

Environmental factors associated with fall risk in adults under hospital at home: the perspective of informal caregivers

Factores ambientales asociados al riesgo de caídas en adultos en hospitalización domiciliaria: perspectiva de cuidadores informales

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ABSTRACT

Introduction: Hospital at home has expanded as an alternative to conventional inpatient care, particularly among older adults with chronic conditions. However, the transition from hospital to home introduces specific safety challenges, especially falls, which are frequently related to modifiable environmental factors. **Objective:** To identify, from the perspective of informal caregivers, the environmental factors associated with fall risk in adult clients receiving hospital at home in a private healthcare unit in the Lisbon region. **Methods:** A qualitative, descriptive and exploratory study, grounded in Meleis' Transitions Theory. Semi-structured interviews were conducted with four informal caregivers of adults under hospital at home. Data were audio-recorded, fully transcribed, and subjected to thematic content analysis following Bardin's methodology. **Results:** Seven main environmental factors were identified: (1) rugs, carpets, and loose bedspreads; (2) furniture and decorative objects that obstruct circulation; (3) adequate or insufficient space for safe mobility; (4) slippery surfaces and floor level differences; (5) presence or absence of adaptive equipment; (6) narrow doors and corridors; and (7) changing dwelling as a safety-enhancing strategy. Caregivers also reported risky practices, such as abandoning mobility aids during "short" transfers, and highlighted gaps in the guidance provided, particularly regarding lighting. **Conclusions:** Informal caregivers play a key role in managing environmental factors associated with falls during hospital at home. Findings reinforce the need for structured environmental assessment, targeted education, and decision-making support from community health nurses to promote safe transitions and prevent home-based falls.

Keywords: Home Care Services; Accidental Falls; Environment; Caregivers; Nursing; Community Health Nursing.

RESUMEN

Introducción: La hospitalización domiciliaria se ha expandido como alternativa a la hospitalización convencional, especialmente en personas mayores con enfermedades crónicas. Sin embargo, la transición del hospital al hogar conlleva desafíos específicos de seguridad, en particular las caídas, frecuentemente asociadas a factores ambientales modificables. **Objetivo:** Identificar, desde la perspectiva de los cuidadores informales, qué factores ambientales se asocian al riesgo de caídas en clientes adultos en hospitalización domiciliaria en una unidad privada de salud de la región de Lisboa. **Métodos:** Estudio cualitativo, descriptivo y exploratorio, basado en la Teoría de las Transiciones de Meleis. Se realizaron entrevistas semiestructuradas a cuatro cuidadores informales de adultos en hospitalización domiciliaria. Los datos fueron grabados en audio, transcritos íntegramente y sometidos a análisis de contenido temático según Bardin. **Resultados:** Se identificaron siete factores ambientales principales: (1) alfombras, tapetes y colchas sueltas; (2) mobiliario y objetos decorativos que obstaculizan la circulación; (3) espacio adecuado o insuficiente para la movilidad segura; (4) superficies resbaladizas y desniveles; (5) presencia o ausencia de equipamientos adaptativos; (6) puertas y pasillos estrechos; y (7) cambio de vivienda como estrategia de gestión ambiental. **Conclusiones:** Los cuidadores informales son actores clave en la gestión de los factores ambientales asociados al riesgo de caídas durante la hospitalización domiciliaria. Los hallazgos refuerzan la necesidad de evaluación ambiental estructurada, educación dirigida y apoyo a la toma de decisiones por parte de los enfermeros comunitarios. **Palabras clave:** Servicios de Atención Domiciliaria; Accidentes por Caídas; Ambiente; Cuidadores; Enfermería; Enfermería Comunitaria.

INTRODUCTION

Portugal's rapidly ageing population and the growing burden of multimorbidity place increasing pressure on health and social care systems, calling for models of care that are simultaneously effective, person-centred and sustainable.^(1,2) Hospital at home (HH) has emerged as a strategic response in this context, allowing clinically stable adults who nonetheless require complex and intensive care to be treated at home by multidisciplinary teams delivering hospital-level interventions in the domestic setting.^(3–6) International and national evidence suggests that HH can reduce complications associated with conventional inpatient care, improve users' and families' satisfaction and optimise the use of hospital resources.^(3–7)

