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EMPIRICAL RESEARCH QUANTITATIVE

Exploring the Impact of Medical Complexity on Nursing Complexity of Care in Paediatric Patients: A Retrospective Observational Study

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ABSTRACT

Aims: To explore the impact of medical complexity, defined by the number of chronic conditions, on the complexity of care, as described by the frequency of nursing diagnoses (NDs) and nursing actions (NAs), in paediatric patients.

Design: Retrospective observational study.

Methods: This study was conducted in an Italian university hospital and involved the analysis of electronic health records for neonatal and paediatric patients who were consecutively admitted from January to December 2022. The sample was classified into three categories—non-chronic, single chronic and multimorbid patients—according to their clinical profiles. NDs recorded within the first 24 h from patient hospital admission and NAs performed throughout the hospital stay were counted for each group.

Results: Distinct variations in the prevalence and patterns of NDs and NAs were observed across different levels of medical complexity. A significant moderate positive correlation between the number of NDs and NAs was found. However, the frequency of NDs did not directly correlate with the number of chronic conditions. Conversely, a weak but significant negative correlation was identified between the quantity of NAs and the number of chronic conditions. While the frequency of NDs showed a stable but decreasing trend as the number of chronic conditions increased, a higher number of chronic conditions were associated with a lower quantity of NAs.

Conclusions: We discovered a notable variation in the complexity of care across varying levels of medical complexity in paediatric patients. Our findings suggest that the complexity of care does not necessarily correspond to the degree of medical complexity. The observed negative relationship between the number of chronic conditions and the quantity of NAs underscores the need for further research to explore this unexpected finding and its implications for clinical practice.

Implications for the Profession and/or Patient Care: Without the adoption of standardised nursing terminologies, such as nursing diagnoses (NDs) and nursing actions (NAs), assessing the complexity of care in paediatric settings can be challenging. Integrating clinical nursing information systems that incorporate standardised NDs and NAs into electronic health records is crucial for accurately documenting and analysing the complexity of care and its relationship with medical complexity.

The members of Nursing and Public Health Group are provided in the Appendix

Impact:

- In paediatric patients, the frequency of nursing diagnoses (NDs) at hospital admission is significantly associated with the quantity of nursing actions (NAs) delivered during hospitalisation. However, there is no correlation between the frequency of NDs and medical complexity, as defined by the number of chronic disorders. Specifically, the frequency of NDs decreases with increasing medical complexity, while the quantity of NAs is negatively associated with the number of chronic disorders. This indicates that the complexity of care cannot be inferred solely from medical complexity, and additional factors need to be explored.
- These findings enhance understanding of how complexity of care relates to medical complexity in paediatric patients. Insights into the prevalence and patterns of NDs and NAs can benefit nurses, managers, researchers and policymakers by informing clinical and organisational decision-making to ensure high-quality care.

Reporting Method: The study adhered to the RECORD Statement.

Patient or Public Contribution: Patients, service users, caregivers or public members were not directly involved in the design, conduct, analysis and interpretation of data or in writing this paper. Patients contributed only to data collection.

1 | Introduction

During clinical practice, nurses collect and record patient care in a range of clinical settings. A systematic collection of nursing-generated data becomes necessary if health systems want to have a comprehensive view of patient characteristics and needs (Horn, Doucette, and Sweeney 2021). Despite the acknowledged power of nursing-generated data (Fennelly et al. 2021), several clinical settings today struggle with a lack of health records that use standardised nursing terminologies (SNTs) (D'Agostino et al. 2017). SNTs use coded definitions and terms to express patient needs from a nursing perspective. Their systematic implementation in clinical practice would enable the analysis of patient needs and comparison of nursing-generated data for clinical and research purposes by enhancing the quality of care (Chae, Oh, and Moorhead 2020).

One of the fields suffering from a deficiency of SNT-based documentation is paediatrics, which accounts for a sizeable portion of annual hospital admissions, with an estimated 5 million cases occurring in the United States alone (Freyleue, Arakelyan, and Leyenaar 2023). According to a recent report, paediatric hospitalisations are primarily triggered by major conditions such as respiratory problems (e.g., asthma), digestive system diseases (e.g., appendicitis) and traumatic injuries (Schneuer et al. 2023). The reacutisation of chronic conditions also significantly contributes to the hospital readmission rate, as well as to the complexity of clinical conditions (Bucholz, Toomey, and Schuster 2019; Genna et al. 2024; Miller et al. 2016).

However, despite research that has extensively described the medical complexity and the clinical characteristics of paediatric patients, little is known about their complexity of care. SNTs could be useful to describe this complexity jointly with medical conditions (Cesare et al. 2023; Sanson et al. 2019).

2 | Background

Nurses can produce a significant volume of patient data using SNTs such as nursing diagnoses (NDs) within electronic health records (EHRs) (Chae, Oh, and Moorhead 2020; Fennelly et al. 2021). Over time, the secondary analysis of NDs has improved the understanding of patients' needs and the complexity of care (Cesare et al. 2023; Macieira et al. 2019). Notably, the nursing dependency index (NDI), which quantifies the frequency of NDs recorded at hospital admission, serves as a key indicator of complexity of care and informs the planning of NAs to be performed in clinical practice (Cesare et al. 2023; D'Agostino et al. 2017; Sanson et al. 2019). Standardised data, such as NDs and NAs, provide scientific evidence on clinical issues and strategies to improve patient outcomes (Freguia et al. 2022; Sanson et al. 2019).

