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# Factors Associated With Missed Nursing Care in Home Care Setting: Insights From the AIDOMUS-IT Multicentre Study

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**Aims:** To explore factors associated with missed nursing care (MNC) in home care in Italy.

**Methods:** A secondary analysis of the AIDOMUS-IT national cross-sectional study was conducted investigating structural factors, including details on services offered, waiting times, nurses' working conditions and workload, nurses' perceptions of the work environment, climate, staffing adequateness, opportunities for career advancements, leadership, level of burnout, and work-life balance. Nurses' and patients' characteristics were hypothesized as "part of the MNC process," while patients' perception of care as

an MNC outcome. The “Missed Nursing Care in the Home Care” (MNC\_HC) instrument was developed and validated. Other instruments used were the “Practice Environment Scale of the Nursing Work Index,” the “NASA Task Load Index,” and the “Copenhagen Psychosocial Questionnaire version III”. Data from nursing directors, home care nurses, and patients were used in a quantile regression to explore factors linked to MNC. A univariate linear regression model assessed the relationship between MNC and patients’ evaluation of the service.

**Results:** A total of 3949 nurses and 9780 patients participated in this study. MNC was reported by 3545 nurses (89.77%), and MNC\_HC mean score of items of care missed was 5.23 (SD = 3.18) out of 9. When MNC was low, overtime work increased it, while staffing adequacy and leadership quality reduced it. When MNC was at a medium level, associated factors included longer patient waiting times, more home visits per shift, and inadequate staffing. When MNC was high, work-life conflict and burnout were strongly associated with increased MNC. High perceived workload and lack of career progression opportunities were consistently associated with MNC, regardless of its level.

**Conclusion:** A critical appraisal of organizational and staffing features is recommended in home care. To enhance both patient outcomes and nurse satisfaction, it is advisable to implement indicators to monitor care delivery, revise nurse staffing levels, and establish advanced roles, such as specialized community nursing positions.

**Keywords:** cross-sectional study; home care; Italy; missed nursing care; national study; unfinished nursing care

## 1. Introduction

Over the past decades, the research community has explored unfinished nursing care, a phenomenon that has been conceptualized by several authors [1–5]. Various terms have been used in the literature to refer to this concept, namely, “care left undone,” “missed nursing care (MNC),” “task incompleteness,” “unmet nursing care needs,” and “implicit rationing of nursing care.” While differences in terminology and contexts exist [3], all these terms refer to an error of omission, meaning the lack or seriously delayed completion of a necessary care action [2, 4]. To ensure clarity and taking into account the Italian context where this study was conducted, the term “MNC” is used throughout this paper [6]. The documented impact of MNC on patient outcomes [7–10] highlights the growing importance of studying this issue.

Research on MNC dynamics is historically focused on hospital settings, although in recent years studies have been conducted in the community and nursing homes [11]. Given the phenomenon’s complexity and the measurement challenges, there remains a lack of clarity on some dynamics of MNC in hospital settings and even less in community settings [2, 3, 12]. In this regard, it is relevant to note that essential nursing activities and, therefore, MNC dynamics may be very different according to the setting and healthcare context [13]. This requires an overview of the healthcare characteristics before planning to deeply investigate MNC through robust methods suggested in methodological literature [5, 14].

Given the populations’ needs related to epidemiological changes and aging [15, 16] and with the broad aim of assessing the main characteristics, strengths, and challenges of Italian home care services in facing these needs, the AIDOMUS-IT cross-sectional multicentre study was conducted [17]. Part of the AIDOMUS-IT study was to undertake a general and first-level measurement of MNC and associated factors, with the aim of acquiring initial national insights into this phenomenon and inform future research

and practice. An available but not yet exhaustive reference framework for home care setting [18] was considered to inform data collection, in conjunction with an analysis of available literature on hospital settings [19], community and home care settings [12, 20], and the Italian context [21]. First, the assessment of the concept of MNC was considered, and the main issues that emerged were related to the contents and methods. In particular, the type of activities in MNC that need to be customized and adopted to the home care setting were considered [3, 5, 22]. In addition, consideration was given to heterogeneity across the home care settings regarding nurses’ activity documentation and a general lack of adoption of standardized taxonomies expected in Italy. Finally, based on the considerations outlined above, an instrument that measured nurses’ perceptions on MNC was developed and distributed.

MNC can be considered within the framework of the Donabedian model [23], serving as a proxy measure for various structural, process, and outcome indicators [19] that ultimately impact on the quality of care [24, 25]. In this context, MNC can be seen as a process that nurses perform to decide which actions could be avoided or delayed because of time constraints. Factors reported in the literature that are associated with MNC include structural factors, such as the work environment, work climate, psychosocial characteristics, and caseload, as well as process-related factors, such as patient complexity and characteristics, and variables related to nursing staff (age, sex, educational level, and professional experience) [2, 12, 20, 21, 26, 27].

Previous studies have reported that MNC is associated with an impact on patient health outcomes in community settings, such as long-term disability and levels of patient satisfaction [13]. However, there is no clear evidence to date on the association between MNC and job dissatisfaction, burnout, and intention to leave among nursing staff working in home care settings, although the association with these variables has been suggested in the literature [22, 28]. The literature has also investigated the decision-making process leading to MNC and its results, showing that nurses often

neglect activities that have a less immediate impact on patient health, such as psychological support, counseling [1], preventative actions and reassessment [13], and administrative tasks (e.g., recording patient data) or care planning [13, 28]. The latter suggests that assessments of MNC should consider which types of care activities are missed and highlight the usefulness of instruments used to collect subjective MNC data. In addition, an exhaustive list of nursing activities is difficult to define, as many activities fall under the scope of professionalism that defines the specificity of nursing and are difficult to completely document or measure [10, 29]. Therefore, it will be useful to assess perceived MNC and include categories of caring activities to facilitate nurses' recall and data collection.

Given the paucity of literature on MNC in the provision of care to people in their home care setting, it is critical to go beyond the documentation of its prevalence [30] and investigate its related factors and consequences. The shift from hospital to community care and the evolution of care demands will make effective home care increasingly necessary, and it could be considerably improved by understanding and reducing the levels of MNC, thus positively impacting on citizens' overall health outcomes. Therefore, the aim of this study was to explore factors that are associated with MNC in home care settings.