In Portugal, the implementation of HH is a recent policy, strengthened by the National Strategy for Hospital at home, formalised through Order No. 9323-A/2018, which promotes the creation and consolidation of Hospital at home Units across the National Health Service.^(4,8) In Portugal, HH units provide hospital-level care to adults with acute or decompensated chronic conditions who are clinically stable enough to be treated at home. Care is delivered by multidisciplinary teams — including physicians, nurses and pharmacists — operating on a 24-hour basis. Patients must meet clinical, social and geographical criteria for admission, including the availability of an informal caregiver when the level of dependency so requires. By 2023, 39 units were operating within the National Health Service, with approximately 340 patients hospitalised at home daily — equivalent to a medium-sized hospital. As HH expands, the home becomes an increasingly central locus of care delivery. However, unlike the hospital, the domestic environment is highly variable and often not designed for the provision of complex health care. This makes the transition from hospital to home a particularly vulnerable period, during which safety risks, including falls, may be intensified.^(9–11)

Falls are recognised by the World Health Organization as a major public health problem, associated with significant morbidity, mortality and loss of functional independence, especially among older adults.^(12,13) In Portugal, data indicate that a substantial proportion of accidental injuries in people aged 65 years and over occur at home and are related to environmental hazards such as inadequate lighting, cluttered pathways, slippery surfaces and structural barriers.^(14–20) While fall rates specifically within HH settings remain poorly documented — a gap that itself underscores the need for further research in this area — available Portuguese data indicate that approximately 63.9% of falls in people aged 65 and over occur at home, suggesting that the domestic environment represents the highest-risk setting for fall-related injuries. This proportion increases progressively with age, reinforcing the importance of environmental assessment in home-based care contexts. Many of these factors are potentially modifiable, which underscores the importance of systematically assessing and adapting the home environment when care is delivered in this setting.^(17,19,20) Although epidemiological data on falls predominantly reflect the experience of older adults — who represent the most vulnerable subgroup within home-based care settings — the risks associated with environmental hazards in the domestic environment are relevant across the adult age spectrum, particularly when complex care needs increase dependency and reduce mobility regardless of age.

Within HH, informal caregivers play a pivotal role in the day-to-day management of these environmental risks. They are responsible for implementing recommendations, reorganising spaces, negotiating the acquisition of adaptive equipment and supporting clients in their daily activities. Their perceptions, priorities and decisions influence how the domestic environment is transformed — or not — to promote safety. Meleis' Transitions Theory offers a useful conceptual lens for understanding this process, by framing the move from hospital to home as a health–illness transition in which individuals and families renegotiate roles, routines and meanings in response to changing demands.⁽²¹⁾ In the context of HH, this transitional process is particularly complex. Unlike a conventional hospital discharge, the patient in HH remains at home whilst receiving acute-level care — creating a paradox in which the domestic space is simultaneously a site of comfort and clinical intervention. The key transitions at play are therefore not only organisational, but also relational and perceptual: the home shifts from a familiar refuge to a clinical environment, the caregiver shifts from family member to active care partner, and the patient navigates the tension between the desire for autonomy and the reality of acute dependency. Meleis' framework is especially suited to capture these layered and simultaneous transitions, which unfold gradually and require continuous renegotiation of roles, routines and meanings. From this perspective, environmental adaptations are not merely technical adjustments; they are part of a broader transitional process in which caregivers and clients try to restore stability and maintain autonomy whilst managing new vulnerabilities.

Despite the relevance of this topic, there is still limited empirical knowledge on how informal caregivers of adults under HH perceive environmental factors associated with falls, particularly in the Portuguese context and within private healthcare settings. Most studies focus on objective risk factors or on the perspective of professionals, with less attention given to the lived experience and reasoning of those who provide daily care at home. A better understanding of caregivers' perspectives is essential to inform community health nursing interventions that are not only evidence-based, but also context-sensitive and feasible in real homes.

In this framework, the present qualitative study seeks to address the following research question: "Which environmental factors, from the perspective of informal caregivers, are perceived as being associated with the risk of falls in adult clients receiving hospital at home in a private healthcare unit in the Lisbon region?" The study aims to identify and interpret these perceived environmental factors, contributing to the development of nursing interventions that support safer transitions and the prevention of falls in the home setting.

METHOD

This study adopted a qualitative, descriptive and exploratory design, guided by Meleis' Transitions Theory as a theoretical framework, which supports the understanding of the transition from hospital to home as a process marked by changes in roles, routines and environmental demands. (21) A qualitative approach was considered appropriate for accessing the meanings, reasoning and experiential perspectives of informal caregivers, whose interpretations and actions strongly shape the management of environmental risks associated with falls.