Significant efforts have been made to develop clinical nursing information systems (CNISs) that integrate SNTs into EHRs, with some incorporating care algorithms to assist nurses in selecting appropriate NDs and NAs and improving documentation quality (Cocchieri et al. 2018; Zega et al. 2014).

However, nursing contributions to healthcare are often underrecognised, partly due to inadequate reporting of nursing-generated data in EHRs and inconsistent documentation practices (D'Agostino et al. 2017; Fennelly et al. 2021). This results in an underrepresentation of valuable standardised nursing data, which could provide crucial insights if properly utilised (D'Agostino et al. 2017; Sanson et al. 2019).

Recent implementations of SNTs in EHRs have shown positive results in various clinical settings, particularly with adult patients (Cesare et al. 2023; D'Agostino et al. 2017, 2019; Sanson et al. 2019; Vanalli et al. 2023). However, there is a lack of CNISs utilising SNTs to characterise paediatric patients, leaving a gap in understanding the complexity of care for this population, especially given the rising prevalence of chronic diseases in children (Bucholz, Toomey, and Schuster 2019).

Chronic diseases, responsible for 74% of global deaths, and multimorbidity—defined as the coexistence of multiple chronic conditions—pose significant public health challenges (Johnston et al. 2019). About 25% of children and adolescents have one chronic disorder, and 5% have multiple chronic conditions (Miller et al. 2016). These conditions often result in frequent hospitalisation rates due to acute exacerbations,

Summary

- This study offers a detailed examination of how medical and nursing complexities interact in paediatric care by evaluating nursing diagnoses (NDs) and nursing actions (NAs) across varying levels of medical complexity: non-chronic, single chronic and multimorbid patients.
- Our findings reveal that greater complexity of care is not necessarily linked to higher levels of medical complexity. Instead, the use of NDs and NAs is essential for accurately defining complexity of care and ensuring the delivery of high-quality and safe care.

leading to high healthcare costs, diminished quality of life and increased medical complexity (Genna et al. 2024; Miller et al. 2016). As multiple chronic conditions complicate inpatient hospital care and result in greater utilisation of healthcare services, the number of chronic illnesses can serve as a useful metric for assessing medical complexity, reflecting the cumulative burden on patient care (Corallo, Proser, and Nocon 2020; Marlikowska et al. 2024; Nicolaus et al. 2022). Children with increased medical complexity experience chronic, multisystem health conditions that result in significant healthcare needs, major functional limitations and high utilisation of resources (Murphy et al. 2020). Increased medical complexity often leads to early clinical deterioration and complications, negatively impacting the child's and family's quality of life and increasing mortality rates (Genna et al. 2024).

Despite the growing burden of chronic diseases and multimorbidity, which heightens medical complexity, the relationship between medical and nursing complexity of care remains insufficiently explored, particularly in paediatric settings. This gap exists despite the potential of SNTs to effectively assess nursing complexity of care.

3 | The Study

3.1 | Aim(s) and Objective

The aim of this study was to explore the impact of medical complexity, defined by the number of chronic conditions, on the complexity of care, as described by the frequency of NDs and NAs, in paediatric patients.

3.2 | Research Questions

1. What is the prevalence of NDs and NAs among paediatric patients with varying levels of medical complexity, including those with non-chronic conditions, a single chronic condition or multimorbidity?
2. What is the relationship between the frequency of NDs, NAs and the number of chronic conditions?

4 | Methods

4.1 | Design

Retrospective, observational and single-centre study.

4.2 | Study Setting and Sampling

The study was conducted in the largest general university hospital in Rome, Italy (1661 total beds, 8 departments and 275 wards). The study was reported according to the REporting of Studies Conducted using Observational Routinely-collected health Data (RECORD) Statement (Benchimol et al. 2015) and adhered to a study protocol previously published by the authors (Cesare, D'Agostino, and Cocchieri 2024).

Considering the descriptive nature of the study, a consecutive and purposive sampling was used including EHRs of all paediatric patients hospitalised over a period of one solar year, from 1 January to 31 December 2022. This method included all eligible participants who met the study criteria throughout the year, minimising selection bias and enhancing the generalisability and representation of the findings (Cesare et al. 2023). The hospital data warehouse, in close collaboration with the research team, managed participant selection, rigorously applying predefined exclusion criteria to ensure that only eligible cases were included in the final dataset. This systematic approach, executed before data acquisition, ensured the data's accuracy and relevance for the study.

4.3 | Exclusion Criteria

The exclusion criteria were records of: (1) patients > 18 years old at the time of hospitalisation; (2) patients hospitalised in the Outpatient and Day Hospital Units; (3) patients with length of stay < 2 days. The flowchart in Figure 1 illustrates the step-by-step process of sample selection, from initial recruitment through the application of exclusion criteria to the final study population.