## 2. Methods

**2.1. Design.** A secondary analysis of the cross-sectional multicentre AIDOMUS-IT study, which can be consulted elsewhere, was performed [17]. Reporting was conducted according to the STROBE guidelines [31] and the guidelines for reporting research on MNC [14].

**2.2. Measuring MNC and Development of a Reference Framework.** When designing this secondary analysis within the AIDOMUS-IT study, an instrument to measure MNC in home care settings and a reference framework were developed. Details regarding the development and characteristics of the MNC instrument are provided in Section 2.5.3 of this manuscript. To address the gap in prior research on predictors of MNC in home care, the research team relied on existing literature—primarily focused on hospital settings—as well as their clinical expertise to hypothesize a framework for describing MNC in the home care context. An analysis of the literature was conducted, followed by a series of research team meetings to identify key items to be included in the framework. The development process involved iteratively adding and removing contents and variables, considering both the broader goals of the AIDOMUS-IT study and insights from the literature and clinical practice. For the framework's development, the Donabedian model was chosen to define key elements of MNC in the home care setting. This model provided the structure for organizing the framework into three categories: structure, process, and outcomes. Subsequent meetings focused on identifying and refining the specific contents for each category. A detailed description of the framework content is provided in Section 2.5.

**2.3. Setting and Sampling.** The Italian National Healthcare System is tax-based, provides universal coverage, and is delivered by local health authorities (LHAs), university hospitals, or other facilities [32]. Private facilities affiliated with the national health system are also available. However, only LHAs include community and home care services. Home care can be activated through a request performed by a physician, either a general practitioner or a hospital physician, allowing patients to access these services both from home and when discharged from hospital. Based on the physician's request, the nurse plans the interventions and determines the number of visits needed according to the patient's needs. All the LHAs in Italy were invited to participate in the AIDOMUS-IT study using a contact network available through the "National Federation of Orders for Nursing Professions," that is, the Italian Regulatory Board of Nursing.

Following this, nursing directors, all nurses working in home care services, and patients using the services of the LHAs that agreed to participate were invited to be included in the AIDOMUS-IT study. No exclusion criteria were set for nursing directors. Regarding nurses, those with administrative roles, who did not directly provide home care, were excluded from the study. Patients were included if they were being directly cared for by a home care service. All participants were required to provide informed consent before data collection.

**2.4. Data Collection and Procedures.** From November 2022 to October 2023, following ethical approvals, each LHA was assigned with an alphanumeric code by the authors, who communicated this code to the nursing directors of each participating site. Three consecutive rounds of data collection were undertaken using three different surveys to collect data regarding LHA characteristics (nursing director survey), nurses and organizational features of the LHA (nurse survey), and patients' assessment of the healthcare service (patient survey). All surveys were performed in Italian and online using LimeSurvey [33].

The first period of data collection was performed with the nursing directors of LHAs who received a link via e-mail to access the survey. This survey included questions regarding the main characteristics of the LHA (catchment area, type of territory, and population density) and the services provided by the LHA (number of districts, number and type of healthcare services delivered, average waiting time for the first home care visit and patient evaluation, and average waiting time for the first home care visit).

The nursing director identified a facilitator in each LHA to conduct data collection. In this phase, all nurses providing direct care in LHAs were invited to participate. The facilitator was trained in data collection procedures online or through face-to-face meetings by the research team. The facilitator supervised the dissemination of the survey to all the eligible nurses of the LHA, verifying the inclusion criteria and their credentials prior to participation. This survey included sociodemographic questions (e.g., age, gender, education, and postgraduate courses) as well as those related

to work conditions in the home care service (staffing, type of employment, average duration of each service provided at home, etc.). A more detailed structure of this survey is reported elsewhere [30].

The patients' survey was also managed by facilitators and included the Home Health Care Survey of the Consumer Assessment of Healthcare Providers and System (HHCAPHS) tool, a specific questionnaire evaluating patients' experiences of the home care that they received [34].

Data collection from nurses and patients was done anonymously, and a random ID was assigned by LimeSurvey. Details on the AIDOMUS-IT study methods are described in the study protocol [17], while details on the variables included in this sub-analysis are reported in the description of the framework.

**2.5. Variables.** Variables hypothesized to influence MNC dynamics and included in this analysis are outlined in Figure 1, that is, the study framework developed based on the Donabedian model. MNC was considered as a process, while other process variables, along with structural and outcome factors were hypothesized to influence or be influenced by MNC, as described in the following subsections. Figure 1 also provides details on surveys from which variables were derived.

**2.5.1. Hypothesized Structural Factors Associated with MNC.** Structural variables hypothesized as associated with MNC and included in the directors' survey were the number of total caring activities available in the service other than home care visits (community hospital, hospice care, telemedicine, etc.), the number of clusters of activities performed by the home service (i.e., blood sampling, drugs administration, health education, and health monitoring), and the mean waiting times for patients to access services and undergo a first evaluation (as a proxy measure of general workload of the home care service).

The variables hypothesized as associated with MNC from the nurses' survey were working hours in the last shift, overtime work (monthly-yes/no), number of visits to patients' homes performed in the last shift, percentage of visits to patients' homes to perform only specific procedures in the last shift, duration of visit in the patients' home, number of extra visits performed by other nurses for the same patient, and members included in the healthcare team in the last shift (i.e., nurses or also other professionals). Moreover, additional organizational factors measured with specific instruments were considered, that is, perceived adequacy of resources and leadership (i.e., work environment), workload, team working climate, commitment to safety, and psychosocial conditions in the workplace. The work environment was measured using two of the five dimensions of the Practice Environment Scale of the Nursing Work Index (PES-NWI) as these were identified as being applicable to the home care setting. The dimensions were "Staffing and resource adequacy" and "Nurse manager ability, leadership, and support of nurses," accounting for 9 of the 32 items of the scale [35]. Answers were provided by four-point Likert

scale (ranging from 1 = completely disagree to 4 = completely agree) and, for each dimension, a mean score was computed. Higher scores indicate a better perception of explored aspects; in particular, a score  $\geq 2.5$  for each dimension indicates a positive perception of the work environment. In this study, the "Nurse manager ability, leadership, and support of nurses" and "Staffing and resource adequacy" showed excellent levels of reliability (internal consistency) (Cronbach's  $\alpha = 0.91$  and  $0.88$ , respectively). This tool was previously translated in Italian and validated [35].