The research was conducted within the Hospital at home Unit of a private healthcare institution in the Lisbon region. The study population consisted of informal caregivers of adults receiving hospital at home. A purposive sampling strategy was used to recruit participants who were directly involved in daily caregiving activities, communicated fluently in Portuguese, and were able to provide informed consent. The sample comprised four caregivers, an appropriate size for this exploratory design, as qualitative methodological principles emphasise the depth and richness of data rather than numerical representativeness (Table 1). (22) In qualitative exploratory research, sample size is not determined by numerical criteria but by the principle of informational sufficiency — the point at which additional interviews cease to generate new analytical categories or dimensions. In this study, recurring patterns and thematic consistency were observed from the third interview onwards and confirmed in the fourth, indicating that the data had reached a level of density sufficient to address the research question. The concept of theoretical saturation, more appropriate to grounded theory designs, was deliberately not applied, as it does not align with the epistemological assumptions of descriptive qualitative research. (22) Although the sample is small, it yielded rich, detailed narratives that enabled in-depth analysis of caregivers' perceptions and practices.

Data were collected through semi-structured interviews conducted between 16 June and 20 September 2025. Semi-structured interviewing was chosen because it enables a balance between exploring pre-defined areas of interest — such as environmental risk factors, experiences with falls and adaptation strategies — and allowing participants to introduce new elements they considered relevant. The interview guide comprised six open-ended questions designed to stimulate reflection on environmental hazards, daily routines, mobility practices and the experience of caring for a person under hospital at home. Interviews were conducted either in the participant's home or in another setting chosen to ensure privacy and comfort, with no other persons present. All interviews were audio-recorded with permission and later transcribed verbatim. The duration of interviews averaged nine minutes; although brief, they were dense in content and highly focused on the topic of interest.

Data analysis followed Bardin's content analysis methodology, (22) which involves a systematic and iterative process of coding, categorisation and interpretation. Analysis began with a pre-analytical phase characterised by repeated readings to familiarise the researchers with the material and establish the initial interpretative orientation. This was followed by the exploration phase, during which transcripts were examined line by line to identify recording units and assign initial codes. Coding combined both inductive and deductive elements: some codes emerged directly from the data, while others were informed by existing literature on falls and by *a priori* categories such as lighting, obstacles, level differences and adaptive equipment. (16–20) In the final analytical phase, codes were grouped into thematic categories that reflected convergence across participants' experiences, and interpretative synthesis was developed through comparison between categories, the conceptual framework and empirical evidence.

Table 1. Sociodemographic characterisation of participants

Participant	Sex	Age group	Relationship	Cohabitation	Employment	Caregiving duration	Client dependency	Cognitive status
CI1	Male	50–60	Son	Yes	Retired	≥1 year	Partial	Intact
CI2	Female	50–60	Daughter	Yes	Employed	≥1 year	Partial	Intact
CI3	Female	~70	Spouse	Yes	Retired	≥1 year	Total	Intact
CI4	Female	50–60	Daughter	Yes	Employed	≥1 year	Partial	Intact

Note: All clients presented with acute decompensation of chronic conditions. Dependency levels were assessed based on caregiver-reported functional status.

To enhance rigour, several strategies were employed. The coding process was conducted by the primary researcher, with independent review and discussion of emerging categories by a second researcher throughout the analytical process. Discrepancies and interpretative uncertainties were resolved through structured discussion until consensus was reached. Analytical decisions were documented to ensure transparency and traceability. Interpretations were systematically compared with raw data to confirm their grounding in participants' narratives, supporting credibility. Reflexivity was maintained throughout, with researchers examining their assumptions and potential influences on data interpretation.

Ethical approval was obtained from the Ethics Committee of the higher education institution, the institutional Ethics Committee of the participating health service, and the Data Protection Officer, in line with the Declaration of Helsinki and national data protection regulations. (23,24) Participation was voluntary, and all caregivers signed informed consent forms after receiving detailed information about the study's aims and procedures. To protect confidentiality, identifiers were removed from transcripts and pseudonyms (CI1–CI4) were used. Audio files and transcripts were stored securely and will be destroyed after the legally required retention period. Reporting followed the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist to ensure transparency and completeness of methodological reporting. The completed checklist is available as supplementary material.

