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Transfer and Lifting Technologies in Long-Term Care Facilities: A Scoping Review of Assistive Solutions for Older Adults Care

Mariana Anjos de Almeida[1], Milene de Almeida Ribeiro Checoni[1], Ana Beatriz Ferreira Cardim[2], Érica Pereira das Neves[1], Carla da Silva Santana Castro[3], and Fausto Orsi Medola[1]

[1]Faculty of Architecture, Arts, Communication and Design (FAAC), São Paulo State University (UNESP), Bauru, SP, Brazil
[2]Faculty of Engineering of Bauru (FEB), São Paulo State University (UNESP), Bauru, SP, Brazil
[3]Faculty of Medicine of Ribeirão Preto (FMRP), University of São Paulo (USP), Ribeirão Preto, SP, Brazil

ABSTRACT

This scoping review mapped the scientific literature on lifting and transfer devices utilised in Long-Term Care Facilities (LTCFs) for older adults. A total of sixteen studies published between 2004 and 2025 from countries such as the United States, Sweden, Denmark, and the Netherlands were included. The most frequent devices were ceiling lifts, mobile lifts, sliding sheets, and transfer belts. The majority of studies focused on the perspectives of carers, particularly in relation to the prevention of musculoskeletal disorders. Reported benefits included reductions in physical strain, improved posture, and enhanced safety and comfort. Nonetheless, challenges related to low adherence, improper use and infrastructural limitations were reported. The findings underscore the importance of ergonomic considerations and highlight the need for integrated approaches to support the effective implementation of these technologies in LTCFs.

Keywords: Lifting devices, Patient transfer, Older adults, Long-term care facilities

INTRODUCTION

The global growth of the older population has intensified the demand for long-term care, placing increasing pressure on institutions such as nursing homes and senior residences, which often face problems of limited resources and infrastructure (Varoto et al., 2021; Camargos, 2014). This demographic shift highlights the need for systemic responses in care policy and practice.

One of the recurrent challenges in this context is mobility limitation, which affects approximately 35% of individuals aged 70 and the majority of those aged 85 and older (Freiberger, Sieber, and Kob, 2020). Within LTCFs, mobility impairments lead to significant dependence on carers for the performance of activities of daily living, often necessitating frequent repositioning and postural transfer manoeuvres (Silva, 2012). These physical

demands are closely linked to a high prevalence of musculoskeletal disorders among caregiving professionals (Cargnin et al., 2019; Ji et al., 2023). Additionally, older adults are exposed to increased risks, including pain, reduced autonomy, and falls (Rice et al., 2019; Ferreira and Yoshitome, 2010; Shao et al., 2023).

Health and ergonomics organisations recommend the use of transfer and lifting devices as a strategy to enhance safety, prevent injuries, and improve the quality of care in long-term care facilities (LTCFs) (Morandi et al., 2015; Júnior, 2021; Silverwood and Haddock, 2006). These technologies contribute to the well-being of residents and support improved working conditions for carers (Nelson et al., 2006; Bersch, 2013). Despite these benefits, their adoption remains limited in many Brazilian LTCFs, hindered by barriers such as high costs, the need for staff training, and the requirement for structural adaptations (Checoni et al., 2024).

In this context, the present study undertakes a scoping review of the scientific literature on transfer and lifting devices in LTCFs. The review aims to map the geographical and temporal distribution of publications, research designs, technologies evaluated, sample characteristics, assessment methods, and key findings reported in the literature.

METHODS

This review was conducted in the Scopus and PubMed databases, with the objective of examining the existing literature on use of transfer and lifting devices in long-term care facilities (LTCFs). The search strategy involved combinations of the following terms: "patient transfer(s/transferring/handling)," "transfer of older people," "housing for older people," "nursing homes," "long-term care facilities," "LTCFs," "nursing home care," "equipment," "device," "assistive devices," "lifting devices" and "welfare equipment". Inclusion criteria comprised: articles published in English, Spanish, or Portuguese; full-text availability; and a specific focus on the use of these devices within LTCFs. Studies reporting the design or development of technologies, without practical evaluation, were excluded.

The selected articles were analysed to map trends, challenges, and gaps in the use of ergonomic transfer tools and lifting devices in LTCFs, focusing on publication patterns, methodologies, device types, user perspectives, and key findings.

RESULTS

The initial search identified a total of 166 articles (53in Scopus and 113 in PubMed). After applying the language and open access filters, the number of articles was reduced to 16 in Scopus and 109 in PubMed. Title and abstract screening identified 9 eligible articles from Scopus and 11 from PubMed. Following the removal of duplicates, 16 articles were included in the final review, as presented in Table 1. Of these, one was published in conference proceedings and the remaining 15 in peer-reviewed scientific journals.