4.4 | Data Source Instruments

Data collection was performed through the analysis of structured hospital records of patients from two databases, the Neonatal Paediatric Professional Assessment Instrument (PAI*ped*) (Cocchieri et al. 2018) and the hospital discharge register (HDR). A deterministic linkage was performed by the data warehouse to match the two databases throughout the study analysis (Zhu et al. 2015).

4.4.1 | Neonatal Paediatric Professional Assessment Instrument (PAI*ped*)

The PAI*ped* is a CNIS integrated into the EHR of the study hospital and allows the electronic documentation of nursing care, including NDs and NAs, in accordance with the steps of nursing

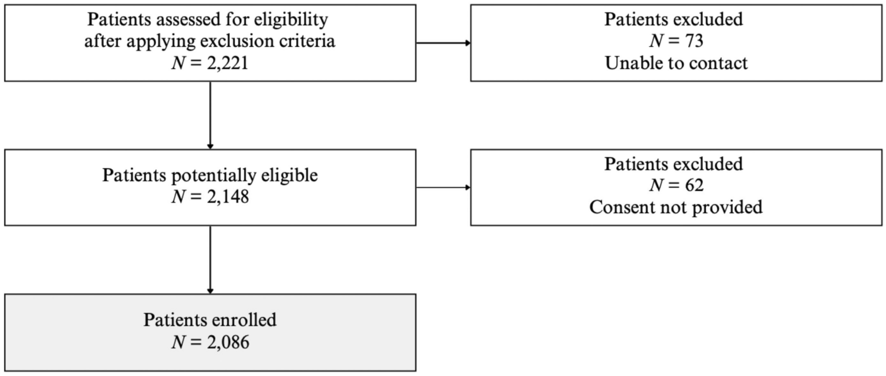

FIGURE 1 | Flow diagram of the participant selection process for the study.

process (Cocchieri et al. 2018). Nurses using PAI*ped* in the study hospital may be deemed experienced users because they have used this system since 2016. Nurses are supported in selecting NDs and NAs by a scientifically validated algorithm embedded in PAI*ped* and called Nursing Assessment Form (NAF). The NAF has demonstrated excellent content validity (Zega et al. 2014). Through this scientific approach, the entire process of selection and validation of data is standardised and this reduces potential documentation errors (Cocchieri et al. 2018). PAI*ped* adopts the Clinical Care Classification (CCC) System version 2.5, an internationally recognised SNT that has been specifically tested for neonatal and paediatric care (Zeffiro et al. 2021). The CCC framework consists of 176 NDs and 804 NAs (Clinical Care Classification System 2024). Due to its descriptive completeness qualities, CCC is ideal for serving as the foundation for patient care plans created in EHRs. For this reason, it has been translated into several languages, including Italian (Zeffiro et al. 2021).

4.4.2 | Hospital Discharge Register (HDR)

The HDR is a tool used to gather information about patients who are discharged from Italian public or private hospitals. It is a summary of the data found in the medical record, of which it is an essential component. In order to describe and classify diseases injuries, HDR adopts the International Classification of Diseases, 9th revision, Clinical Modification (ICD-9-CM) codes. The patient information collected through HDR is extensive and includes sociodemographic data, hospitalisation characteristics and clinical features (Cesare et al. 2023).

4.5 | Variables Analysed and Instrument

The EHR of each patient was used to gather and analyse the following data:

- Sociodemographic characteristics, such as gender and age;
- Clinical characteristics, such as Major Diagnostic Categories (MDC), number of medical procedures and chronic disease, and DRG weight. MDC classify patients' medical diagnoses into broad categories primarily based on organ systems or specific medical conditions. A medical procedure refers to any medical action to treat or manage a patient's condition. The DRG weight is a numerical value that indicates the relative costs and resource utilisation. A higher DRG weight suggests a more complex and resource-intensive case. The Chronic Condition Indicator, developed by the Agency for Healthcare Research and Quality (2016), was used to classify patient medical diagnoses based on ICD-9-CM codes into either chronic or non-chronic designation, thereby ensuring a standardised approach to categorisation for study analysis. This tool includes a CSV translation file which lists each ICD-9-CM code and categorises them as either '0' for non-chronic conditions or '1' for chronic conditions. Multimorbidity was defined as the coexistence of two or more chronic health conditions (Harrison et al. 2021). The total number of chronic conditions was used to categorise patient's medical complexity into three categories: non-chronic, single chronic condition or multimorbid (Corallo, Proser, and Nocon 2020; Marlikowska et al. 2024; Nicolaus et al. 2022);
- Nursing characteristics such as NDs and NAs. NDs are defined as '*a clinical judgement about the healthcare consumer's response to actual and potential health conditions or needs*'. NDs represent the clinical judgement that underlies the choice of NAs selected and applied by nurses to enhance patient outcomes in clinical practice (e.g., *Fall risk*, defined as an *increased chance of conditions that results in falls*) (Clinical Care Classification System 2024). The NAs, or specific activities delivered by nurses to improve patient outcomes (Clinical Care Classification System 2024). In the PAI*ped*, nurses use also the Italian Nomenclature of Nursing Care Performance (Sanson et al. 2019) to systematically document their tasks. The Italian Nomenclature of Nursing Care Performance are standard activities that are more granular than most of the NAs included in PAI*ped*, providing detailed insights into the process of care. However, the PAI*ped* operates in the background to map these two terminologies.

