



Nursing staffing and skill mix in nursing homes in Italy: An observational cross-sectional study



Daniele Marchetti^{a,1}, Simone Cosmai^{b,1,*}, Pietro Xausa^c, Giancarlo Galbiati^c, Andrea Poliani^d, Chiara Mainardi^a, Stefano Mancin^{b,e}, Gianluca Solitro^f

^a ASST Papa Giovanni XXIII Piazza OMS, 1, Bergamo 24127, Italy

^b Department of Biomedical Sciences, Humanitas University, Via Rita Levi Montalcini 4, Pieve Emanuele, Milan 20072, Italy

^c ASST Bergamo Est, Viale Carlo Maria Martini, 1 Seriate 24068, Bergamo, Italy

^d Center for Nursing Research and Innovation, Faculty of Medicine and Surgery, Vita-Salute San Raffaele University, Milan 20132, Italy

^e IRCCS Humanitas Research Hospital via Manzoni 56, Rozzano 20089, Italy

^f Ordine delle Professioni Infermieristiche di Bergamo, via Pietro Rovelli 45, Bergamo 24125, Italy

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ABSTRACT

Introduction/Objective: The relationship between staffing levels and skill mix in nursing homes is poorly documented in Italy. This study aimed to investigate nursing staffing levels and skill mix in Northern Italian nursing homes.

Methods: A cross-sectional observational study was conducted using a questionnaire sent to several nursing homes.

Results: Twenty-three nursing homes participated. Data were collected on organizational models, daily hours of support staff, and daily hours of care per resident, categorized by professional profile. The predominant models were “by sector or modular” and “Team nursing”. Daily hours of nursing care were minimal; in most nursing homes, daily hours of support staff exceed those of nurses and healthcare assistants. Total daily hours of care per resident were 2.75, below international and recommended standards.

Discussion: Organizational settings can be improved by adjusting staffing, particularly by rebalancing the ratio of nursing to support staff, to improve outcomes and prevent missed care.

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Introduction

The relationship between staffing levels and skill mix and quality and safety in nursing homes (NH) for the elderly has been extensively investigated.¹ Adequate nursing staffing levels have been associated with improved outcomes for residents and staff.^{2,3} This positive influence has led some authors to develop methodologies to define appropriate nursing staffing levels based on the complexity of care needs.⁴ However, nursing staffing and skill mix levels remain heterogeneous internationally, reflecting different systems and models of elderly care facilities.⁵ In the United States, federal law establishes minimum standards, usually increased by individual states, while most Canadian provinces have higher standards.⁶ In Europe, Germany has adopted regional standards that vary according to the level of acuity

and the number of residents, with nursing staff available 24 h a day. However, England, Norway, and Sweden do not have specific nursing staffing standards.⁷ Actual staffing levels are lower than recommended by established guidelines. In the United States, for example, in 2010, residents received 3.9 h of nursing care per day, compared to recommended levels of 4.5 h, with adjustments related to case mix.⁷

A similar situation is observed in Italy, where nursing staff-to-resident ratios in nursing home range from 1:60 to 1:100.⁸ Differences in nurse-to-resident ratios are mostly related to regional accreditation models that determine staffing levels based on the calculation of assistance minutes but not related to objective tools for defining activities related to care complexity.^{9,10}

The literature concerning skill mix in NH highlights that the composition of the staffing can be divided into two main categories: personnel such as nurses and Licensed Vocational Nurses / Licensed Practical Nurses (LVN/LPN) and personnel such as Certified Nurse Assistants (CNA).¹¹ In NH the role of CNAs is the most prevalent, which has long been the subject of extensive professional and political debate regarding the proper identification of the relationship between nurses/LVN/LPN and other support roles in caregiving.¹² For

* Corresponding author at: Humanitas University, Via Rita Levi Montalcini 4, 20072 Pieve Emanuele – Milan, Italy.

E-mail address: simone.cosmai@hunimed.eu (S. Cosmai).