Table 1: Selected articles (author's own, 2025).

	Title	Publication	Countries	Year
1	Use of patient-handling devices and coworker assistance in long-term care settings: A cross-sectional study	International Journal of Nursing Studies Advances	South Korea and United States	2025
2	Risk assessment of healthcare workers' exposure to physical load in relation to patient handling and movement: a feasibility study of the instrument TilThermometer	BMC Musculoskeletal Disorders	Sweden	2024
3	Ward-level leadership quality and prospective low-back pain of eldercare workers: do resident handlings mediate the association?	International Archives of Occupational and Environmental Health	Sweden and Denmark	2023
4	The influence of organizational factors, eldercare worker characteristics and care situation on the use of assistive devices during resident handling in eldercare work	Applied Ergonomics	Denmark	2022
5	Use of Resident Handling Equipment by Nursing Aides in Long-Term Care: Associations with Work Organization and Individual Level Characteristics	American Journal of Safe Patient Handling & Movement	United States	2021
6	Predictors of low back pain in nursing home workers after implementation of a safe resident handling programme	Occupational and Environmental Medicine	Sweden and United States	2018
7	Effectiveness of re-education based on appropriate care methods using welfare equipment on the prevention of low back pain among care workers: a 1.5 year follow-up study	Industrial Health	Japan	2018
8	Evaluation of patient transfer assistance systems for nursing personnel at a residential home for the elderly	IEEE ROBIO 2014	Germany	2014
9	Do assistive devices, training, and workload affect injury incidence? Prevention efforts by nursing homes and back injuries among nursing assistants	Journal of Advanced Nursing	United States and Japan	2012

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Table 1: Continued

	Title	Publication	Countries	Year
10	The Influence of Ergonomic Devices on Mechanical Load during Patient Handling Activities in Nursing Homes	The Annals of Occupational Hygiene	Netherlands	2012
11	Individual and organisational determinants of use of ergonomic devices in healthcare	Occupational and Environmental Medicine	Netherlands	2010
12	Back disorders and lumbar load in nursing staff in geriatric care: a comparison of home-based care and nursing homes	Journal of Occupational Medicine and Toxicology	Germany	2009
13	Participatory Action Oriented Training for Hospital Nurses (PAOTHN) Program to Prevent Musculoskeletal Disorders	Journal of Occupational Health	United States and South Korea	2009
14	Evaluation of Ceiling Lifts in Health Care Settings: Patient Outcome and Perceptions	Workplace Health & Safety AAOHN	Canada	2009
15	Intensive education combined with low tech ergonomic intervention does not prevent low back pain in nurses	Occupational and Environmental Medicine	Denmark	2005
16	An evaluation of a "best practices" musculoskeletal injury prevention program in nursing homes	BMJ Injury Prevention	United States	2004

The temporal distribution of the reviewed studies, published between 2004 and 2025, shows a balanced distribution over the past two decades, with a greater concentration in the years 2009 (n = 3), 2012 (n = 2) and 2018 (n = 2), as shown in Figure 1.

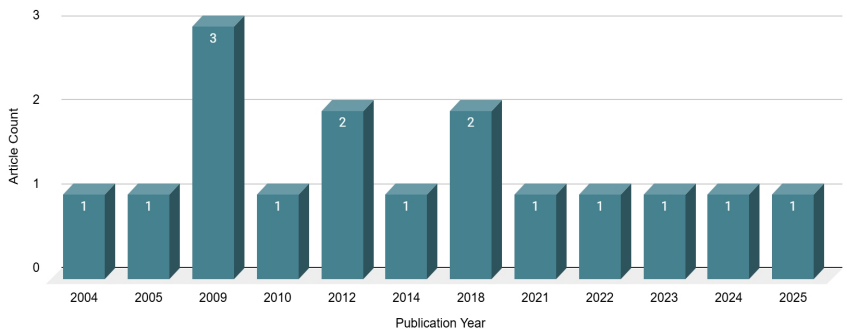

Figure 1: Temporal distribution of publications (author's own, 2025).

The articles showed broad geographical distribution (Figure 2), with international co-authorship in six studies. The United States led in publications, followed by European and Asian countries.

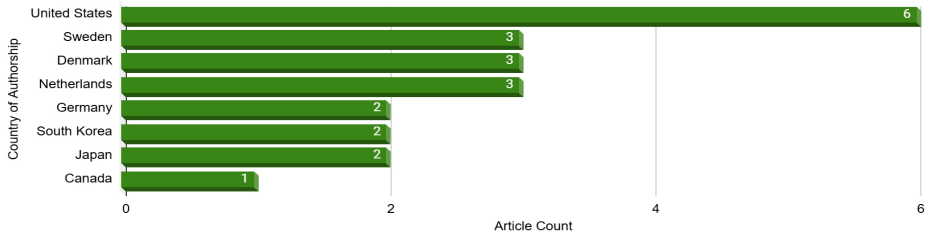

Figure 2: Temporal distribution of publications (author's own, 2025).