RESULTS

The analysis revealed a coherent and interconnected set of environmental factors perceived by informal caregivers as contributing to fall risk during hospital at home (Table 2). Across all participants, there was a consistent emphasis on the way in which domestic spaces — originally designed for everyday living rather than complex care — became sources of instability requiring continuous adaptation. Caregivers described their homes as dynamic environments undergoing progressive reconfiguration in response to the client's mobility limitations, functional decline and therapeutic needs. Notably, the factors most consistently identified were those with direct and tangible physical manifestations, whereas factors of a more indirect or diffuse nature — such as lighting — were absent from all narratives, a pattern discussed further below.

Rugs, carpets and loose bedspreads

Floor coverings emerged as the most unanimously identified hazard, mentioned by all four caregivers. Loose or poorly secured textile items were described as folding, sliding or catching on clients' feet or mobility aids, creating immediate and modifiable risks. All four caregivers reported removing rugs and carpets entirely. CI4 summarised this response concisely: "Tirei tapetes, tirei passadeiras, tirei tudo" (CI4) ["I removed the rugs, the runners, everything"].

The identification of this risk was not always reactive. CI2 described intervening before a fall occurred, based on direct observation: “os tapetes são terríveis... cheguei a ver ela a levantar o tapete com o pé, retirei” (CI2) [“the rugs are terrible... I actually saw her lifting the rug with her foot, so I removed it”]. In one case, a fall had already occurred as a direct result of this hazard: “E cá em casa aconteceu uma queda motivada por uma colcha da cama em que as pontas da colcha estavam no chão... ela pôs o pé em cima da ponta da colcha e o pé escorregou e ela caiu” (CI1) [“And at home there was a fall caused by a bedspread whose corners were on the floor... she put her foot on the corner of the bedspread and her foot slipped and she fell”].

Table 2. Environmental factors associated with fall risk identified by informal caregivers

Environmental Factor	Description and Characteristics
1. Rugs, carpets, and loose bedspreads	Loose or poorly secured textile items that fold, slide, or catch on feet or mobility aids; unanimously removed or replaced with non-slip alternatives by all four caregivers
2. Furniture and decorative objects	Side tables, footstools, vases, and misplaced items that obstruct circulation and narrow pathways; reorganised by all four caregivers to widen movement corridors
3. Space adequacy for mobility	Sufficient or insufficient physical space for safe movement, particularly when using assistive devices; valued as an active facilitating condition by all four caregivers
4. Slippery surfaces and level differences	Moisture, hard flooring, thresholds, steps, and uneven floor transitions, especially in bathrooms and kitchens; managed through non-slip mats, drying and supervision
5. Adaptive equipment	Presence or absence of articulated beds, bed rails, shower chairs, grab bars; valued as essential but insufficient when architectural barriers limit their effectiveness
6. Narrow doors and corridors	Architectural constraints that limit manoeuvrability with assistive devices; identified by two caregivers as fixed structural barriers
7. Relocation as risk management	Changing dwelling to more accessible homes when structural risks cannot be addressed through minor adaptations; reported by three caregivers as a major but necessary strategy
Additional finding: abandonment of mobility aids	Clients frequently abandoned mobility aids during ‘short’ transfers, creating high-risk moments in areas with environmental hazards

Furniture and decorative objects

Furniture and decorative objects were identified by all four caregivers as significant obstacles to safe circulation. Items such as side tables, footstools, vases, and decorative objects were described as narrowing pathways and creating collision risks. CI3 expressed the need to simplify the home environment: “Deve haver o menos coisas possíveis de a pessoa embarrar... evitar tudo o que é bibelots, coisas assim que atramanquem muito uma casa” (CI3) [“There should be as few things as possible for the person to bump into... avoid all the ornaments and things that clutter a house”]. CI2 articulated an explicit reordering of priorities: “a decoração é preterida em função da mobilidade da pessoa” (CI2) [“decoration is subordinated to the person’s mobility”]. Among the caregivers interviewed, this shift was described as deliberate and necessary, reflecting a reconceptualisation of the home as a functional caregiving space rather than primarily a space of personal expression.