¹ Both authors have equally contributed to conducting the study and writing the manuscript.

example the Centre for Medicare & Medicaid identifies at least one nurse for 45 min per patient per day, a Licensed Practical Nurse (LPN) for 33 min per patient per day, and a Certified Nurse Assistant (CNA) for 180–228 min per person per day.¹³

In Lombardy, Northern Italy, a weekly time requirement of 750 min of assistance per guest is stipulated, increased to 901 min as a regional accreditation requirement, involving all professional figures.¹⁴ Indeed, in regulations, the calculation of assistance time provided is not only for nursing staff but also for support staff such as Nursing Assistants (OSS) and Socio-Healthcare Assistants (ASA).^{15,16} Both figures play a central role in providing services to meet primary needs and support nursing staff.^{15,16} Additionally, both authorization and accreditation parameters require continuous nursing assistance or, alternatively, guaranteed assistance for 12 h a day, with medical availability connected to the presence of OSS in the facility.¹⁴

Currently, in Italy, there is a lack of national guidelines or standards to implement nursing staffing in nursing homes, with a shortage of studies analyzing the relationship between staffing and care outcomes.¹⁷ This issue stems from both the lack of national programs and the recent COVID-19 pandemic, particularly in Northern Italy, in the province of Bergamo, which has had the most dramatic consequences in the healthcare setting and assisted living facilities.^{18,19} These events have not only resulted in a high loss of lives but also significant impacts on the professional and psychosocial levels of many healthcare workers, leading to a nursing profession abandonment and consequently affecting nursing staffing and skill mix levels.^{20,21}

Study aims

This study aims to investigate nursing staffing levels and skill mix in nursing homes in Italy, specifically in the province of Bergamo.

Methods

Study design and sampling

A descriptive cross-sectional survey was conducted from 13/10/2022 to 31/12/2022. The sample consisted of NH in the province of Bergamo, Italy. The sample size was determined using the list of NH lodged in the local health authority. Departments dedicated to specific high-care pathologies, such as Alzheimer's units, were excluded because these departments have another regulations on staffing. Their inclusion could overestimate staffing levels. In these departments there are only people with diagnosis of Alzheimer who need a greater care, not all the seniors with cognitive impairment. No follow-up was planned. This research adheres to the STROBE Guidelines (Supplementary File).²²

Ethical approval

Informed consent was obtained from all participants prior to their involvement in the study, and the ethical recommendations contained in the Declaration of Helsinki were followed at all times.²³ Ethical committee approval was not required, as it was unnecessary for this type of study. The ethical review and the authorization to conduct the study was drawn up by a committee of experts from the provincial order. Permission to participate in the study was requested from the health and general directorates of each individual facility enrolled in the study

Instrument

The questionnaire was developed following rigorous methodological standards, involving an expert panel from the Order of Nursing Professions (OPI) of Bergamo, Italy. The questionnaire, specifically

designed by OPI Bergamo, aimed to collect comprehensive data on organizational models and staffing in nursing homes (NH). The development of the questionnaire followed a structured approach comprising several key steps. Initially, an interview was conducted with the nursing director of a nursing home (NH) not included in the study sample. This interview aimed to thoroughly explore and define the aspects of interest relevant to the research. In parallel, an in-depth review of policies, regulations, and existing literature was undertaken to provide a robust foundation for item development. Based on the insights gathered, a pool of questionnaire items was generated. Each item was then assessed by a panel of experts, who evaluated its relevance, clarity, and comprehensibility to ensure the quality and validity of the final instrument. The questionnaire consisted of 35 structured questions divided into three main sections:

Facility Characteristics: Adopted care model. Total number of residents (excluding those in Alzheimer units). Subcategories of patients, including individuals with amyotrophic lateral sclerosis (ALS) or in vegetative states. Classification of residents based on SOSIA categories, a system used in Lombardy, Italy, to evaluate resident fragility. This classification ranges from Class 1 (most severe) to Class 8 (least severe).²⁴

Staffing Details: Presence and schedules of nursing and support staff (OSS and ASA) during morning, afternoon, and night shifts. Number of working hours for each type of shift (full-time, part-time, daily shifts). **Care Outcomes:** Total nursing hours and overall personnel hours provided in 2021. The questionnaire included close-ended questions to collect quantitative data and categorical options to ensure uniformity in responses. The study protocol excluded data related to Alzheimer units. The variables assessed included: Daily hours per professional profile (Hours/day); Total daily assistance hours (Total hours/day); Daily assistance hours per resident by professional profile (HPRD); Total daily assistance hours per resident (HPRD Total). The skill mix was calculated as the ratio of nurses to support staff (OSS and ASA). Daily hours were determined based on the following criteria: The duration of each work shift (morning, afternoon, and night) for nurses and support staff (full-time, part-time, and daily shift workers). The number of workers present during each shift and the actual duration of their working hours. The total sum of working hours for each shift.