The NASA Task Load Index (NASA-TLX) [36] was used to measure nurses' perceived workload. This instrument was translated, adapted to the home care setting, and followed a validation process [37]. The scale consists of six items, and answers were provided using a 20-point Likert scale (ranging from 1 = lowest workload possible to 20 = highest workload possible), investigating aspects of mental, physical, emotional, and temporal demand, as well as performance and frustration. The final score was computed by standardizing from 0 to 100 the score obtained by summing all the items except the one referring to performance, where higher scores indicate a higher subjective workload. In this study, the NASA-TLX showed good reliability (internal consistency) (McDonald's  $\Omega = 0.74$ ).

Two of the five dimensions of the safety attitudes questionnaire (SAQ), available in Italian and previously validated, were included [38] to measure perceived quality of collaboration among personnel (i.e., "Team working climate" dimension) and perceptions of a strong and proactive organizational commitment to safety (i.e., "Safety of the working climate" dimension). These dimensions accounted for 12 of the 36 items of the scale, which can be used in all healthcare settings. Answers were provided through a five-point Likert scale (ranging from 1 = completely disagree to 5 = completely agree), and the score was computed for each dimension, by calculating the percentage of nurses who answered with 4 or 5 on the five-point Likert scale. The range of possible dimension scores is from 0 to 100, where higher scores indicate a better perception of patient safety. In this study, "Team working climate" and "Safety of the working climate" showed excellent internal consistency (Cronbach's  $\alpha = 0.88$  and  $0.86$ , respectively).

The Copenhagen Psychosocial Questionnaire version III (COPSOQIII), available in Italian and previously validated [39], was used to assess perceived psychosocial conditions in the workplace. Out of the 29 items included in the validated scale, 16 were considered appropriate for the home care setting and included in the survey. Answers were provided on a five-point Likert scale (ranging from 0 = never/not at all to 4 = always/very much). The final score was computed by transforming the responses to each item into a score ranging between 0 (never or not at all) and 100 (always or very much). The following dimensions were considered (number of items and Cronbach's  $\alpha$  in brackets): opportunities for career progression (2;  $\alpha = 0.79$ ), with higher scores indicating better opportunities; quality of leadership (2;  $\alpha = 0.81$ ), with higher scores indicating better quality of leadership; burnout (2;  $\alpha = 0.87$ ), with higher scores

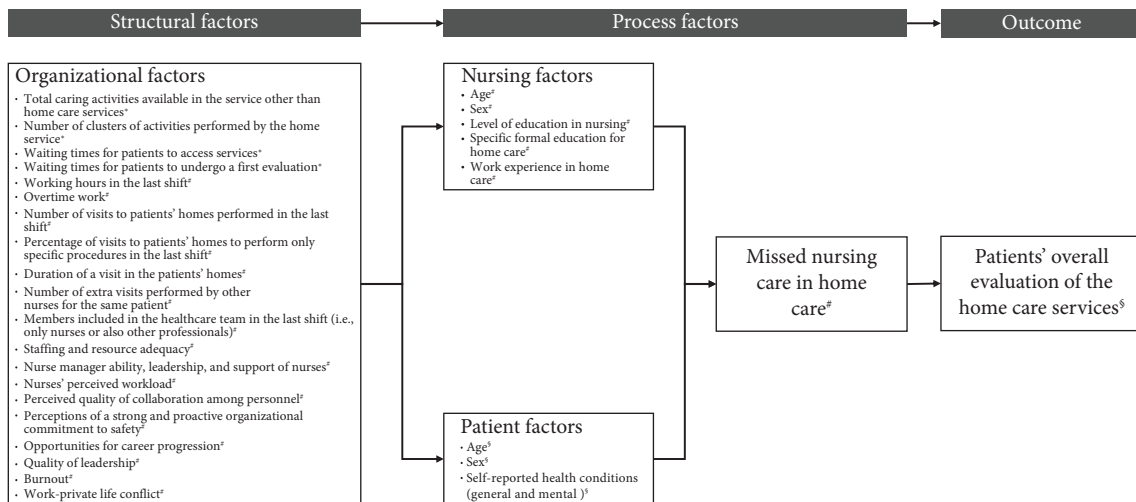


FIGURE 1: Conceptual framework of the study. \*Data from directors' survey; <sup>#</sup>data from nurses' survey; and <sup>§</sup>data from patients' survey.

indicating worse burnout; and work-private life conflict (2;  $\alpha = 0.88$ ), with higher scores indicating worse work-life balance.

**2.5.2. Hypothesized Process Factors Associated with MNC.** Among process factors collected in the AIDOMUS-IT study, those hypothesized as associated with MNC were collected through the nurse and patient surveys. The variables considered from the nurse survey were sociodemographic characteristics (age and sex), level of education in nursing, specific formal education for home care (yes/no), and work experience in home care (years). These have been included as they have previously identified as being associated with missed care [26]. The variables considered from the patient survey were age, sex, and self-reported health conditions (general and mental) as measured on a five-point Likert scale ranging from "Poor" to "Excellent." A single item has been identified as a valid measure for self-reported health status [40].

**2.5.3. Process: MNC.** The instrument "Missed Nursing Care in Home Care" (MNC\_HC) was developed and validated within the AIDOMUS-IT study. The development and validation process can be retrieved elsewhere [41]. MNC\_HC was derived by a tool validated by Senek et al. [18] and other relevant studies on missed care [5, 13, 42]. The scale includes nine items measuring how often nurses missed the following care activities in the last week: technical nursing; basic nursing/personal hygiene; health education; collaboration with other healthcare professionals to provide support to families; provide support to carers; disease prevention; health promotion; bureaucracy; and communication and relationship. Nurses were requested to answer on a four-point Likert scale from 0 (never) to 3 (often). Answers were dichotomized replacing responses from 1 (hardly ever) to 3 (often), with 1 indicating the presence of missed care, while responses 0 (never) were used to indicate the absence of missed care. This categorization was made because the nine nursing

activity areas explored were considered essential in home care, both by the authors and in the literature, and should never be missed. The final score was computed by summing the items where nurses reported missed care (range 0–9), with higher scores indicating more MNC. Moreover, by completing the MNC\_HC instrument, nurses could indicate up to three reasons for the occurrence of MNC, including: "Absence of social care workers or other healthcare professionals"; "Sudden increase in the number or patients or exacerbation of their conditions"; and "Insufficient number of nurses to ensure adequate patient care." The instrument demonstrated high internal consistency, with a Cronbach's alpha of 0.92 [41]. The MNC\_HC was included in the survey completed by nurses.