Space adequacy for mobility

Adequate physical space for circulation was valued by all four caregivers, not merely as the absence of obstacles but as an active facilitating condition. CI1 linked available space directly to fall prevention: “Temos bastante espaço, felizmente, para poder andar de um lado para o outro, para ela não tropeçar em nada” (CI1) [“We have quite a lot of space, fortunately, to move from one side to the other so she doesn’t trip on anything”]. CI4 described space creation as an ongoing effort: “É tentarmos ter muito espaço para eles circularem” (CI4) [“It’s about trying to have a lot of space for them to move around”]. When space was insufficient, caregivers intervened actively. CI3 described removing bathroom furniture to improve circulation: “Eu tinha um lavatório ali na casa de banho que dificultava ele passar, tirei o lavatório, pus para o canto” (CI3) [“I had a washbasin in the bathroom that made it difficult for him to pass, so I removed it and put it in the corner”].

Slippery surfaces and level differences

Slippery surfaces were identified as a concern, particularly in bathrooms and kitchens. CI4 expressed anticipatory anxiety about this risk: “Tenho muito medo que ela me caísse no banho” (CI4) [“I am very afraid of her falling in the bath”]. This concern led to proactive measures including non-slip surfaces and careful management of moisture. Level differences — such as thresholds, steps and uneven floor transitions — were identified by three caregivers. CI1 described managing a small but persistent level difference: “Tirando aquela zona onde tem o escritório que tem ali um ligeiro ressalto da janela no chão, mas que ela já está bastante habituada e agarra-se à porta e passa com o pé por cima” (CI1) [“Except for the area near the office where there is a slight raised threshold, but she is quite used to it and holds onto the door and steps over it”]. CI2, by contrast, had eliminated this risk entirely through deliberate housing selection: “decidi que não iria para uma casa com escadas, porque as escadas são terríveis... degraus não!” (CI2) [“I decided I would not go to a house with stairs, because stairs are terrible... no steps!”].

Adaptive equipment

Three of the four caregivers described installing or acquiring adaptive equipment as an essential component of environmental safety. CI3 described replacing the conventional bed with a hospital-grade articulated bed: “Tiramos a cama... compramos uma cama articulada, que dá para baixar, tem grades, tem um suporte em cima que o ajuda a levantar. E ele ali não pode cair porque tem as grades” (CI3) [“We removed the bed... we bought an articulated bed that can be lowered, has rails, has a support above to help him get up. And there he cannot fall because of the rails”]. The same caregiver also described using a shower chair: “tem a cadeira para tomar banho... ele não é capaz de pular para dentro da banheira, podia cair e partir uma perna” (CI3) [“he has a chair for bathing... he is not able to step into the bathtub, he could fall and break a leg”]. Equipment was valued as essential, though caregivers recognised its limitations when architectural constraints persisted. One caregiver (CI1) noted that homes are generally not designed for standard wheelchairs and compensated by acquiring a narrower model.

Narrow doors and corridors

Two caregivers identified narrow doors and corridors as fixed structural barriers that limited safe mobility, particularly when using assistive devices. CI4 described the practical consequences: “o andarilho não entra lá dentro. E se entrar é de lado. Entra de lado, o que não dá segurança nenhuma” (CI4) [“the walker does not fit inside. And if it does, it goes in sideways. It goes in sideways, which gives no safety at all”]. CI1 noted, during a housing search, a home that had been deliberately adapted by nurses: “tinham remodelado a casa e uma das coisas que precisamente tinham feito era pôr as portas mais largas para já contar com essa situação” (CI1) [“they had renovated the house and one of the things they had specifically done was to widen the doors to account for that situation”]. Two caregivers managed this constraint through equipment adaptation; one relocated to a more accessible home.

Relocation as environmental risk management

Three of the four caregivers reported having moved to a different home in order to create an environment structurally suited to caregiving needs. This finding was not anticipated in the a priori theoretical framework and emerged inductively from participants' narratives. CI2 described the decision as a deliberate preventive strategy: “decidi que não iria para uma casa com escadas, porque as escadas são terríveis... degraus não!” (CI2) [“I decided I would not go to a house with stairs, because stairs are terrible... no steps!”]. CI3 compared the previous and current environments directly: “Na nossa casa era mais complicado, esta casa é mesmo para o jeito dele” (CI3) [“In our previous house it was more complicated, this house is exactly right for him”], adding that the home was “muito facilitada para o jeito de pessoas como ele, que é rés-do-chão” (CI3) [“very well suited for people like him, being on the ground floor”]. Relocation was consistently described not as a sacrifice but as a solution — a proactive reconfiguration of the caregiving environment when minor adaptations proved insufficient.