Data collection

The questionnaire was distributed via email to all nursing managers and/or human resources managers of all NHs in the province of Bergamo, Italy. Units dedicated to specific high-care needs, such as Alzheimer's units, vegetative states, and ALS wards, were excluded from the study. To encourage participation, a maximum of two follow-up calls were made to the medical directors in each facility if responses were not received within one month of the request. Respondents have given informed consent by implicitly filling in and returning the questionnaire as described in the section on ethical approval.

Statistical analysis

Given that the total sample in the investigated area included 65 NH, a minimum sample of 20 questionnaires (30.7 %) was considered significant for this study. This value was calculated to ensure adequate statistical representativeness, despite the variation in size and staff numbers of the different facilities, ensuring that the results are generalizable to the entire investigated area. The sample size was assessed based on a previous mapping of the nursing homes in the area, conducted with the support of OPI Bergamo. The hours/day were calculated as the sum of the daily hours worked by individual professional profiles within the nursing homes. The Hours Per

Resident Day (HPRD) for each professional profile were determined by dividing the hours/day by the number of residents in the facility. The total HPRD was obtained by summing the HPRD of all professional profiles, thus representing the total daily care hours per resident.

The collected data were processed and reported in aggregated and anonymous form and gathered in a specific Excel database created for this study, protected by a password. The statistical analysis was conducted using SPSS software version 22.

Results

Out of the 65 surveyed nursing homes, 23 (35 %) completed the survey. Of these, two did not provide information on the hours of the involved staff and their respective shifts. Therefore, the total sample analyzed consists of 21 nursing homes. The facilities reported adopting the following prevalent organizational care models: "Sector or modular" (33.3 %) and "Team Nursing (for small teams)" (33.3 %), followed by "Functional or task-based" (19.0 %) and "Primary Nursing" (9.6 %). One nursing home (4.8 %) did not answer the question.

The distribution of the number of residents in the nursing homes was as follows: 4 nursing homes (19.0 %) had fewer than 50 residents, 11 nursing homes (52.4 %) had between 50 and 100 residents, 4 nursing homes (19.0 %) had between 100 and 150 residents, 1 nursing home (4.8 %) had between 150 and 200 residents, and 1 nursing home (4.8 %) had >350 residents. During the analysis of the collected data, a significant discrepancy was noted between a nursing home with >350 residents and the other facilities, which had much smaller sizes. Due to this disparity, it was decided to analyze the nursing home with over 350 residents separately to avoid distorting the overall results. The remaining 20 nursing homes were divided into tertiles to ensure a more balanced and representative analysis. The tertiles were defined as follows: the first tertile (T1) includes nursing homes with an average of 68 residents, while the second tertile (T2) includes nursing homes with an average of 93 residents. This subdivision allows for the comparison of homogeneous groups in terms of size, providing more accurate and relevant results for each segment analyzed (Table 1).

Subsequently, the analyzed sample was evaluated through the S. OS.I.A classes, respectively to the previously defined subdivision into tertiles. In the first tertile, 43.4 % of residents were in S.OS.I.A class 1–2, 31.1 % in S.OS.I.A 3–6 and 25.5 % in S.OS .I.A 7–8; In the second tertile, 37.4 % of residents were in S.OS.I.A class 1–2, 40.1 % in S.OS.I.A

Table 1
Distribution of patients in the NHs investigated.

Tertile	Patients (n)	Min (n)	Max (n)	Mean (n)	SD
1	341	28	68	48,7	15,2
2	561	71	93	80,1	7,4
3	677	100	152	112,8	19,5
Total	1579	28	152	79	29,8

Legend. n=number; Min=Minimum; Max= Maximum; SD= Standard Deviation.

3–6 and 22.5 % in S.OS .I.A 7–8; In the third tertile, 41.8 % of residents were in S.OS.I.A class 1–2, 32.5 % in S.OS.I.A 3–6 and 25.7 % in S.OS .I. A 7–8 (Table 2).

