFI=0.97 RMSEA=0.05, a value within acceptable guideline range. The path coefficient values for "Care value of ICT" and "Training of ICT skills," "Training of ICT skills" and "Workload value of ICT," and "Care value of ICT" and "Workload value of ICT" were 0.53, 0.45, and 0.44, respectively, all of which indicating moderate correlation.

Discussion

In this study, shortened ITASH-J was developed by translat-

Table 1. Distribution of shortened ITASH-J responses.

Contents		*n* = 85				Mean (*SD*)
		Strongly disagree	Disagree	Agree	Strongly agree	
Care value of ICT						
Item 1	Use of ICT devices is helping to improve patient care.	0	0	42 (49.4)	43 (50.6)	3.51 (0.50)
Item 2	Information obtainable from ICT devices is helping to provide better care to patients.	0	0	32 (37.6)	53 (62.4)	3.62 (0.49)
Item 3	Use of ICT devices speeds up communication with other healthcare professionals.	0	6 (7.1)	35 (41.2)	44 (51.8)	3.45 (0.62)
Item 4	I believe ICT devices can help provide individualized care.	1 (1.2)	5 (5.9)	33 (38.8)	46 (54.1)	3.46 (0.66)

Contents		*n* = 85				Mean (*SD*)
		Strongly disagree	Disagree	Agree	Strongly agree	
Training of ICT skills						
Item 5	I feel that more training should be needed for proper use of ICT devices.	0	3 (3.5)	24 (28.2)	58 (68.2)	3.65 (0.55)
Item 6	I hope to have ongoing training to improve my ICT skills.	0	3 (3.5)	37 (43.5)	45 (52.9)	3.50 (0.57)
Item 7	ICT skills are increasingly needed for healthcare professionals.	0	2 (2.4)	24 (28.2)	59 (69.4)	3.67 (0.52)
Item 8	To achieve a successful career, the ability to use ICT devices for work is necessary.	0	3 (3.5)	35 (41.2)	47 (55.3)	3.52 (0.57)
Item 9	The use of ICT devices helps to raise the professional knowledge base.	0	8 (9.4)	34 (40.0)	43 (50.6)	3.41 (0.66)
Item 10	I want to know more about ICT devices in general.	2 (2.4)	5 (5.9)	42 (49.4)	36 (42.4)	3.32 (0.69)

Contents		*n* = 85				Mean (*SD*)
		Strongly disagree	Disagree	Agree	Strongly agree	
Confidence in ICT						
Item 11	I have little confidence in my general ICT skills. R	4 (4.7)	13 (15.3)	30 (35.3)	38 (44.7)	3.20 (0.87)
Item 12	I generally have enough confidence in the operation of ICT devices.	25 (29.4)	35 (41.2)	19 (22.4)	6 (7.1)	2.07 (0.89)
Item 13	I can easily learn new ICT skills.	19 (22.4)	42 (49.4)	16 (18.8)	8 (9.4)	2.15 (0.88)
Item 14	When using ICT devices, I often feel at a loss what to do. R	24 (28.2)	39 (45.9)	17 (20.0)	5 (5.9)	2.04 (0.85)

Contents		*n* = 85				Mean (*SD*)
		Strongly disagree	Disagree	Agree	Strongly agree	
Workload value of ICT						
Item 15	Usage of ICT devices is more trouble than it is worth. R	21 (24.7)	51 (60.0)	9 (10.6)	4 (4.7)	1.95 (0.73)
Item 16	In my workplace, ICT devices reduce staff productivity. R	29 (34.1)	46 (54.1)	7 (8.2)	3 (3.5)	1.81 (0.73)
Item 17	Currently, I feel that there are too many ICT devices around. R	18 (21.2)	41 (48.2)	19 (22.4)	7 (8.2)	2.18 (0.86)
Item 18	I'm afraid we are at risk of being taken over by ICT devices. R	22 (25.9)	31 (36.5)	26 (30.6)	6 (7.1)	2.19 (0.90)
Item 19	Time and benefits spent on ICT devices are poorly balanced. R	16 (18.8)	64 (75.3)	4 (4.7)	1 (1.2)	1.88 (0.52)

ing the original scale using back-translation method, receiving expert evaluation of its content clarity and validity, and conducting cognitive debriefing on the nursing students. To the best of our knowledge, this study is the first to formally translate the ITASH into Japanese and to evaluate its reliability and validity. The cross-cultural adaptation procedure followed the rigorous process described in the "Methods" section. Previous studies that have translated the ITASH into Portuguese used expert ratings to assess the comprehension and clarity of each item on the scale. However, cognitive debriefing requires examining the understandability and cognitive equivalence of each item expression in the target population who are expected to use the scale. Therefore, in this study, cognitive debriefing was conducted with nursing students whose native language is Japanese. Since we were able to hold cognitive debriefing sessions with the intended

Table 2. Cronbach's alpha in each dimension.