4.6 | Data Analysis

4.6.1 | Quantitative Analysis and Assessment of Data Normality

A quantitative data analysis focused on descriptive and inferential statistics was conducted. Descriptive statistics were employed to provide a comprehensive summary of the study data and to outline participant characteristics. For categorical variables, such as the classification of NDs and NAs, frequencies and percentages were used to describe distribution patterns. Continuous variables, including the number of NDs, were analysed using means and standard deviations (SD) if normally distributed. For non-normally distributed continuous variables, such as the number of NAs, medians and interquartile ranges (IQR) were reported. Normality was assessed using skewness and kurtosis, with values falling within the range of −2 to +2 indicating approximate normal distribution (George and Mallery 2010). This approach ensures that subsequent analyses were appropriately tailored to the data's distribution characteristics.

4.6.2 | Statistical Methods for Comparing Group Means and Handling Data Distribution

Parametric tests were used to compare group means when the data were normally distributed. Specifically, for comparisons involving more than two groups (e.g., mean number of NDs across medical complexity conditions), one-way analysis of variance (ANOVA) was used. Following ANOVA, the Tukey–Kramer post hoc test was performed to identify specific group differences and to correct for multiple comparisons while controlling for Type I errors, thus enhancing the robustness of the findings. This test adjusts for multiple comparisons by providing a method to identify specific group differences while maintaining the overall significance level. In cases where data did not meet the normality assumption, non-parametric tests were employed. This choice was made because non-parametric tests do not assume a normal distribution and are more appropriate for skewed data, thereby providing a valid comparison without requiring normality. The Kruskal–Wallis H test was used to compare medians across more than two groups (e.g., median number of NAs across different medical complexity conditions). Confidence intervals were used to delineate the range of plausible values for population parameters, thus providing a measure of precision and quantifying the uncertainty of the estimates.

4.6.3 | Analysis of Association Between Categorical and Continuous Variables

For categorical data, Pearson's chi-square test was used to examine associations between different groups (e.g., frequency of NDs across various medical complexity conditions). To quantify the strength of these associations, Cramer's *V* was calculated, offering a standardised measure of effect size ranging from 0 to 1. An effect size > 0.25 was considered very strong; > 0.15 as strong; > 0.10 as moderate; > 0.05 weak; and > 0 very weak (Akoglu 2018). The thresholds for effect size interpretation were used to determine the strength of association, aiding in the meaningful interpretation of categorical relationships.

For examining relationships between variables, correlation analyses were performed. Pearson's correlation coefficient was used to measure associations between normally distributed variables (e.g., relationship between the frequency of NDs and the number of chronic conditions), while Spearman's rank correlation coefficient was applied to non-normally distributed data for the same purpose (e.g., relationship between the frequency of NDs and the quantity of NAs). The choice of correlation method ensures appropriate handling of data distribution and provides accurate measures of association. The magnitude of the correlation coefficient was evaluated using the following categories: 0.00–0.10 as negligible; 0.10–0.39 as weak; 0.40–0.69 as moderate; 0.70–0.89 as strong; and 0.90–1.00 as very strong (Schober, Boer, and Schwarte 2018). Scatter plots were employed to visually represent the relationships between key variables, specifically to illustrate the association between the number of NDs, NAs and chronic conditions.

4.6.4 | Classification of NDs and NAs and Their Association With Chronic Conditions

NDs were quantified by counting the number of diagnoses recorded for each patient within the first 24 h from hospital admission (Cesare et al. 2023). NDs were considered high frequency if their prevalence was ≥ 20% in the study sample (Cesare et al. 2023; D'Agostino et al. 2017). This classification was instrumental in identifying prevalent issues and understanding their distribution within the population. NAs were calculated by counting the total quantity of actions performed by nurses for each patient within the hospitalisation period (Sanson et al. 2019).

To analyse the relationship between the frequency of NDs, NAs and the number of chronic conditions, participants were categorised into three groups based on the 50th percentile of the overall number of chronic conditions in the study population: 0 chronic conditions (corresponding to < 50th percentile), 1 chronic condition (corresponding to the 50th percentile), and ≥ 2 chronic conditions (corresponding to > 50th percentile). This categorisation allowed for a comparative analysis of NDs and NAs across different levels of medical complexity, thereby elucidating patterns and relationships pertinent to the study objectives.

4.6.5 | Statistical Significance and Software

Results were considered statistically significant where *p*-values were ≤ 0.05. All tests were two-sided. All data were analysed using IBM SPSS *Statistics* for Mac OS, Ver. 29 (Armonk, NY, USA: IBM Corp.).