**2.5.4. Hypothesized Outcome of MNC.** Patients' overall evaluation of the home care services was hypothesized to be an outcome of MNC and was collected through the patients' survey. Patients provided an evaluation of home care received according to a 10-level Likert scale, with 0 and 10 representing the worst and the best home care ever, respectively. This single-item assessment derived from the validated HHCAHPS questionnaire underwent content validity by national experts before its use.

**2.6. Data Analysis.** First, the survey data collected from directors, nurses, and patients were matched considering the nurse survey as the main reference, as this included the majority of the variables for analysis. The assigned codes for each LHA were used to match the data of the director and patient data with those of the nurse survey. For each variable of the directors' and patients' survey to be included in the final dataset, a mean or a percentage of one of the categories was computed enabling the data to be matched with the nurses from the same LHA. This process was performed using the "dplyr" package in R-studio v.4.4.0 [43] and underwent a double-check for accuracy. The final dataset included data from director, nurse, and patient surveys.

All the variables first underwent descriptive analysis. According to the conceptual framework of reference, the association between the MNC\_HC score and the structural and process factors was assessed by quantile regression. Unlike ordinary least square regression, quantile regression allows for the estimation of conditional quantiles, providing a more comprehensive understanding of the relationship across the entire distribution of the dependent variable. Considered percentiles were the 15th, 25th, 50th, 75th, and 80th of the MNC distribution, since they correspond to the lower and higher levels of MNC (i.e., nurses reporting that they missed 1, 2, 6, 8, and 9 items of care, respectively). Moreover, to ensure robust inference, bootstrapping was used to adjust standard errors, and 1000 bootstrap replications were performed for each quantile regression model. The significance of each independent variable was assessed using regression coefficients and  $p$  value ( $< 0.05$ ). All the independent variables were checked for possible multicollinearity before entering the regression model. A univariate linear regression model was performed to test the hypothesis that MNC was associated with patients' overall evaluation of received home care services. Prior to performing the linear regression analysis, the assumptions of no autocorrelation, homoskedasticity of variance, and linearity were assessed. Multicollinearity was not evaluated, as only one independent variable was included in the model. Linearity was assessed visually using a residual plot, which indicated potential deviations from linearity. Given the presence of nonlinear patterns in the data, both the dependent and independent variables were log-transformed prior to model fitting. This transformation is commonly used to address violations of the linearity assumption and to improve model interpretability [44]. To test for autocorrelation, the Durbin–Watson test was conducted, revealing significant autocorrelation in the residuals ( $DW = 0.084$ ,  $p < 2.2e - 16$ ). The Breusch–Pagan test was used to assess homoskedasticity, and the results indicated no evidence of heteroscedasticity ( $BP = 0.29$ ,  $df = 1$ ,  $p = 0.592$ ). To address the presence of autocorrelation, we applied heteroscedasticity and autocorrelation consistent (HAC) standard errors using the Newey & West covariance matrix estimator. This approach allows for robust inference by adjusting the standard errors to account for both heteroscedasticity and autocorrelation in the residuals [45].

For the latter model, the significance of each independent variable was assessed using the  $t$ -statistic and corresponding  $p$  values. All the analyses were conducted using R v.4.4.0 [46].

**2.7. Ethics.** The AIDOMUS-IT study was approved by the Ethical Committee of Genoa on 29 November 2022 (Ref. *n.* 675/2022—DB ID 12844). In some cases, ethical approval was also required at the LHA level.

Data collection was done anonymously and conducted in accordance with the Helsinki Declaration, as well as Italian and European standards for data protection and storage [47, 48]. All the participants were informed that their participation was completely voluntary and that their

decision to join the study would not affect their career or care pathway.

### 3. Results

**3.1. Descriptive Statistics.** Overall, 70 LHAs joined the study accounting for 18 of the 20 Italian Regions. A total of 3949 nurses and 9780 patients were enrolled in the study.

**3.1.1. Structural Factors.** Directors identified an average of 9.86 ( $SD = 2.57$ ) services (hospice, nursing care unit, mental health service, etc.) available in the same LHA other than home care services, which delivered a mean number of 11.28 ( $SD = 2.90$ ) various clusters of activities (venous sampling, education, housing assessment, electrocardiogram, etc.). Each patient waited an average of 1.70 ( $SD = 1.75$ ) days to obtain a first evaluation and a mean of 1.86 ( $SD = 1.55$ ) days to access healthcare services.

On average, nurses reported working less than 7 h (mean = 6.62;  $SD = 1.12$ ) on their last shift, and the majority did not work overtime during the month ( $n = 2499$ ; 63.3%). Each nurse performed a mean of over six visits to patients in their homes during their last shift (mean = 6.52;  $SD = 3.20$ ), and over 50% of these were visits to perform specific procedures (mean = 52.34%;  $SD = 3.03\%$ ). Each visit had an average duration of just over 20 min (mean = 23.51 min;  $SD = 36.20$ ), and, overall, an average of 4.41 ( $SD = 5.48$ ) extra visits were performed by other nurses for the same patient. More than half of the nurses reported that the team composition in the last shift was predominantly composed of nurses and other professionals (e.g., physicians, therapists, and nurse assistants) ( $n = 2449$ ; 62.0%), and, on average, nurses perceived that their workload was moderate (mean NASA-TLX score = 47.85;  $SD = 21.69$ ). The majority of the nurses reported that staffing and resources were adequate (scoring  $\geq 2.5$  at PES-NWI-related dimension  $n = 2431$ ; 61.6%), and that there was good nurse manager ability, leadership, and support for nurses (nurses scoring  $\geq 2.5$  at the PES-NWI-related dimension  $n = 3293$ ; 83.4%). The analyses showed a moderate level of quality of leadership (mean score of the COPSQIII-related dimension = 55.49;  $SD = 24.95$ ), along with a good perception of the teamwork climate (scores of the SAQ teamwork climate and safety of the work climate: mean = 73.69 and  $SD = 32.97$ ; mean = 75.23 and  $SD = 32.96$ ; respectively). Moreover, nurses reported high scores regarding career progression (mean score of the related COPSQIII dimension = 81.13;  $SD = 17.30$ ), along with a low level of work-life conflict (mean score of the related COPSQIII dimension = 35.66;  $SD = 23.72$ ) and a moderate level of burnout (mean score of the related COPSQIII dimension = 51.78;  $SD = 24.03$ ). The descriptive statistics of the structural factors are shown in Table 1.