Shortened ITASH-J factors	Cronbach's alpha	95% CI
Care value of ICT	0.912	0.895–0.941
Training of ICT skills	0.845	0.794–0.925
Confidence in ICT	0.830	0.813–0.854
Workload value of ICT	0.861	0.836–0.912

users of the scale, we believe that shortened ITASH-J ensures a translation process that maintained equivalence with the original version of the ITASH better than the previous studies.

Second, shortened ITASH-J was confirmed to have a four-factor structure, while the path values were found to be somewhat lower than those among factors in the original version. While the original version showed moderate path values among all items, this study indicated such moderate
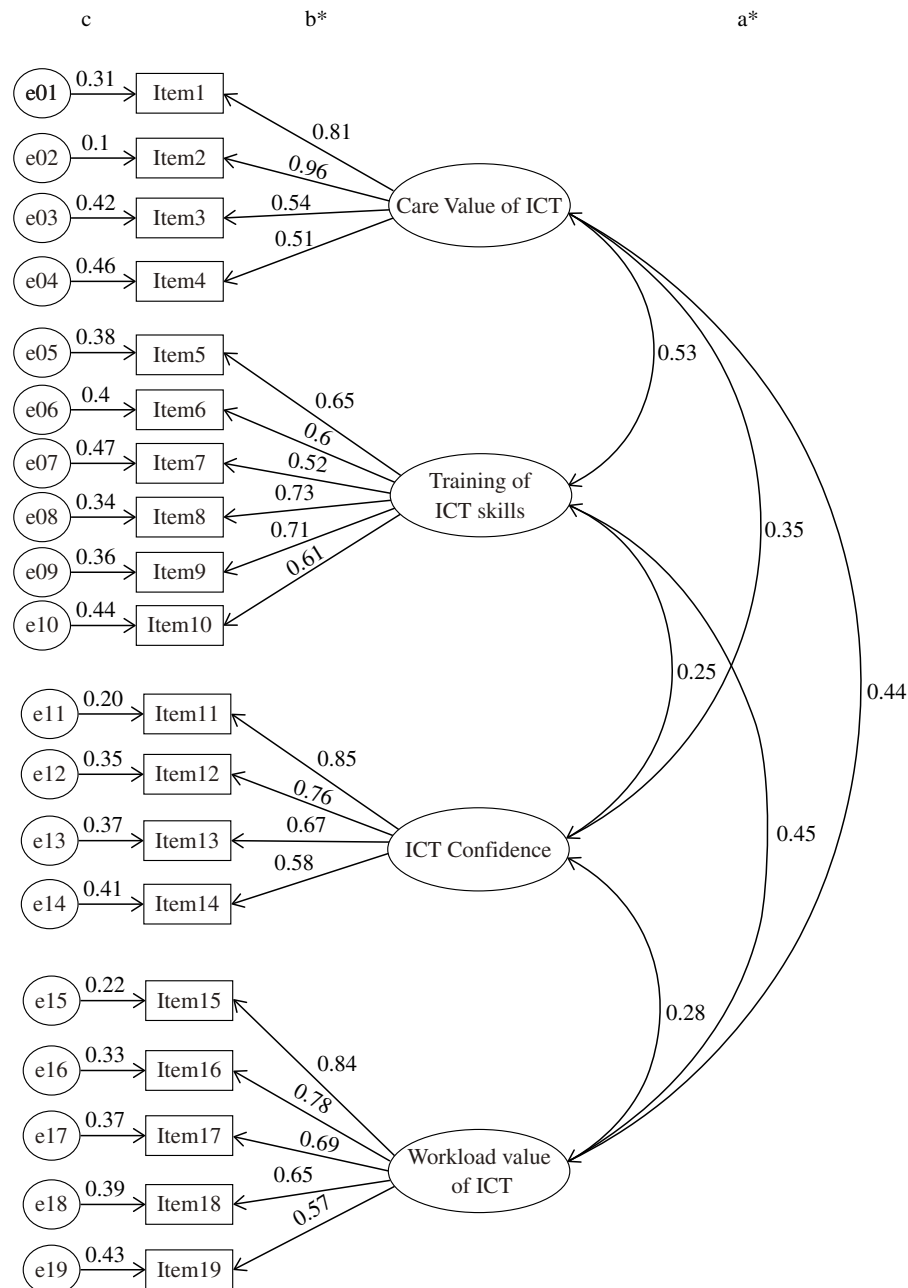

Figure 1. Factor structure of the Japanese version of Information Technology Attitude Scale for Health with correlations among four factors, standardized factor loadings, and error terms.