After analyzing the population residing in NHs, with particular attention to its size and frailty, an analysis of the hours worked by nursing and support staff was conducted.

The distribution of staff across daily shifts revealed that at least one nurse was always present in all facilities during the morning shift. However, the situation varied during the afternoon and night shifts: a nurse was not present in one NH (5 %) in the afternoon and in two NHs (10 %) during the night.

Regarding support staff, three NHs (15 %) do not had OSS. Among the facilities that employ them, OSSs were always present during the morning shift, while they were not present in three NHs (17.6 %) in the afternoon and in nine NHs (52.9 %) during the night. Additionally, three NHs (15 %) do not had ASA. In the facilities that employ them, ASAs were always present during the morning and afternoon shifts. However, in one NH (5.9 %), ASAs was not present during the night shift (Table 3).

The analysis revealed the following distribution of working hours among the different categories of staff in NH: in the first tertile, 30.6 % of the hours were attributed to nursing staff, 41 % to OSS, and 28.4 % to ASA; in the second tertile, 17.4 % of the hours were provided by nursing staff, 26 % by OSS, and 56.6 % by ASA; in the third tertile, 21.9 % of the hours were covered by nursing staff, 5.4 % by OSS, and 72.7 % by ASA (Table 4).

Analyzing in detail the proportion of HPRD provided by each professional category, it was observed that in the first tertile, 28.8 % of HPRD was provided by nursing staff, 43.2 % by OSS and 28 % by ASA; in the second tertile, 18 % of HPRD were provided by nursing staff, 25.7 % by OSS and 56.3 % by ASA; in the third tertile, 21.7 % of HPRD were provided by nursing staff, 5.1 % by OSS and 73.2 % by ASA.

Table 2
NH patients classified according to S.OS.I.A classes.

Tertile	S.OS.I.A 1–2			S.OS.I.A 3–6			S.OS.I.A 7–8		
	Min (h)	Max (h)	Mean (h)	Min (h)	Max (h)	Mean (h)	Min (h)	Max (h)	Mean (h)
1	3	45	21,1	5	34	15,1	5	19	12,3
2	17	50	30,0	23	43	32,1	2	34	18,0
3	41	57	47,2	27	49	36,7	22,0	46	29,0
Total	3	57	32,1	5	49	27,6	5	46	19,3

Legend. h=Hours; Min=Minimum; Max= Maximum; S.OS.I.A= Intermediate Care Observation Sheet.

Table 3
Distribution of care activity among healthcare workers.

Tertile	Nurse Hour/Day			OSS Hour/Day			ASA Hour/Day			Total Hour/Day		
	Min (h)	Max (h)	Mean (h)	Min (h)	Max (h)	Mean (h)	Min (h)	Max (h)	Mean (h)	Min (h)	Max (h)	Mean (h)
1	16,0	207,0	50,5	16,0	114,0	67,4	0	116,0	46,9	81,0	349,0	164,8
2	17,0	45,2	36,4	0	222,0	54,1	0	165,2	117,9	165,6	267,2	208,4
3	43,3	107,5	57,8	0	36,5	14,2	146,8	293,5	192,2	199,5	437,5	264,2
Total	16,0	207,0	47,8	0	222,0	46,8	0	293,5	115,3	81,0	437,5	209,9

Legend. h=Hours; Min=Minimum; Max= Maximum; OSS=Nursing Assistants; ASA=Socio-Healthcare Assistants.

Table 4

Distribution of care activity among healthcare workers and HPRD.

Tertile	HPRD (Nurse)			HPRD (OSS)			HPRD (ASA)			HPRD (Total)		
	Min (h)	Max (h)	Mean (h)	Min (h)	Max (h)	Mean (h)	Min (h)	Max (h)	Mean (h)	Min (h)	Max (h)	Mean (h)
1	0,2	3,5	1	0,4	2,1	1,5	0	2,2	0,9	2,3	5,8	3,4
2	0,2	0,6	0,5	0	2,7	0,7	0	2	1,5	2,2	3,2	2,6
3	0,4	0,7	0,5	0	0,2	0,1	1,3	2	1,7	1,8	2,9	2,3
Total	0,2	3,5	0,7	0	2,7	0,8	0	2,2	1,4	1,8	5,8	2,8

Legend. h=Hours; HPRD= daily assistance hours per resident per professional profile; OSS=Nursing Assistants; ASA=Socio-Healthcare Assistants.**Table 5**

NH > 350 residents detail of daily hours by professional category and HPRD.