**3.1.2. Process Factors.** On average, the mean age of the nurses was 46.02 years ( $SD = 10.23$ ), and the majority were female ( $n = 3088$ ; 78.2%). Almost half of the nurses had a bachelor's degree in nursing ( $n = 1813$ ; 46.0%), with the

TABLE 1: Descriptive statistics of structural factors.

	Variables	Frequency (%)	Mean (SD)
Directors ( <i>n</i> = 70)	Total caring activities available in the service other than home care services	—	9.86 (2.57)
	Number of clusters of activities performed by the home service	—	11.28 (2.90)
	Waiting times for patients to access services (days)	—	1.86 (1.55)
	Waiting times for patients to undergo a first evaluation (days)	—	1.70 (1.75)
Nurses ( <i>n</i> = 3949)	Working hours in the last shift	—	6.62 (1.12)
	Overtime work (monthly)		
	Yes	1450 (36.72)	—
	No	2499 (63.28)	—
	Number of visits to patients' homes performed in the last shift ( <i>n</i> = 3894)	—	6.52 (3.20)
	Percentage of visits to patients' homes to perform only specific procedures in the last shift ( <i>n</i> = 3479)	—	3.88 (3.03)
	Duration of a visit in the patients' homes (minutes) ( <i>n</i> = 3938)	—	23.51 (36.20)
	Number of extra visits performed by other nurses for the same patient ( <i>n</i> = 2981)	—	4.41 (5.48)
	Members included in the healthcare team in the last shift		
	Only nurses	1500 (37.98)	—
	Nurses and other professionals	2449 (62.02)	—
	Staffing and resource adequacy (PES-NWI dimension)		
	≥ 2.5	2431 (61.56)	—
	< 2.5	1518 (38.44)	—
	Nurse manager ability, leadership, and support of nurses (PES-NWI dimension)		
	≥ 2.5	3293 (83.39)	—
	< 2.5	656 (16.61)	—
	Nurses' perceived workload (NASA-TLX)	—	47.85 (21.69)
	Team working climate (SAQ dimension) ( <i>n</i> = 3926)	—	73.69 (32.97)
	Safety of the working climate (SAQ dimension) ( <i>n</i> = 3901)	—	75.23 (32.96)
Opportunities for career progression (COPSQIII dimension)	—	81.13 (17.30)	
Quality of leadership (COPSQIII dimension)	—	55.49 (24.95)	
Burnout (COPSQIII dimension)	—	51.78 (24.03)	
Work-private life conflict (COPSQIII dimension)	—	35.66 (23.72)	

Note: COPSQIII, Copenhagen psychosocial questionnaire III; NASA-TLX, National Aeronautics and Space Administration task load index. Abbreviations: PES-NWI, practice environment scale-nursing work index; SAQ, safety attitudes questionnaire; SD, standard deviation.

majority reporting that they had not attended any specific education for home care nursing (*n* = 2926; 74.1%). The average length of time they had worked in the home care setting was less than 10 years (mean = 8.01; SD = 8.26).

Patients' mean age was 75.32 years (SD = 14.61), and the majority were female (*n* = 5585; 57.6%). A small proportion of patients reported having good or excellent general health (*n* = 2639; 27.3%), while almost half of the patients reported having good or excellent mental health (*n* = 4421; 45.7%) (Table 2).

### 3.1.3. MNC and Patients' Overall Evaluation of the Service.

Out of a total possible score of 9, the average number of items of care missed was 5.23 (SD = 3.18). The main reason for MNC was either a sudden increase in the number of patients or an exacerbation of their health condition (*n* = 1540; 39.0%). The descriptive statistics identifying the reasons for MNC are shown in Table 3. Patients' overall evaluation of the service was very good (mean = 9.28; SD = 1.05).

**3.2. Relationship Between Structural and Process Factors, and MNC.** Results from quantile regression exploring organizational, nurse, and patient factors associated with an increased risk of MNC in the home care setting are reported in Table 4.

Since normality and homoskedasticity assumptions were not met for the linear regression, results related to quantile regression were analyzed and considered as appropriate for the data and to better represent the impact of independent variables to MNC. The data provided by nursing directors showed that the mean waiting times for patients to undergo a first evaluation was associated with more MNC in the 50<sup>th</sup> and 75<sup>th</sup> quantiles, indicating that this predictor increased MNC when their level is medium-high. The data collected from nurses revealed that the working hours in the last shift were associated with less MNC in the 50<sup>th</sup> quantile. Overtime work (monthly) was associated with more MNC in the 15<sup>th</sup> quantile, indicating that this factor influences MNC when its level is low. The number of visits to patients' homes performed in the last shift were associated with more MNC in the 50<sup>th</sup> quantile, and the percentage of visits to patients' homes to perform only specific procedures in the last shift were associated with more MNC in the 25<sup>th</sup> and 75<sup>th</sup> quantiles. Nurses' perceived workload was a significant influencing factor in all quantiles, indicating that workload increased MNC regardless of their level, while staffing and resource adequacy were associated with less MNC in 15<sup>th</sup>, 25<sup>th</sup>, and 50<sup>th</sup> quantiles, thus staffing and resource adequacy affects MNC when their level is low or medium. The quality of leadership was an influencing factor in the 15<sup>th</sup> quantile; thus, it is

TABLE 2: Descriptive statistics of process factors.