Note: a = correlation among the scales; b = standardized factor loadings; c = error terms; *p<.01.

path values only between the items as "Care value of ICT" and "Training of ICT skills," "Training of ICT skills" and "Workload value of ICT," "Care value of ICT" and "Workload value of ICT." What is different from the original version is the involvement of "Confidence in ICT" in the low path values among all other interrelated factors. This may be explained by the fact that the study participants in this study were first-year university students. Compared to other OECD countries, such as South Korea, Japan tends to have more opportunities to use ICT for hobbies and entertainment, while less experiences of ICT use in education (Organization For Economic Co-Operation and Development, 2018) - the duration of using ICT has a significant impact on attitudes toward ICT (Salameh et al., 2019). Fewer opportunities of incorporating ICT in academic learning may have led to the lower paths to other items. However, the results of this study showed that the CFI and RMSEA of shortened ITASH-J were 0.97 and 0.05, respectively, indicating that shortened ITASH-J constitutes the same four-factor structure as the original version and each subscale is highly compatible with the structure of the original version. These results indicate that the original version of shortened ITASH has a rigorous structure and shortened ITASH-J maintains validity. Particularly, we consider the structural validity of shortened ITASH-J to be acceptable based on the goodness of fit of the RMSEA, the most robust measure in CFA. The internal consistency of the ITASH is considered acceptable with Cronbach's alpha minimum of 0.810 in the 95% CI (Cronbach, 1951). These results indicate that shortened ITASH-J developed in this study meets certain standards of validity and reliability. Shortened ITASH-J can be used to evaluate nursing students' attitudes toward ICT in Japan.

This study has some limitations. First, the original version of the ITASH short version translated in this study is a scale to measure attitudes toward ICT among healthcare professionals; the short version developed by Lee et al. has confirmed reliability and validity with nursing students, but retains most of the questions from the original ITASH version. Since nursing students were the subjects in this study, the question wording may have affected the face and content validity. Second, although efforts were made to follow the guidelines of the ISPOR Task Force, the reproducibility of shortened ITASH-J could not be verified because the study participants were students. Essentially, when examining the reliability of a scale, it is recommended to demonstrate reproducibility and aspects of internal consistency (Wild et al., 2005). These limitations may have affected the reliability of shortened ITASH-J. Third, since the study participants were from a single site, there is an inherent risk of over-fitting the data. Furthermore, the results of this study may not be generalizable to all nursing students, since the study did not target the upper secondary graders among nursing students. However, since the original, abbreviated version of the

ITASH is valid for older nursing students, shortened ITASH-J may also prove useful. Finally, no domestic studies have been done of scale development focused on nursing students' attitudes toward ICT, making it difficult to compare the findings obtained in this study with domestic studies. Future studies are needed to examine the criterion-relevant validity of shortened ITASH-J when relevant scales are reported in the Japanese context.

Despite these limitations, we are confident that the scale developed in this study will contribute to the assessment of attitudes toward ICT among Japanese nursing students. We are currently conducting research on the benefits of improving nursing students' shortened ITASH-J on their ability to practice nursing. We also plan to expand the scope of application of shortened ITASH-J to include students of medical and health-related majors other than nursing while testing its reliability and validity, including reproducibility in the future. As ICT continues to evolve, we anticipate that shortened ITASH-J will become a more accurate measure for the evaluations of nursing students' attitudes toward ICT by examining the structure of the scale when necessary to ensure that the questions are appropriate for the times.

Author Contributions

Yuma Ota conceptualized, designed and conducted the study, analyzed and interpreted the data, and prepared the paper. Ayako Nishimura conceptualized, designed and conducted the study, analyzed and interpreted the data, and critically reviewed and edited the paper. Yoko Adachi and Yasuyo Kasahara analyzed and interpreted the data and critically reviewed and edited the paper. Miki Yokoyama conducted the study, analyzed and interpreted the data, and critically reviewed and edited the paper.

Declaration of Conflicting Interests

The authors declare no conflicts of interest.