Most of the studies used quantitative and observational methods, primarily cross-sectional and observational designs (n = 3 each), with some longitudinal, quasi-experimental, exploratory, and pilot studies, providing a comprehensive understanding through diverse methodological approaches.

The reviewed studies primarily addressed the prevention of musculoskeletal disorders in LTCF healthcare workers, focusing on risk factor identification and work context analysis (50%), evaluation of transfer devices and techniques (31.3%), and development of intervention and educational programmes (18.8%). Many studies highlighted organisational factors, such as leadership, task duration, and training access, as key to effective equipment use, emphasising the complexity of the issue and the need for multidimensional strategies to improve occupational health in institutional care.

The analysis of the devices (Figure 3) shows a diverse range, highlighting the complexity of safe patient handling. The 16 articles evaluated multiple devices, totalling 58 occurrences, more than the number of studies. Lifts were most common (25 occurrences; 43%), followed by sliding sheets (9; 15.5%), ceiling lifts (6; 10.6%), and mechanical lifts (6; 10.6%). Floor lifts, mobile lifts, and transfer belts were reported 5 times each (8.6%). Less frequent devices included adjustable beds, bathing chairs, transfer boards, and electric turning sheets, suggesting that complementary equipment may provide additional contribution in reducing the risks in patient handling and transferring.

When it comes to the studies' participants, most studies targeted healthcare professionals (nurses, technicians, carers), with only one focusing on patients' perceptions. The sample sizes varied: 25% had small (12–54), 18.8% medium-small (101–247), 25% medium (345–549), 18.8% large (1,154–1,390), while two studies had very large samples (1,728 and 2,692). This variation reflects diverse methods and study scopes, from local to broader generalisability.

Questionnaires were the most used evaluation method (n = 10), followed by field observations (n = 5), interviews (n = 3), and time-motion studies and administrative record analyses (n = 1 each). Four studies used mixed methods, therefore the total number of occurrences exceeded the number of articles.

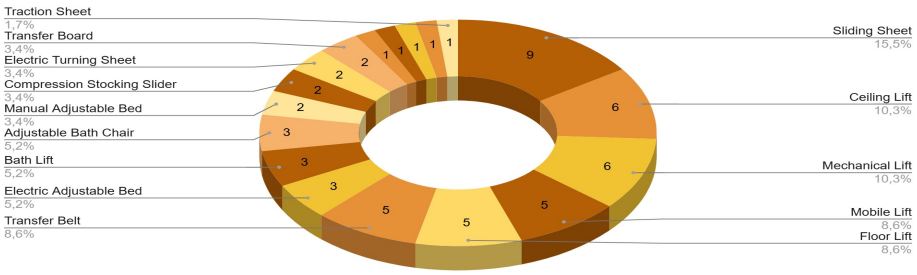

Figure 3: Types of devices addressed in the studies (author's own, 2025).

Table 2 summarises key findings, highlighting benefits such as reduced musculoskeletal symptoms, proper posture, increased patient comfort and safety, and economic gains. Limitations identified included: low availability and adherence to equipment, institutional resistance, unproper device use, inadequate staff training, and increased time required for some tasks. Additionally, structural constraints and maintenance issues were also reported as factors that may reduce the effectiveness of these interventions.

Table 2: Key positive and negative findings from the studies (author's own, 2025).

	Key Positive Findings	Key Negative Findings
1	Reduction of musculoskeletal symptoms through combined methods.	Insufficient adoption and availability of devices in long-term care settings.
2	Device use in LTCFs tied to motivation, pain, and support.	Suboptimal hospital uses due to limited access, low support, and poor adherence.
3	Increased LTCF device use is linked to motivation, prior pain, and support.	Leadership-pain link was shaped by organisational, not care-related, factors.
4	LTCFs are well equipped with lifting devices.	LTCFs: higher strain, poor guidance; home care: lower strain, less support.
5	Patients reported safety, comfort, and high satisfaction with ceiling lifts.	Ceiling lifts: no fall reduction; staff experience and adaptation affected results.
6	Use grows with task difficulty, carer readiness, and supportive settings.	Underuse raises ergonomic risk, especially in overloaded teams.
7	Adjustable devices like sliding sheets are widely used in LTCFs.	Greater risk in care tasks with limited device use, mainly in LTCFs.
8	Sliding sheets slightly increase transfer time but improve safety and comfort.	Floor lifts increase total transfer time, hindering nursing staff acceptance.
9	High device use reduces strain and improves posture.	More staff in LTCFs reduces poor posture and handling strain.
10	Widespread ergonomic device use improves posture and movement.	No evidence that lifts use reduces early low back pain; lifts alone insufficient.
11	Lifting devices reduced injuries; costs providing quick financial benefits.	High costs and resistance limit equipment adoption.