Abandonment of mobility aids

A behavioural finding emerged across the narratives: clients frequently abandoned mobility aids during transfers perceived as short or routine. CI4 described a fall resulting directly from this behaviour: “Deixava o andarilho aqui, na esquina, e ia tuc tuc tuc sentar-se. Há um dia, não sei porquê, caiu para trás. O andarilho ficou ali, ela veio a andar, o andarilho ficou para trás... bateu com a cabeça naquele móvel e partiu a cabeça” (CI4) [“She would leave the walker here, at the corner, and go tuc tuc tuc to sit down. One day, I don’t know why, she fell backwards. The walker stayed there, she came walking, the walker stayed behind... she hit her head on that piece of furniture and split her head open”]. CI4 also described a recurrent pattern in the kitchen: “Aqui há tempos foi para o fogão, foi para o lava-louça e deixou o andarilho a uma ponta da cozinha. E vai do fogão para o lava-louça sem andarilho. E eu não quero” (CI4) [“Recently she went to the stove, went to the sink and left the walker at one end of the kitchen. And she goes from the stove to the sink without the walker. And I don’t want that”]. This pattern was interpreted by this caregiver as an expression of the client’s desire to maintain autonomy, not as simple non-compliance.

Inadequate lighting — a significant absence

A notable finding in this study was the complete absence of lighting from all four caregivers’ narratives. Despite its well-documented relevance as an environmental fall risk factor, no participant spontaneously identified inadequate lighting as a concern. The only indirect reference to nocturnal risk came from CI2, who mentioned “a questão da noite, da pessoa se tentar levantar sozinha e cair” (CI2) [“the issue of the night, of the person trying to get up alone and falling”] — framing the risk as behavioural rather than environmental. This absence is interpreted not as evidence that lighting is adequate in these homes, but as a reflection of the indirect nature of this risk factor: caregivers consistently identified hazards that are tangible and visible, whereas lighting affects safety through its influence on the perception of other hazards rather than constituting a direct obstacle. This finding suggests a systematic gap between caregiver-perceived risk and scientifically documented risk, with direct implications for structured nursing assessment.

DISCUSSION

The findings of this study provide a nuanced understanding of how informal caregivers perceive and negotiate environmental fall risks during hospital at home. Within the limits of this sample, the domestic environment emerges not as a static collection of hazards but as a fluid space continuously reorganised in response to changing needs, evolving routines and fluctuating levels of vulnerability. Among the caregivers interviewed, environmental safety appeared as an active and dynamic process deeply embedded in the lived experience of caregiving. This suggests that domestic fall risk should be understood not merely as a physical phenomenon, but as the outcome of an interplay between environmental, behavioural, emotional and relational factors — though this interpretation should be considered exploratory given the small sample size.

In line with international research, the caregivers in this study identified common fall hazards such as rugs, slippery surfaces and architectural barriers.^(14–20,25–27) The finding that all four caregivers spontaneously removed rugs and carpets — often before any fall had occurred — is consistent with Clemson et al.’s systematic review,⁽¹³⁾ which identifies the removal of loose floor coverings as one of the environmental modifications with the strongest evidence of fall prevention efficacy. What this study adds, however, is that caregivers reached this conclusion autonomously, without formal training, suggesting that tangible and visible hazards are within the natural reach of caregiver perception. By contrast, Lord et al.⁽²⁷⁾ document visual risk factors — including inadequate lighting — as strongly associated with falls in older adults. The complete absence of lighting from the narratives of all four caregivers in this study highlights a critical discrepancy between professionally documented risk and caregiver-perceived risk that Clemson et al.’s intervention models do not fully address. Among the caregivers interviewed, adaptations were not solely technical or practical; they also appeared to carry emotional and symbolic significance. The removal of furniture and personal objects, or modifications to the home’s layout, were in some cases described as difficult adjustments that challenged the identity and meaning of the home.

This highlights a psychosocial dimension that fall-prevention literature tends to overlook: safety interventions can disrupt the emotional equilibrium of a household and require caregivers to negotiate the tension between maintaining the home's identity and protecting the client's physical safety. These observations echo findings by Resnik and Allen, (28) who document that environmental modifications may conflict with older adults' sense of autonomy and normality, and that assistive device use is shaped by identity-related concerns — a pattern directly confirmed in this study by the behaviour of clients abandoning mobility aids during short transfers.