4.7 | Ethical Considerations

Ethical approval was granted by the Catholic University of the Sacred Heart Committee before the research was conducted (Protocol no. 0012915/24, ID 6752, approved 16 May 2024). All methods were performed in accordance with regulations of the Institutional Review Board. Given the retrospective nature of the study, the informed consent process involved several key steps to ensure ethical compliance. During the hospitalisation, parents or legal guardians were provided with a written general consent form for data processing and analysis of their clinical documentation which were reported in patients' EHRs by the data warehouse. To ensure secure management and retrieval of patient data, the information was stored in a password-protected database, compliant with relevant data protection regulations. Access to this data was restricted to authorised researchers only. After obtaining general informed consent, we made efforts to contact the parents or legal guardians of the paediatric patients via mailed letters or phone calls. These communications included detailed information about the study's objectives, the use of anonymised child data, the minimal risks involved, and the rights of the participants, including the right to withdraw consent. If contact was unsuccessful after three attempts within a 3-month period, subjects were excluded from the study. Written consent was then obtained, ensuring that participants' rights, confidentiality and privacy were fully respected throughout the study. Additionally, consent was sought from healthcare professionals involved in clinical documentation to allow the use of their contributions while respecting their professional rights. The study adhered to the principles of Good Clinical Practice and the Declaration of Helsinki.

5 | Results

5.1 | Sociodemographic and Clinical Characteristics of the Sample and Distribution Among Different Chronic Conditions

A total of 2086 patients met the inclusion criteria, and their EHRs were deemed eligible for this study. Among these, 516 (24.7%) were multimorbid patients, 757 (36.3%) had a single chronic condition and 813 (39.0%) were non-chronic patients. The majority of patients were male in all groups. The mean age in the general population was 8.08 ± 5.89 years [95% CI: 7.83–8.33], while it was higher in multimorbid patients compared to others (8.63 ± 5.29 years [95% CI: 8.17–9.08]). There was a statistically significant difference in mean age between the groups considered ($F = 4183$, $p = 0.015$). Specifically, the mean age was significantly different between patients with a single chronic condition and those with multimorbidity ($p = 0.011$, 95% C.I. = −1.75 to −0.18). In the study population, 3847 medical diagnoses were identified. Of these, chronic conditions were more prevalent than non-chronic conditions, with 2026 diagnoses (52.7%) compared to 1821 diagnoses (47.3%), respectively. The main MDC in patients with a single chronic condition and multimorbidity was nervous system diseases and disorders (DDs) (45.0% and 43.6%, respectively), otherwise non-chronic patients were mainly characterised by musculoskeletal system and connective tissue DDs (17.6%). A total of 9294 medical procedures were performed during patient hospitalisations. The mean frequency of medical procedures per patient was significantly higher in multimorbid patients compared to those with a single chronic condition or non-chronic patients (5.63 ± 1.57 vs. 4.47 ± 2.10 vs. 3.70 ± 2.02, respectively), with a significant difference observed between groups ($F = 154.526$, $p < 0.001$). Additionally, there was a statistically significant difference in median DRG weight across these groups [$\chi^2(2) = 51.973$, $p < 0.001$], with chronic patients showing higher median DRG weights (multimorbid: 0.7933, IQR: 0.4734; single chronic condition: 0.7933, IQR: 1.4736) compared to non-chronic patients (0.7041, IQR: 0.6597). A weak positive Pearson correlation was identified between the frequency of medical procedures and the number of chronic conditions ($r = 0.343$, $p < 0.001$). Additionally, a positive Spearman correlation was observed between the number of chronic conditions and DRG weights ($r = 0.130$, $p < 0.001$). Multimorbid patients had an average of 2.46 ± 0.77 chronic diseases ([95% CI: 2.39–2.53], range: 2–7) (Table 1).

5.2 | Prevalence of NDs in the Study Sample and Distribution Among Different and Chronicity Classes

Overall, a set of 35 different NDs were identified for a total of 8504 NDs selected on admission in the total sample, corresponding to a mean of 4.08 ± 2.71 NDs per patient ([95% CI: 3.96–4.19], range: 0–14). The prevalence of NDs among different medical complexity conditions was analysed. *Fall Risk* was the most frequently selected ND in the general population, except for non-chronic patients, which showed a main prevalence of the *Infection Risk* ND. In all groups, four NDs (*Fall Risk*, *Infection Risk*, *Acute Pain*, *Sleep Pattern Disturbance*) were predominant, exhibiting different rankings.

The means of NDs varied significantly among the different groups (non-chronic patients: 4.36 ± 2.46; patients with a single chronic condition: 3.72 ± 2.53; multimorbid patients: 4.15 ± 3.25; $F = 11{,}170$, $p < 0.001$). The Tukey–Kramer post hoc test revealed a statistically significant difference in the number of NDs between non-chronic patients and those with a single chronic condition (mean difference = 0.638 [95% CI: 0.32–0.96], $p < 0.001$) and between patients with a single chronic condition and multimorbid patients (mean difference = −0.421 [95% CI: −0.78 to −0.06], $p = 0.017$). However, the difference between non-chronic patients and multimorbid patients was not significant (mean difference = 0.216 [95% CI: −0.14 to 0.57], $p = 0.329$). In the groups analysed, there was a statistically significant difference related to the mean number of 21 NDs ($p < 0.05$).

In the general population, 5 HF-NDs were identified: *Fall Risk*, *Infection Risk*, *Acute Pain*, *Sleep Pattern Disturbance*, *Injury Risk*. The pattern and frequency of HF-NDs were different in each group analysed. The frequencies and rankings of the NDs in the study sample and the distribution among different medical complexity conditions are shown in Table 2.