Continued

Table 2: Continued

	Key Positive Findings	Key Negative Findings
12	Lifts, training, and time cut injuries by 41%; devices common in institutions.	Training had no injury effect; unequal device access raises risks.
13	Intervention sites showed stable low back pain; training and equipment aided.	Intervention stabilised low back pain; lack of intervention led to increase.
14	Programmes boosted device use, driven by support and self-efficacy.	Equipment availability requires attention to ensure programme effectiveness.
15	Over 90% adhered to transfer techniques with high satisfaction.	Intensive programmes were no more effective than minimal education for pain.
16	Programmes reduced musculoskeletal risks and highlighted improvements.	Implementation limited by budgetary and structural constraints.

DISCUSSION

Despite the observed technological diversity, in this review, no study evaluated newly developed devices. Many investigations focused on non-powered equipment, such as sliding sheets and transfer boards (Kiung et al., 2025; Januário et al., 2023; Karstad et al., 2022; Iwakiri et al., 2018; Reimer et al., 2014; Koppelaar et al., 2011; D'Arcy, Sasai and Stearns, 2012; Kromark et al., 2009; Hartvigsen et al., 2005). Although a range of solutions has been assessed, several barriers, including low adherence, staff resistance, time constraints, maintenance challenges, insufficient training, and unequal access, continue to limit their widespread implementation (Kurowski et al., 2016; Collins et al., 2004).

Methodologically, observational, cross-sectional, and quantitative designs predominated, primarily addressing risk assessment, technology evaluation, and intervention efficacy. Only four studies (Januário et al., 2023; Kurowski et al., 2016; Iwakiri et al., 2018; Collins et al., 2004) utilised longitudinal designs, thereby limiting the knowledge on the long-term impact of these devices on occupational health outcomes.

A significant gap remains in the literature regarding the perspectives of healthcare professionals, particularly concerning their motivations, resistance, and experiences with the use of transfer and lifting devices. Furthermore, only one study (Alamgir et al., 2009) directly examined patient perceptions. Yet, comfort, safety, and dignity are essential dimensions in evaluating the quality of care. As emphasised by Baxter (2000) and Pichler and Merino (2017), the effectiveness of assistive technologies is strongly dependent on their alignment with the real-world experiences of end users, both carers and patients.

Beyond technical considerations, organisational barriers seem to play a critical role in device utilisation, even in settings where such equipment is available. Factors such as institutional culture, leadership practices, and workload pressures significantly influence adherence (Wåhlin et al., 2024; Karstad et al., 2022; Kurowski et al., 2016; Koppelaar et al., 2011;

Kromark et al., 2009; Collins et al., 2004). In this context, isolated interventions lacking continuous institutional support or environmental restructuring tend to be ineffective in preventing lower back injuries in professionals (Nelson et al., 2003).

Although limited in scope, existing evidence suggests that transfer and lifting devices offer favourable cost-benefit ratios, with economic returns observed through the reduction of injuries and absenteeism (Richardz et al., 2023; Li, Wolf and Evanoff, 2004). However, high initial costs and logistical constraints continue to limit large-scale implementation, underscoring the need for policies that promote both access and cost-effectiveness.

Based on these findings, expanding qualitative research on professionals' and patients' experiences and conducting longitudinal studies on long-term device impact are recommended. Additionally, developing technologies suited to the specific conditions of long-term care facilities is crucial for improving safe and effective care.

CONCLUSION

This review highlights the important role of transfer and lifting devices in the care of older adults in long-term care facilities, with research mainly from countries with established policies on ageing, while revealing significant gaps in Latin America and Africa.

Most research employed quantitative, observational methods focusing on the prevention of musculoskeletal disorders among staff, with limited approach to patient comfort, safety, and autonomy.

The variety of devices reported in the evaluated studies, especially lifts and sliding sheets, highlights the complexity of safe patient handling. Although these technologies offer benefits such as reduced physical strain and improved working conditions, their adoption is challenged by financial limitations, staff resistance, insufficient technical support, and poor integration with training and management.

This review underscores the need to integrate ergonomic technologies into policies prioritising staff well-being and care quality in LTCF. Ultimately, it contributes with knowledge on trends, gaps, and challenges, supporting future research and policy in prolonged care.

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