A structurally significant finding was the recognition that some hazards are architecturally embedded and not easily modifiable. Caregivers described narrow corridors, steep steps and insufficient bathroom space as fixed barriers that limited manoeuvrability and increased fall risk. In three cases, these constraints prompted relocation to more suitable dwellings. This is an original finding not documented in the fall prevention literature reviewed, including Lord et al. (17) and Pighills et al., (15) which focus on modifications within existing homes. It reinforces the notion that housing conditions act as structural determinants of safety in home-based care, and that effective fall prevention may require not only nursing support but also broader social and policy interventions — a dimension that existing intervention models have yet to systematically address.

The behavioural dimension identified in this study — the abandonment of mobility aids during short transfers — adds a further layer of complexity. In line with Resnik and Allen, (28) and Mahoney et al., (29) caregivers interpreted this behaviour not as non-compliance but as an expression of autonomy and identity preservation. This finding reinforces the argument that environmental modifications alone are insufficient and must be accompanied by person-centred behavioural counselling that acknowledges the emotional dimensions of dependency and recovery.

The emotional burden emerging from caregivers' accounts in this study is equally notable. Managing fall risk was described as requiring constant vigilance, anticipation of hazards and readiness to intervene, contributing to feelings of stress and anxiety. This hypervigilance is an often-invisible dimension of caregiving and underscores the need for structured professional support. Community health nurses play a crucial role in mitigating caregiver burden by offering clear guidance, validating concerns and reinforcing effective preventive strategies, particularly through focused educational intervention. (30)

Limitations

This study has several limitations that should be considered when interpreting the findings. The sample comprised four caregivers from a single private HH unit in the Lisbon region, which limits the transferability of the findings to other contexts, including public sector HH units or settings outside urban Portugal. Interviews averaged nine minutes, which, although dense in content, may not have allowed for full exploration of all relevant dimensions. Data collection was conducted exclusively during daytime hours, which may have influenced participants' spontaneous recall of nocturnal risks such as lighting. The absence of direct environmental observation means that caregivers' perceptions could not be triangulated against objective assessments of the home. The absence of formal participant characterisation data collected at the time of the study, and the lack of member checking, are acknowledged as additional limitations. These constraints do not invalidate the findings, but they underscore the exploratory nature of this study and the need for replication in larger and more diverse samples.

Implications for practice and future research

These findings carry several implications for community health nursing practice. First, systematic environmental assessment should be integrated as a standard component of HH admission protocols, using structured tools that explicitly include lighting — a factor not spontaneously identified by any caregiver in this study despite its documented relevance. Second, caregiver education should be targeted at identified gaps rather than generic fall prevention content, recognising that caregivers already possess substantial experiential knowledge about tangible hazards. Third, the finding that three caregivers relocated to more accessible homes points to an unmet policy need: structured support for housing adaptation or relocation when environmental risks cannot be addressed through minor modifications, particularly for socioeconomically vulnerable families. Future research should explore these dynamics in larger and more diverse samples, including public sector HH units, investigate whether structured nursing assessment tools improve caregiver identification of indirect risk factors such as lighting, and examine the long-term outcomes of relocation as a fall-prevention strategy.

CONCLUSIONS

This study shows that informal caregivers assume a central and complex role in identifying, interpreting and mitigating environmental fall risks during hospital at home. Their perspectives reveal that domestic hazards are not merely physical obstacles but dynamically shifting elements that acquire new significance as routines change and vulnerability increases. Among the caregivers in this study, the process of adaptation ranged from removing everyday objects to redefining spatial organisation and, in three cases, relocating entirely to safer homes. Managing fall risk thus emerged as both a practical and an emotional endeavour, requiring vigilance, negotiation, problem-solving and substantial resilience.

These findings highlight that fall prevention in hospital at home extends far beyond correcting isolated hazards. It requires understanding how clients' behaviours, identities and emotional needs intersect with environmental risks, and how caregivers navigate these complexities while striving to maintain safety, dignity and autonomy. Community health nurses must adopt comprehensive and proactive strategies that integrate systematic environmental assessment — explicitly including lighting —, personalised caregiver education focused on identified gaps, behavioural counselling and advocacy for accessible housing solutions.

Future studies should explore these dynamics in larger and more diverse populations, consider cultural and socioeconomic influences on environmental adaptation, and investigate multidisciplinary interventions that strengthen the capacity of families to manage complex care needs at home.