Data source	Variables	Frequency (%)	Mean (SD)
Nurses ( <i>n</i> = 3949)	Age	—	46.02 (10.23)
	Sex		
	Male	784 (19.85)	—
	Female	3088 (78.20)	—
	Declined to answer	77 (1.95)	—
	Level of education in nursing ( <i>n</i> = 3944)		
	Regional diploma	1674 (42.44)	—
	University diploma	284 (7.20)	—
	Bachelor's degree	1813 (45.97)	—
	Master of science in nursing	173 (4.39)	—
	Specific formal education for home care		
Yes	1023 (25.91)	—	
No	2926 (74.09)	—	
Work experience in home care (years, <i>n</i> = 3887)	—	8.01 (8.26)	
Patients ( <i>n</i> = 9780)	Age	—	75.32 (14.61)
	Sex ( <i>n</i> = 9701)		
	Male	4044 (41.69)	—
	Female	5585 (57.57)	—
	Declined to answer	72 (0.74)	—
	Self-reported general health ( <i>n</i> = 9674)		
	Insufficient	1316 (13.60)	—
	Poor	1947 (20.13)	—
	Sufficient	3772 (38.99)	—
	Good	2379 (24.59)	—
	Excellent	260 (2.69)	—
	Self-reported mental health ( <i>n</i> = 9665)		
	Insufficient	949 (9.82)	—
	Poor	1134 (11.73)	—
Sufficient	3161 (32.71)	—	
Good	3703 (38.31)	—	
Excellent	718 (7.43)	—	

Abbreviation: SD, standard deviation.

TABLE 3: Missed nursing care occurrence and reasons (data source: nurses, *n* = 3949).

Variables	
MNC_HC score, mean (SD)	5.23 (3.18)
Reasons for MNC, frequency (%)	
Absence of social care workers or other healthcare professionals	407 (10.3)
Absence of other healthcare professionals and increase of workload	234 (5.9)
Insufficient number of nurses, other healthcare professionals, and increase of workload	405 (10.3)
Sudden increase in the number of patients or exacerbation of their health condition	1540 (39.0)
Insufficient number of nurses and other healthcare professionals	133 (3.4)
Insufficient number of nurses and sudden increase in the number of patients or exacerbation of their conditions	512 (12.9)
Insufficient number of nurses to ensure adequate patient care	718 (18.2)

associated with less MNC when the level of the latter is low. The opportunities for career progression were significantly associated with less MNC in all quantiles, while the work-life conflict was an influencing factor in the 50<sup>th</sup>, 75<sup>th</sup>, and 80<sup>th</sup> quantiles, indicating that work-life conflict increased levels of MNC when their level is high. Burnout was associated with higher levels of MNC in the 80<sup>th</sup> quantile. Nurses' age was associated with more MNC in the 75<sup>th</sup> and 80<sup>th</sup> quantiles, while patients' age was associated with less MNC in the 50<sup>th</sup> quantile.

**3.3. Outcome of MNC.** The unadjusted univariable linear regression model evaluating the association between patients' overall evaluation of the home care services and MNC did not show any statistically significant association (adjusted  $R^2 = 0.0011$ ,  $p = 0.170$ ) (Table 5).

#### 4. Discussion

The aim of this study was to explore factors associated with MNC among nursing staff providing care in the Italian

TABLE 4: Quantile regression analysis of factors associated with missed nursing care.