Ethical Approval

This study was approved by the Ethics Review Committee of Tokyo Healthcare University [approval code: 32-43C].
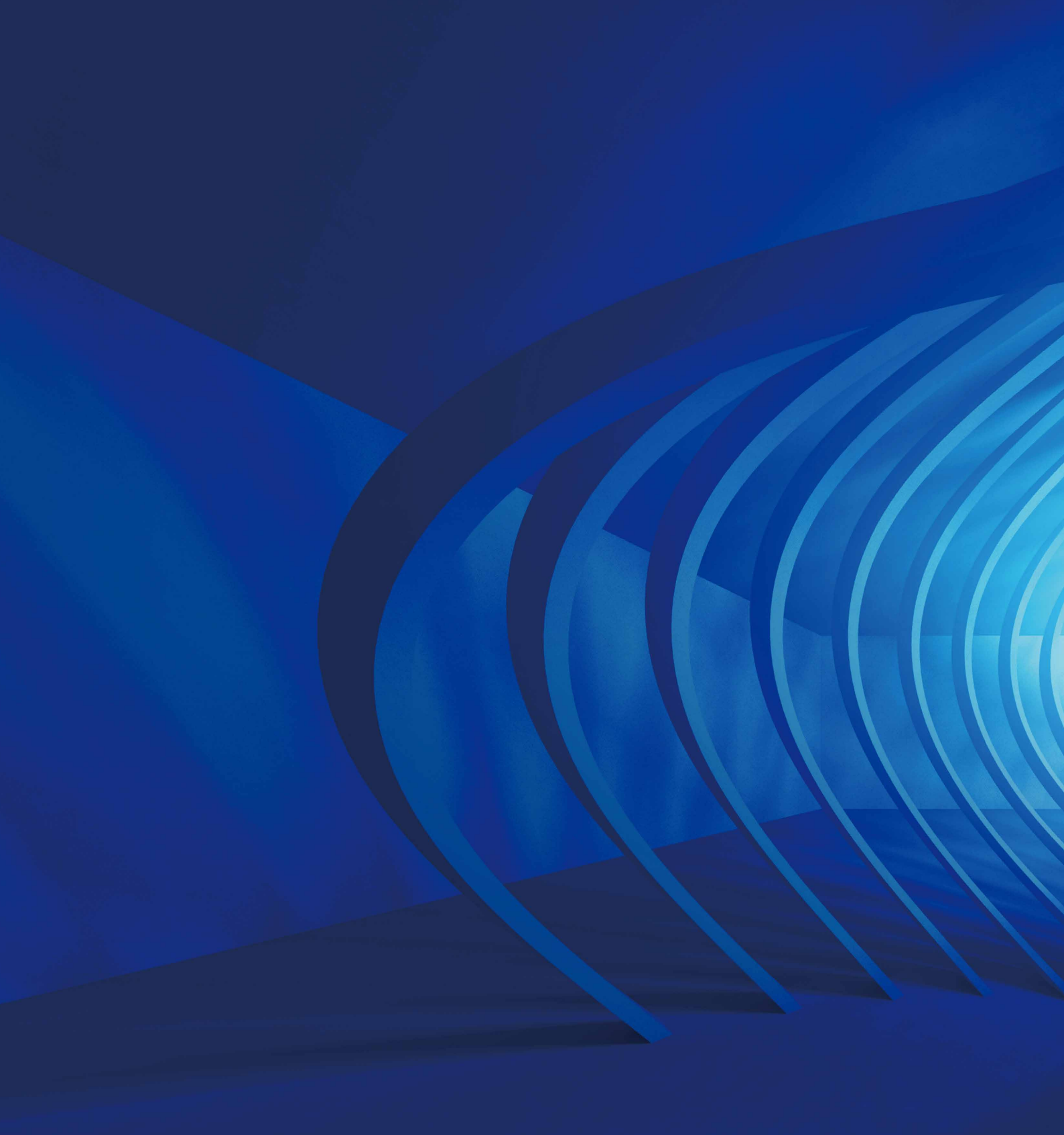
Informed Consent

Informed consent was obtained from all participants in this study.