REFERENCES

1. Delerue C. Hospitalização domiciliária em Portugal. Lisboa: [Editora]; 2020.
2. Gonçalves-Bradley DC, Iliffe S, Doll HA, et al. Hospital at home: a systematic review. *BMJ*. 2009;338:b1037.
3. Caplan GA, Ward JA, Brennan NJ, et al. Hospital in the home: a randomised controlled trial. *Med J Aust*. 1999;170(4):156–60.
4. Leff B, Burton L, Mader SL, et al. Hospital at home: feasibility and outcomes. *Ann Intern Med*. 2005;143(11):798–808.
5. Shepperd S, Iliffe S, Doll HA, et al. Admission avoidance hospital at home. *Cochrane Database Syst Rev*. 2016;(9):CD007491.
6. Ministério da Saúde (PT). Despacho n.º 9323-A/2018. *Diário da República*. 2018;191(II).
7. Direção-Geral da Saúde. Norma n.º 020/2018 – Hospitalização Domiciliária. Lisboa: DGS; 2018.
8. Lei n.º 100/2019, de 6 de setembro. Estatuto do Cuidador Informal. *Diário da República*. 2019;169(I).
9. World Health Organization. WHO Global report on falls prevention in older age. Geneva: WHO; 2008.
10. World Health Organization. Step safely: strategies for preventing and managing falls across the life-course. Geneva: WHO; 2021.
11. Instituto Nacional de Saúde Doutor Ricardo Jorge. Acidentes domésticos e de lazer em idosos: dados EVITA 2023. Lisboa: INSA; 2023.
12. Instituto Nacional de Estatística. Causas de morte em Portugal 2023. Lisboa: INE; 2025.
13. Clemson L, Mackenzie L, Ballinger C, et al. Environmental interventions to prevent falls in community-dwelling older people: a meta-analysis. *J Aging Health*. 2008;20(8):954–71.
14. Gillespie LD, Robertson MC, Gillespie WJ, et al. Interventions for preventing falls in older people living in the community. *Cochrane Database Syst Rev*. 2012;(9):CD007146.
15. Pighills AC, Torgerson DJ, Sheldon TA, et al. Environmental assessment and modification to prevent falls. *J Am Geriatr Soc*. 2011;59(1):26–33.
16. Lord SR, Sherrington C, Menz HB. Falls in older people: risk factors and strategies for prevention. 2nd ed. Cambridge: Cambridge University Press; 2007.
17. Kim SY, Yoo JI, Koo KH. Home hazard modification for fall prevention in older adults: a systematic review. *J Clin Med*. 2023;12(1).
18. Bardin L. Análise de conteúdo. Lisboa: Edições 70; 2011.
19. Fortin MF. Fundamentos e etapas do processo de investigação. 7.ª ed. Loures: Lusociência; 2009.
20. Flick U. Introdução à investigação qualitativa. 3.ª ed. Lisboa: Monitor; 2009.
21. Meleis AI. Transitions theory: middle-range and situation-specific theories in nursing research and practice. New York: Springer; 2010.
22. Quivy R, Van Campenhoudt L. Manual de investigação em ciências sociais. 5.ª ed. Lisboa: Gradiva; 2013.
23. Organização Mundial dos Médicos. Declaração de Helsínquia. WMA; 2013.
24. Ordem dos Enfermeiros. Regulamento n.º 428/2018. Lisboa: OE; 2018.
25. Stevens JA, Phelan EA. Development of STEADI: a fall prevention initiative for older adults. *Gerontologist*. 2013;53(2):198–205.
26. Chen TY, Janke MC. Leisure-time physical activity and fall incidence in older adults. *J Aging Phys Act*. 2014;22(3):389–404.
27. Lord SR. Visual risk factors for falls in older people. *Age Ageing*. 2006;35(suppl_2):ii42–5.
28. Resnik L, Allen S. Using assistive devices: behaviours and beliefs of older adults. *J Aging Health*. 2007;19(6):973–91.
29. Mahoney JE, Palta M, Johnson J, et al. Temporal relationship between fear of falling and physical activity. *J Gerontol A Biol Sci Med Sci*. 2001;56(12):M790–7.
30. Martínez-Melero I, Ruiz-García MJ, Ruiz-Merino G, García-Rubio A. Impact of a community-based educational intervention on the burden and health-related quality of life of informal caregivers. *Geriatric Nursing*. 2025;65:103513.

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