	Quantiles					Collinearity statistics VIF
	15%	25%	50%	75%	80%	
Total caring activities available in the service other than home care services <sup>o</sup>	0.062 (0.226)	0.071 (0.054)	0.101 (0.054)	0.034 (0.029)	0.018 (0.025)	1.502
Number of clusters of activities performed by the home care service <sup>o</sup>	-0.080 (0.058)	-0.085 (0.064)	-0.004 (0.075)	0.052 (0.062)	0.023 (0.058)	1.370
Waiting times for patients to access services (days) <sup>o</sup>	0.022 (0.056)	-0.013 (0.072)	0.014 (0.064)	-0.025 (0.043)	-0.020 (0.032)	1.382
Waiting times for patients to undergo a first evaluation (days)	0.101 (0.070)	0.109 (0.068)	<b>0.125 (0.040)**</b>	<b>0.058 (0.025)*</b>	0.032 (0.018)	1.204
Working hours in the last shift	-0.103 (0.138)	-0.245 (0.142)	<b>-0.324 (0.117)**</b>	-0.068 (0.079)	-0.114 (0.066)	1.137
Overtime work (monthly—yes) <sup>#</sup>	<b>0.730 (0.237)**</b>	0.433 (0.238)	-0.016 (0.203)	0.031 (0.137)	-0.001 (0.112)	1.199
Number of visits to patients' homes performed in the last shift <sup>#</sup>	0.017 (0.035)	0.045 (0.039)	<b>0.064 (0.030)*</b>	0.019 (0.019)	0.009 (0.017)	1.149
Percentage of visits to patients' homes to perform only specific procedures in the last shift <sup>#</sup>	0.004 (0.003)	<b>0.006 (0.003)*</b>	0.002 (0.003)	<b>0.005 (0.002)*</b>	0.002 (0.002)	1.060
Duration of a visit in the patient's home (minutes) <sup>#</sup>	-0.003 (0.003)	-0.002 (0.004)	-0.001 (0.003)	-0.004 (0.003)	-0.002 (0.002)	1.173
Number of extra visits performed by other nurses for the same patient <sup>#</sup>	0.027 (0.017)	0.022 (0.017)	0.020 (0.014)	0.002 (0.010)	-0.002 (0.009)	1.032
Members included in the healthcare team in the last shift (i.e., only nurses or also other professionals) <sup>#</sup>	0.360 (0.201)	0.326 (0.213)	0.182 (0.192)	0.104 (0.124)	0.031 (0.110)	1.048
Staffing and resource adequacy (PES-NWI dimension) <sup>#</sup>	<b>-0.455 (0.149)**</b>	<b>-0.716 (0.174)**</b>	<b>-0.549 (0.133)**</b>	-0.026 (0.093)	-0.027 (0.072)	1.406
Nurse manager ability, leadership, and support of nurses (PES-NWI dimension) <sup>#</sup>	0.037 (0.183)	-0.204 (0.205)	0.108 (0.171)	0.015 (0.103)	-0.035 (0.093)	1.904
Nurses' perceived workload (NASA-TLX) <sup>#</sup>	<b>0.014 (0.006)*</b>	<b>0.028 (0.006)**</b>	<b>0.027 (0.005)**</b>	<b>0.012 (0.003)**</b>	<b>0.008 (0.003)**</b>	1.200
Team working climate (SAQ dimension) <sup>#</sup>	0.000 (0.005)	-0.001 (0.006)	-0.000 (0.005)	-0.002 (0.003)	-0.000 (0.002)	2.974
Safety of the working climate (SAQ dimension) <sup>#</sup>	-0.005 (0.005)	-0.003 (0.005)	-0.002 (0.005)	0.001 (0.003)	-0.000 (0.003)	2.801
Opportunities for career progression (COPSQIII dimension) <sup>#</sup>	<b>-0.017 (0.008)*</b>	<b>-0.040 (0.008)**</b>	<b>-0.043 (0.006)**</b>	<b>-0.020 (0.004)**</b>	<b>-0.015 (0.003)**</b>	1.207
Quality of leadership (COPSQIII dimension) <sup>#</sup>	<b>-0.010 (0.005)*</b>	<b>-0.002 (0.006)</b>	<b>-0.008 (0.006)</b>	0.000 (0.003)	0.003 (0.002)	1.950
Burnout (COPSQIII dimension) <sup>#</sup>	0.001 (0.005)	0.004 (0.006)	0.006 (0.006)	0.004 (0.003)	<b>0.005 (0.003)*</b>	1.665
Work-private life conflict (COPSQIII dimension) <sup>#</sup>	0.010 (0.006)	0.008 (0.007)	<b>0.014 (0.005)**</b>	<b>0.011 (0.003)**</b>	<b>0.006 (0.002)*</b>	1.637
Age <sup>#</sup>	0.019 (0.014)	0.021 (0.017)	0.019 (0.013)	<b>0.017 (0.009)*</b>	<b>0.013 (0.006)*</b>	2.199
Sex (male) <sup>#</sup>	-0.342 (0.253)	-0.066 (0.289)	0.315 (0.252)	0.136 (0.129)	0.115 (0.105)	1.088
Sex (I would rather not answer) <sup>#</sup>	-0.399 (0.786)	-0.570 (0.926)	-0.285 (0.757)	0.139 (0.416)	0.150 (0.319)	2.141
Level of education in nursing (university diploma) <sup>#</sup>	-0.228 (0.386)	-0.189 (0.475)	0.112 (0.369)	-0.248 (0.301)	-0.049 (0.269)	1.078
Level of education in nursing (bachelor's degree) <sup>#</sup>	0.138 (0.266)	0.329 (0.312)	0.354 (0.287)	0.279 (0.163)	0.158 (0.122)	1.342
Level of education in nursing (master of science in nursing) <sup>#</sup>	0.245 (0.564)	0.110 (0.565)	0.002 (0.446)	0.305 (0.325)	0.230 (0.231)	1.221
Specific formal education for home care (yes) <sup>#</sup>	0.268 (0.212)	0.268 (0.226)	-0.277 (0.226)	-0.146 (0.145)	-0.108 (0.124)	1.180
Work experience in home care (years) <sup>#</sup>	-0.013 (0.014)	-0.016 (0.014)	-0.023 (0.013)	-0.007 (0.008)	-0.005 (0.006)	1.744
Age <sup>§</sup>	0.004 (0.020)	-0.012 (0.025)	<b>-0.044 (0.022)*</b>	-0.014 (0.013)	-0.004 (0.011)	1.633
% of female sex <sup>§</sup>	0.001 (0.011)	-0.004 (0.014)	-0.006 (0.012)	-0.006 (0.007)	-0.005 (0.005)	1.808
% of positive self-reported general health <sup>§</sup>	-0.015 (0.015)	-0.018 (0.017)	-0.015 (0.014)	0.002 (0.008)	0.004 (0.007)	1.744
% of positive self-reported mental health <sup>§</sup>	0.016 (0.013)	0.020 (0.014)	0.005 (0.011)	-0.005 (0.008)	-0.006 (0.006)	1.633

Note: Std. standard. Significant *p* values are in bold.  
<sup>o</sup>Data from directors' survey.  
<sup>#</sup>Data from nurses' survey.  
<sup>§</sup>Data from patients' survey.  
\* *p* < 0.05.  
\*\* *p* < 0.01.  
\*\*\* *p* < 0.001.

TABLE 5: Univariable linear regression model to assess the association between the number of missed nursing care and the patient's overall evaluation of received services.

Model	Unstandardized coefficients				Model summary		
	B (95% IC)	Std. error	t value	p value	R	Adjusted R <sup>2</sup>	
Unadjusted analysis*	MNC	0.002 (< 0.001–0.004)	0.001	1.369	0.170	0.14%	0.11%

Note: Std, standard. Linear regression model summary: Residual standard error: 0.04 on 3639 degrees of freedom; F-statistic: 4.999 on 1 and df 3639 ( $p = 0.025$ ).

\*Unadjusted: Simple linear regression ( $N = 3641$ ).

home care setting. On average, nurses reported missing at least five nursing activities in the last week of their work in home care. Although these findings align with previous results [3], they are relatively high. As also identified in the literature [1, 13, 28], types of MNC activities in this study were predominantly related to bureaucracy, care planning (e.g., collaboration with other professionals), disease prevention, health promotion, and communication with patients. These activities are identified as important for proactive care and long-term outcomes, particularly in home care. Moreover, international policies are shifting from providing care in hospitals to achieving greater levels of care in the community. This was pushed from a higher proportion of older people requiring care, which, because of demographic changes, is also the case in Italy [16, 49]. Primary, community, and home care have been recommended to address most population needs, focusing on education and secondary or tertiary prevention [50]. The results of this study show that nurses reported that they focused on ensuring activities with an immediate effect on patients' health (i.e., procedures or techniques) and missed or delayed key factors of community care that include patient education and disease prevention. The most frequent reasons for the occurrence of MNC were a sudden increase in the number of patients or exacerbation of their health condition and insufficient numbers of nurses to ensure adequate patient care.