Nurse Hour/Day		OSS Hour/Day		ASA Hour/Day		Total Hour/Day	Nurse HPRD		OSS HPRD		ASA HPRD		HPRD Total
N	%	n	%	n	%	n	n	%	n	%	n	%	
129	16,2	262	32,9	406	50,9	797	0,4	18,2	0,7	31,8	1,1	50	2,2

Legend. n=number; HPRD= daily assistance hours per resident per professional profile; OSS=Nursing Assistants; ASA=Socio-Healthcare Assistants.

In a detailed analysis, a specific NH with unique sampling characteristics was examined separately. This NH housed 367 residents, categorized into S.O.S.I.A classes as follows: 39.8 % in class 1 – 2, 40.6 % in class 2 – 3 – 4 – 5 – 6, and 19.6 % in class 7 – 8. Nursing staff, Social Health Operators (OSS), and Care Assistants (ASA) were present across all three work shifts. Table 5 provides a detailed breakdown of the daily hours worked by the various professionals and operators, along with the Hours Per Resident Day (HPRD).

Discussion

The study aimed to investigate the levels of nursing staff allocation and skill mix in nursing homes in the province of Bergamo, Italy. A comparison between organizational models and Hours Per Resident Day (HPRD) shows both consistency and discordance with what is outlined in the literature. Nursing homes that declare the adoption of primary nursing have the highest Total HPRD, a lower ASA HPRD but not a higher Nurse HPRD, which instead is characteristic of NHs adopting the “sectoral or modular” model. What is described aligns with the literature, showing that in these facilities, the primary nurse utilizes support staff to carry out the nursing care plan. However, the theory is not confirmed in the case of NHs with the “Team Nursing (Small Equipe)”, “sectoral or modular”, and “functional or task-based” models, which, in this order, should require a decreasing number of human resources. From the analysis, the averages of the Total HPRD are, respectively, 2.5, 3.1, and 2.5. Although it can be presumed that there is a prevailing tendency rather than a pure application of the models, it is not ruled out that the responses may be unreliable and, therefore, no further considerations will be made on this matter.

From the perspective of resident frailty, it is observed that the first and third tertiles show similar data, while the second tertile displays a lower percentage of residents in the S.O.S.I.A class 1–2 and 7–8, favoring classes 3–6. The greater frailty of residents in the first tertile is also accompanied by a higher percentage of both nurse hours per day and nurse HPRD. The same cannot be said of the third tertile, which, despite having overlapping frailty data, not only has a lower number of nursing hours, both overall and per resident, compared to the other group but also a predominant presence of care provided by ASA (Auxiliary Health Care Workers) over the remaining categories. This disparity is also confirmed by the averages of the total HPRD: a resident in the third tertile receives 1.1 h less assistance per day compared to one residing in the NH of the first tertile (2.3 vs 3.4).

In the face of less severe frailty of the population in the second tertile, there is also a lower percentage of both nurse hours per day and nurse HPRD. The HPRD are less than in the first tertile but higher

than in the third: a resident receives 0.8 h less assistance per day and 0.3 h more compared to if they were in an NH of the first and third tertile respectively.

Analyzing the hours delivered by the staff, it is found that, excluding the NHs of the first tertile, the ASA hours per day are greater than the sum of the nurse hours per day and OSS (Social Health Operator) hours per day.

Similarly, higher values of HPRD are found to be attributed to ASA personnel, with their average increasing progressively across the tertiles. Nurse HPRD values are lower than the other categories except for ASA HPRD in the first tertile and OSS HPRD in the NH of the third tertile. In the first tertile, the highest Nurse HPRD is also observed, but the data is skewed by a particularly virtuous structure with significantly higher Total HPRD and Nurse HPRD than the rest (5.8 and 3.5). If excluded, the values of INF HPRD stand at 0.60, in line with the other ranges.