5.3 | Prevalence of NAs in the Study Sample and Distribution Among Different and Chronicity Classes

A set of 342 different NAs were identified, for a total of 49,607 NAs planned and delivered during hospitalisation to the study population, corresponding to a median of 18.00 NAs per patient (IQR: 9 [95% CI: 17.00–18.00], range: 1–502). The prevalence of NAs among different medical complexity conditions was analysed. The Kruskal–Wallis H test revealed a statistically significant difference in the number of NAs across varying levels of medical complexity [$\chi^2(2) = 61{,}622$, $p < 0.001$]. The number of NAs was higher in non-chronic patients (median: 20.00, IQR: 9 [95% CI: 19.00–20.00]) compared to those with a single chronic condition (median: 18.00, IQR: 9 [95% CI: 17.00–18.00]) and multimorbid patients (median: 17.00, IQR: 9 [95% CI:

TABLE 1 | Sociodemographic and clinical characteristics of the study sample and distribution among different medical complexity conditions.

Variables	General population ($N = 2086$)			Non-chronic patients ($N = 813$)			Patients with a single chronic condition ($N = 757$)			Multimorbid patients ($N = 516$)			*p* value[a]	Effect size[b]
	Descriptive statistics													
Gender (*N*; %)														
Male	1183	56.7		446	54.9		431	56.9		306	59.3		0.278	0.035
Female	903	43.3		367	45.1		326	43.1		210	40.7			
Age (years) (mean; SD) (range)	8.08	5.89	0–17	8.12	6.25	0–17	7.66	5.85	0–17	8.63	5.29	0–17	< 0.001	0.170
MDC (*N*; %) (ranking)														
Nervous system DDs	684	32.8	**1**	118	14.5	**2**	341	45.0	**1**	225	43.6	**1**	< 0.001	0.444
Mental DDs	258	12.4	**2**	2	0.2		105	13.9	**2**	151	29.3	**2**		
Muscoloskeletal system and connective tissue DDs	212	10.2	**3**	143	17.6	**1**	51	6.7	**4**	18	3.5	**5**		
Respiratory system DDs	164	7.9	**4**	85	10.5	**4**	59	7.8	**3**	20	3.9	**3**		
Digestive system DDs	123	5.9	**5**	91	11.2	**3**	20	2.6	**7**	12	2.3	**8**		
Ear, nose, mouth and throat DDs	108	5.2	**6**	61	7.5	**6**	42	5.5	**5**	5	1.0			
Infectious and parasitic DDs / systemic or unspecified sites	92	4.4	**7**	76	9.3	**5**	12	1.6	**10**	4	0.8			
Endocrine, nutritional and metabolic system DDs	62	3.0	**8**	16	2.0		27	3.6	**6**	19	3.7	**4**		
Circulatory system DDs	56	2.7	**9**	32	3.9	**7**	16	2.1	**9**	8	1.6	**9**		
Kidney and urinary tract DDs	36	1.7	**10**	27	3.3	**8**	6	0.8		3	0.6			
Blood and blood-forming organs and immunological disorders DDs	34	1.6		13	1.6		17	2.2	**8**	4	0.8			
Skin, subcutaneous tissue and breast DDs	33	1.6		27	3.3	**9**	6	0.8		§	§			
Female reproductive system DDs	30	1.4		24	3.0	**10**	5	0.7		1	0.2			

(Continues)

TABLE 1 | (Continued)

Variables	General population ($N = 2086$)			Non-chronic patients ($N = 813$)			Patients with a single chronic condition ($N = 757$)			Multimorbid patients ($N = 516$)			*p* value[a]	Effect size[b]
	Descriptive statistics													
Factors influencing health status and other contacts with health services	29	1.4		9	1.1		5	0.7		15	2.9	**7**		
Eye DDs	25	1.2		13	1.6		9	1.2		3	0.6			
Hepatobiliary system and pancreas DDs	25	1.2		13	1.6		11	1.5		1	0.2			
Burns	22	1.1		22	2.7		§	§		§	§			
Myeloproliferative DDs (poorly differentiated neoplasms)	21	1.0		1	0.1		4	0.5		16	3.1	**6**		
Newborn and other neonates (perinatal period)	17	0.8		14	1.7		3	0.4		§	§			
Male reproductive system DDs	17	0.8		4	0.5		10	1.3		3	0.6			
Injuries, poison and toxic effect of drugs	16	0.8		11	1.4		3	0.4		2	0.4			
Multiple significant trauma	12	0.6		10	1.2		2	0.3		§	§			
Pre-MDC	10	0.5		1	0.1		3	0.4		6	1.2	**10**		
Number of medical procedures per patient (mean; SD) (range)	4.46	2.09	0–7	3.70	2.02	0–7	4.47	2.10	0–7	5.63	1.57	0–7	< 0.001	0.269
Number of chronic diseases (mean; SD) (range)	0.97	1.03	0–7	N/A	N/A	N/A	1.00	0	1–1	2.46	0.77	2–7	< 0.001	1.000
DRG weight (median; IQR) (range)	0.7933	0.7140	0.1598–15.5111	0.7041	0.6597	0.1598–12.4289	0.7933	1.4736	0.2085–12.4289	0.7933	0.4734	0.2651–15.5111	< 0.001	0.654

Abbreviations: DDs, diseases and disorders; DRG, diagnosis-related group; IQR, interquartile range; MDC, major diagnostic category; N/A, not applicable; SD, standard deviation.
[a]Chi-squared test.
[b]Cramer's *V* effect size.