References

Chang, J., Poynton, M. R., Gassert, C. A., & Staggers, N. (2011). Nursing informatics competencies required of nurses in Taiwan. *International Journal of Medical Informatics*. *80*(5), 332-340. https://doi.org/10.1016/j.ijmedinf.2011.01.011

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*(3), 297-334. https://doi.org/10.1007/BF02310555

Günbatar, M. S. (2014). The study on development of information and communication technology attitude scale. *Journal of Kırşehir Education Faculty*. *15*(1), 121-135.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis*. Prentice Hall Higher Education, pp. 635-642.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*. *6*(1), 1-55.
https://doi.org/10.1080/10705519909540118

Huryk, L. A. (2010). Factors influencing nurses' attitudes towards healthcare information technology. *Journal of Nursing Management*. *18*(5), 606-612.
https://doi.org/10.1111/j.1365-2834.2010.01084.x

Ibrahim, S., Donelle, L., Sidani, S., & Regan, S. (2019). Factors influencing registered nurses' intention to use health information technology in clinical practice: An integrative literature review. *Canadian Journal of Nursing Informatics*. *14*, 1-2

Kaminski, J. (2007). *P.A.T.C.H. assessment scale, v.2. Pretest for attitudes toward computers in healthcare*. Nursing Informatics Competencies.
https://www.Nursinginformatics.com/niassess/Personal_Plan_2007.pdf

Kaya, N. (2011). Factors affecting nurses' attitudes toward computers in healthcare. *Computers, Informatics, Nursing: CIN*. *29*(2), 121-129.
https://doi.org/10.1097/NCN.0b013e3181f9dd0f

Lee, J. J., & Clarke, C. L. (2015). Nursing students' attitudes towards information and communication technology: An exploratory and confirmatory factor analytic approach. *Journal of Advanced Nursing*. *71*(5), 1181-1193.
https://doi.org/10.1111/jan.12611

Mcgonigle, D., & Mastrian, K. (2009). Nursing informatics and the foundation of knowledge. *Jones & Bartlett Learning*.

Mokkink, L. B., De Vet, H. C. W., Prinsen, C. A. C., Patrick, D. L., Alonso, J., Bouter, L. M., & Terwee, C. B. (2018). COSMIN risk of bias checklist for systematic reviews of patient-reported outcome measures. *Quality of Life Research*. *27*(5), 1171-1179.
https://doi.org/10.1007/s11136-017-1765-4

Oliveira, M. R., Correia, V. G. A., Dantas, E. O. M., Moreira, T. M. M., & Torres, R. A. M. (2019). Validation of the attitude scale for information and communications technologies. *Acta Paulista de Enfermagem*. *32*(1), 79-86.
https://doi.org/10.1590/1982-0194201900011

Organization For Economic Co-Operation and Development. (2018). *Programme for international student assessment 2018 database*.
https://www.oecd.org/pisa/data/2018database/

Parente, S. T., & McCullough, J. S. (2009). Health information technology and patient safety: Evidence from panel data. *Health Affairs*. *28*(2), 357-360.
https://doi.org/10.1377/hlthaff.28.2.357

Piscotty Jr., R. J., Kalisch, B., & Gracey-Thomas, A. (2015). Impact of healthcare information technology on nursing practice. *Journal of Nursing Scholarship*. *47*(4), 287-293.
https://doi.org/10.1111/jnu.12138

Rahimi, B., Nadri, H., Lotfnezhad Afshar, H. L., & Timpka, T. (2018). A systematic review of the technology acceptance model in health informatics. *Applied Clinical Informatics*. *9*(3), 604-634.
https://doi.org/10.1055/s-0038-1668091

Salameh, B., Eddy, L. L., Batran, A., Hijaz, A., & Jaser, S. (2019). Nurses' attitudes toward the use of an electronic health information system in a developing country. *SAGE Open Nursing*. *5*, 2377960819843711.
https://doi.org/10.1177/2377960819843711

Sligo, J., Gauld, R., Roberts, V., & Villa, L. (2017). A literature review for large-scale health information system project planning, implementation and evaluation. *International Journal of Medical Informatics*. *97*, 86-97.
https://doi.org/10.1016/j.ijmedinf.2016.09.007

Ward, R., Pollard, K., Glogowska, M., & Moule, P. (2007). Developing information technology attitude scales for health (ITASH). *Studies in Health Technology and Informatics*. *129*(1), 177-181.

Warshawski, S., Itzhaki, M., & Barnoy, S. (2019). Nurse and nurse student attitudes and perceived self-efficacy in use of information and communication technologies: professional and cultural differences. *Computers, Informatics, Nursing: CIN*. *37*(1), 20-28.
https://DOI.ORG/10.1097/CIN.0000000000000470

Wild, D., Grove, A., Martin, M., Eremenco, S., McElroy, S., Verjee-Lorenz, A., Erikson, P., & ISPOR Task Force for Translation and Cultural Adaptation. (2005). Principles of good practice for the translation and cultural adaptation process for patient-reported outcomes (PRO) measures: report of the ISPOR task force for translation and cultural adaptation. *Value in Health*. *8*(2), 94-104.
https://doi.org/10.1111/j.1524-4733.2005.04054.x