When examining variables associated with MNC, the existence of organizational issues in these contexts emerged. Services with longer waiting lists for patients and shorter nursing shifts did not achieve an adequate balance between the supply and demand of care, leading to increased MNC at the 50th or 75th percentile. For nurses working overtime, MNC was significantly higher at the 15th percentile. This could imply that in environments where MNC is not prevalent, working overtime can have a meaningful impact in increasing levels of missed care. A significant association with higher nurse workload was detected in all analyzed quantiles, confirming that, regardless of the number of MNC, workload is a constant predictive factor. Finally, considering the documented negative association with staff and resource adequacy when the level of MNC is low to medium, results suggest a review of nurse staffing, workload, and time shifts in Italian home care services. Longitudinal studies collecting both objective and subjective data have been recommended [5], not only to assess areas of improvement and optimum staffing for these settings but also to individuate useful indicators to be used as a proxy measure of supply-demand balance.

It is of note that, in addition to higher workload, reduced opportunities for career progression were also associated with higher levels of MNC, regardless of its level. This result suggests that nurses who perceive that they have opportunities to progress in their career have greater commitment and more engagement with their work. It has been identified in a recent study that nurses emphasized the importance of challenging and versatile work, elements central to career development and progression [51]. Currently, home care nurses are considered "regular nurses" and no specific education is available to work in these settings in Italy, although a few, but heterogeneous, formal educational pathways are available [52, 53]. Considering the potential of advanced nursing skills for patients' health [54, 55], the availability of specialized community roles for the whole national territory is advisable. These roles are already established in countries such as Ireland [56] and the United Kingdom [57], where they have demonstrated a clear impact on population health by improving caseload management, risk management, and leadership, while also ensuring person-centered care. The availability of these advanced job positions in Italy could positively impact on MNC and the nursing community.

Nurses who were older and reported conflict between work and their private life showed a significant association with higher levels of MNC, especially in the highest quantiles. These results suggest that individual, as well as organizational factors, can impact on the delivery of quality care in home settings [28]. Evidence further suggests that MNC is driven not only by systemic challenges but also by individual-level attributes. For instance, Drach-Zahavy and Srulovici [58] demonstrated that personal accountability mediates the relationship between personality traits and MNC, highlighting the significant influence of psychological factors in care delivery. This suggests that MNC reflects a complex interplay of systemic and personal factors.

Contrary to the literature [9], MNC did not show an impact on patients' overall level of satisfaction with the service received. In this regard, it is important to highlight that data on patients' ratings were all very high. However, this trend could be influenced by external facilitators not considered for this study. In fact, the development of a good human relationship between patients and nurses [59] may have affected the respective data, and future studies should include the evaluation of these dynamics when collecting patients' perceptions and experiences.

There are limitations to the study, and the results are far from being exhaustive regarding MNC dynamics in Italian

home care services for several reasons. First, the reliance on self-reported data for several variables, including MNC, may introduce reporting bias, as participants could overestimate or underestimate their experiences. In addition, this study's cross-sectional design, which included the inference of patient data to nursing records, limits the ability to establish clear temporal relationships among the variables considered [60]. Furthermore, the absence of independent external validation for some variables may affect the reliability of the measures used and limit the broader applicability of our findings to other contexts. Finally, the framework used to describe factors associated with MNC was developed considering available literature on the topic, which is mainly related to the hospital setting. Therefore, this should be considered as a first attempt to describe MNC in home care setting and results should be interpreted with caution. These limitations underscore the need for longitudinal studies with validated measures and more robust methodologies to provide deeper insights into the factors influencing MNC in home care settings.

Despite these limitations, the aim of this study was to provide a first insight on a hidden phenomenon, which may adversely impact on health outcomes and has not been previously investigated at a national level until this study [21]. Therefore, data were not expected to be exhaustive regarding MNC dynamics, but to stimulate reflection, inform future research, and contribute to orienting future organizational policies, especially regarding the monitoring of service outcomes. The latter aspect leads to the consideration of the potentiality of perceived data collection tools in this context, as performed in this study. Ideal methodologies for the future could include the involvement of external facilitators that contemporaneously assess dyads including the patient and the nurse of reference on each shift while collecting objective data [5]. However, a critical reflection should be made on the sustainability of these types of studies, leading to the reconsidering of the results presented in this study along with international literature.

Therefore, it is possible to state that the results in this study support the need for a call for action to improve nurses' work conditions, staffing, and workload in the Italian home care service, pursuing the aim of ensuring the ability to deliver comprehensive patient care in community settings. This call should include targeted structural and systemic interventions at organizational and educational levels. First, it is recommended to optimize staffing and nurses' workload to avoid long patients' waiting times to access services, minimize nurses' overtime work, and mitigate work-life conflict, thereby positively influencing MNC. In addition, nurses should be encouraged to engage in available structured training programs for home care nursing. Specialist education should be considered a prerequisite for access to advanced job positions, which should be created within healthcare facilities. Furthermore, the role of older nurses, who are more likely to experience MNC, should be clearly defined. Their role may primarily focus on peer consultation, serving as a reference for younger colleagues in providing care.

## 5. Conclusion

MNC was identified in this study as being relatively high in the Italian home care setting and mainly related to activities that should be the core of community nursing. Although the results of this study are not exhaustive, MNC was associated with higher nursing workloads or sudden changes in intensity, inadequate nurse staffing levels and resources, shorter nursing shifts, systematic occurrence of overtime work, and few opportunities for career progression.

A critical appraisal of organizational and staffing features of Italian home care services is suggested, along with the development of useful indicators to monitor the outcome of their expected and suggested revision. Advanced job positions and the development of specialized community nursing posts are also suggested for nurses working in home care, with expected positive outcomes for both patients and nurses.

## Data Availability Statement

Data are available from corresponding author upon reasonable request.

## Conflicts of Interest

The authors declare no conflicts of interest.

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