TABLE 2 | Prevalence of NDs in the study sample and distribution among different medical complexity conditions.

	General population ($N = 8504$)			Non-chronic patients ($N = 3546$)			Patients with a single chronic condition ($N = 2819$)			Multimorbid patients ($N = 2139$)				
	Descriptive statistics													
ND	N	%	Rank	N	%	Rank	N	%	Rank	N	%	Rank	p[a]	Effect size[b]
Fall risk	1689	81.0	**1**	615	75.6	**2**	633	83.6	**1**	441	85.5	**1**	< 0.001	0.110
Infection risk	1445	69.3	**2**	641	78.8	**1**	507	67.0	**2**	297	57.6	**2**	< 0.001	0.183
Acute pain	1032	49.5	**3**	473	58.2	**3**	349	46.1	**3**	210	40.7	**3**	< 0.001	0.145
Sleep pattern disturbance	756	36.2	**4**	308	37.9	**4**	262	34.6	**4**	186	36.0	**4**	0.401	0.030
Injury risk	435	20.9	**5**	164	20.2	**7**	139	18.4	5	132	25.6	**5**	0.007	0.069
Skin integrity impairment risk	409	19.6	6	158	19.4	8	130	17.2	6	121	23.4	**6**	0.021	0.061
Anxiety	385	18.5	7	193	23.7	**5**	128	16.9	7	64	12.4	10	< 0.001	0.118
Feeding deficit	355	17.0	8	154	18.9	9	109	14.4	8	92	17.8	7	0.049	0.054
Fluid volume deficit	344	16.5	9	165	20.3	**6**	99	13.1	9	80	15.5	8	< 0.001	0.086
Breathing pattern impairment	229	11.0	10	94	11.6		67	8.9	10	68	13.2	9	0.042	0.055
Urinary elimination alteration	211	10.1		100	12.3		66	8.7		45	8.7		0.030	0.058
Physical mobility impairment	201	9.6		102	12.5	10	48	6.3		51	9.9		< 0.001	0.091
Body nutrition deficit	136	6.5		58	7.1		42	5.5		36	7.0		0.396	0.030
Aspiration risk	113	5.4		21	2.6		38	5.0		54	10.5		< 0.001	0.136
Skin integrity alteration	112	5.4		61	7.5		32	4.2		19	3.7		0.002	0.076
Bathing/hygiene deficit	90	4.3		33	4.1		22	2.9		35	6.8		0.003	0.074
Constipation	85	4.1		28	3.4		40	5.3		17	3.3		0.107	0.046
Dressing/grooming deficit	70	3.4		35	4.3		16	2.1		19	3.7		0.049	0.054
Activity intolerance	69	3.3		33	4.1		18	2.4		18	3.5		0.171	0.041
Airway clearance impairment	61	2.9		20	2.5		8	1.1		33	6.4		< 0.001	0.124
Swallowing impairment	58	2.8		15	1.8		11	1.5		32	6.2		< 0.001	0.120
Noncompliance	42	2.0		16	2.0		12	1.6		14	2.7		0.369	0.031
Diarrhea	23	1.1		12	1.5		7	0.9		4	0.8		0.413	0.029
Activity intolerance risk	21	1.0		7	0.9		5	0.7		9	1.7		0.142	0.043

(Continues)

TABLE 2 | (Continued)

	General population ($N = 8504$)			Non-chronic patients ($N = 3546$)			Patients with a single chronic condition ($N = 2819$)			Multimorbid patients ($N = 2139$)				
	Descriptive statistics													
ND	***N***	**%**	**Rank**	***N***	**%**	**Rank**	***N***	**%**	**Rank**	***N***	**%**	**Rank**	***p*[a]**	**Effect size[b]**
Bowel incontinence	20	1.0		7	0.9		2	0.3		11	2.1		0.003	0.074
Body nutrition excess	20	1.0		6	0.7		5	0.7		9	1.7		0.107	0.046
Tissue perfusion alteration	16	0.8		6	0.7		4	0.5		6	1.2		0.441	0.028
Individual coping impairment	14	0.7		6	0.7		6	0.8		2	0.4		0.656	0.020
Fatigue	13	0.6		5	0.6		1	0.1		7	1.4		0.024	0.060
Toileting deficit	13	0.6		4	0.5		1	0.1		8	1.6		0.006	0.070
Body image disturbance	10	0.5		1	0.1		4	0.5		5	1.0		0.091	0.048
Social interaction alteration	8	0.4		2	0.2		3	0.4		3	0.6		0.627	0.021
Fear	7	0.3		2	0.2		2	0.3		3	0.6		0.537	0.024
Confusion	6	0.3		—	—		2	0.3		4	0.8		0.036	0.056
Chronic pain	6	0.3		1	0.1		1	0.1		4	0.8		0.058	0.052

Note: In bold, high-frequency nursing diagnoses (HF-NDs) in the corresponding group.
Abbreviation: ND, nursing diagnosis.
[a]Chi-squared test.
[b]Cramer's *V* effect size.