The NH analyzed separately presents a picture of frailty among its residents similar to that of the second tertile. However, it has a lower Total HPRD by 0.4 h of assistance per day (2.2 vs. 2.6). The same structure presents Nurse hours and Nurse HPRD values lower than the analogous averages of the three tertiles.

The average total HPRD of 2.8, excluding the NH with >350 residents, is distant from the 3.9 of the USA, the 4.3 of the United Kingdom, and the 5.2 of Sweden.⁷ The gap is also confirmed just considering the nursing staff's assistance hours: the highlighted values are lower both than what was recommended by a recent study, which indicated a distribution between nurses and support staff of 35 % and 65 %, respectively, and what was actually found in the British reality (25 % nurse/hours).^{25,26} The picture is in line with the regional regulations, which do not indicate any ratio between nurses and support staff but only an overall timing for all professional figures.¹⁶

In light of the relationship between staffing levels and skill mix and the related care outcomes in nursing homes demonstrated in the literature, it is evident that the described organizational contexts could be improved in their outcomes through appropriate adjustment of staff levels, particularly by rebalancing the ratio between nursing and support personnel and harmonizing it with the frailty level of their residents.^{2,4} A re-modulation of nursing staff could also serve as a brake on turnover and a personnel retention tool, containing the exodus reported in the Italian healthcare System.²⁷ The results of this study can be used to compare staffing levels and skill mix with other provinces in Lombardy region or other countries with similar regulations and, consequently, to understand how different choices on staffing can affect the quality of care and organizational outcomes.

Implications for the future

The challenges highlighted in this study, particularly inadequate levels of nursing staff and the mix of skills in nursing homes (NS), require immediate and implementable solutions to improve patient outcomes in the region. Implementing staffing models based on the needs and complexity of resident care, such as the Hours per Day Resident Method (HPRD), could help optimize the deployment of nursing and support staff. Aligning staff ratios with international recommendations, such as increasing nurse-resident ratios and rebalancing the skill mix, can improve care outcomes and reduce missed care. The lack of national standards or guidelines for NHS staff remains a critical issue. Policy makers should give priority to defining minimum staffing requirements appropriate to the different levels of illness of residents. Such guidelines could include a mandatory percentage allocation of nurses and support staff to ensure a balanced mix of skills. Financial incentives, career development opportunities and flexible planning should be introduced. In addition, targeted campaigns to attract new nursing staff could help alleviate the labour shortage.

Study limitation

Among the main limitations of the study is the sample size, which, although it met the defined inclusion criteria, may not be indicative of the entire Italian national territory, primarily reflecting the geographical area of Northern Italy. The questionnaire was developed specifically for this study, following recommendations from the literature.^{28,29} However, it does not have psychometric properties and has not been formally validated. This represents a limitation, as the reliability and validity of the tool have not been tested.

Conclusions

Nursing homes face budget constraints, difficulties in recruiting nurses, and increasing clinical complexity of residents, thereby risking a decline in the quality of care. While the quality of care is extensively studied, specific indicators to monitor it are still to be defined. The current literature lacks studies investigating appropriate staffing levels and skill-mix in nursing homes and their impact on nursing care outcomes. Despite the significance of this issue, further research is needed to determine minimum standards for staffing and skill-mix, and how these factors affect the quality of care.

Supplementary File: Study questionnaire Italian and English version; Strobe checklist

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This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical approval

Informed consent was obtained from all participants prior to their involvement in the study, and the ethical recommendations contained in the Declaration of Helsinki [20] were followed at all times. Ethical committee approval was not required, as it was unnecessary for this type of study. All necessary authorizations were requested from the Order of Nursing Professionals of the province of Bergamo, Milan (Approval code: n. 15/22-116.2018_7/9/22)

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

CRediT authorship contribution statement

Daniele Marchetti: Writing – original draft. **Simone Cosmai:** Writing – review & editing, Methodology, Data curation, Conceptualization. **Pietro Xausa:** Investigation. **Giancarlo Galbiati:** Supervision. **Andrea Poliani:** Software. **Chiara Mainardi:** Visualization, Software. **Stefano Mancin:** Writing – review & editing, Data curation. **Gianluca Solitro:** Project administration.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.gerinurse.2025.01.009](https://doi.org/10.1016/j.gerinurse.2025.01.009).

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