TABLE 3 | Prevalence of NAs in the study sample and distribution among different medical complexity conditions.

			General population ($N=49{,}607$)			Non-chronic patients ($N=19{,}830$)			Patients with a single chronic condition ($N=17{,}239$)			Multimorbid patients ($N=12{,}538$)		
NA code (CCC)	NA description (CCC)	Italian Nomenclature of Nursing Care Performance (PAI*ped*)	*N*	%	Rank	*N*	%	Rank	*N*	%	Rank	*N*	%	Rank
Descriptive statistics														
A04.0.1	Assess Sleep Pattern Control	Assessment of sleep/rest length and quality	2283	4.60	**1**	785	3.96	**2**	838	4.86	**1**	660	5.26	**1**
N42.3.2	Perform Individual Safety	Application and use of a hospital patient identification wristband	2192	4.42	**2**	850	4.29	**1**	796	4.62	**2**	546	4.35	**4**
J29.0.1	Assess Nutrition Care	Assessment and monitoring of nutritional/hydration conditions	2147	4.33	**3**	784	3.95	**3**	776	4.50	**3**	587	4.68	**3**
G.20.0.2	Perform Physician Contact	Nurse-physician collaboration	2101	4.24	**4**	744	3.75	**4**	751	4.36	**4**	606	4.83	**2**
N42.0.2	Perform Safety Precautions	Use of devices to reduce hazards	1716	3.46	**5**	653	3.29	**5**	640	3.71	**5**	423	3.37	**8**
G17.1.4	Teach Adult Day Center	Reception and orientation of the patient	1664	3.35	**6**	622	3.14	**7**	586	3.40	**7**	456	3.64	**7**
K32.1.2	Perform Blood Specimen Care	Venous blood draw for blood chemistry tests	1651	3.33	**7**	546	2.75	§	599	3.47	**6**	506	4.04	**5**
K33.0.2	Perform Vital Signs	Vital signs measurement	1390	2.80	**8**	410	2.07	§	518	3.00	**8**	462	3.68	**6**
H23.4.2	Perform Medication Treatment	Enteral medication administration	1280	2.58	**9**	550	2.77	§	430	2.49	**9**	300	2.39	§
H24.0.2	Perform Medication Care	Intravenous infusion management	1234	2.49	**10**	606	3.06	**10**	419	2.43	**10**	209	1.67	§
H24.4.2	Perform Medication Treatment	Parenteral medication administration	1215	2.45	§	609	3.07	**9**	406	2.36	§	200	1.60	§
Q48.0.2	Perform Comfort Care	Provide comfort measures	1131	2.28	§	642	3.24	**6**	334	1.94	§	155	1.24	§
P45.0.2	Perform Mental Healthcare	Provide privacy and ensure confidentiality	971	1.96	§	611	3.08	**8**	260	1.51	§	100	0.80	§
D78.0.1	Assess Neurological System Care	Assessing and monitoring consciousness	873	1.76	§	196	0.99	§	324	1.88	§	353	2.82	**10**

(Continues)

TABLE 3 | (Continued)

NA code (CCC)	NA description (CCC)	Italian Nomenclature of Nursing Care Performance (PAI*ped*)	General population (N = 49,607)			Non-chronic patients (N = 19,830)			Patients with a single chronic condition (N = 17,239)			Multimorbid patients (N = 12,538)		
			N	**%**	**Rank**	***N***	**%**	**Rank**	***N***	**%**	**Rank**	***N***	**%**	**Rank**
E12.1.2	Perform Coping Support	Relationship of help and psychological support	843	1.70	§	111	0.56	§	330	1.91	§	402	3.21	**9**

Note: The 10 most prevalent NAs of the general population are represented. §: NA not included in the first 10 NAs.
Abbreviations: CCC, Clinical Care Classification; NA, nursing action; PAI*ped*, Neonatal Paediatric Professional Assessment Instrument.

16.00–17.00]). The *Assess Sleep Pattern Control* (*Assessment of sleep/rest length and quality*) was the most frequently selected NA for both patients with a single chronic condition (4.86%) and multimorbid patients (5.26%). In contrast, *Perform individual safety* (*Application and use of a hospital patient identification wristband*) NA was predominantly performed for non-chronic patients (4.29%).

In all groups, the first four NAs [*Assess Sleep Pattern Control (Assessment of sleep/rest length and quality); Perform individual safety (Application and use of a hospital patient identification wristband); Assess Nutrition Care (Assessment and monitoring of nutritional/hydration conditions); Perform Physician Contact (Nurse-physician collaboration*)], albeit ranked differently, were predominant. The frequencies and rankings of the most prevalent NAs in the study sample, along with their distribution among different medical complexity conditions, are presented in Table 3, and the total distribution is provided in the supplementary files of this article (Table S1).

5.4 | Relationship Between the Number of NDs, NAs and the Number of Chronic Conditions in the Study Sample

The association between the number of NDs, NAs and the number of chronic conditions was explored in the total sample. A statistically significant moderate positive Spearman correlation was discovered between the number of NDs and NAs ($r = 0.489$, $p = < 0.001$) (Figure 2). The Pearson correlation analysis revealed no statistically significant relationship between the number of NDs and the number of chronic conditions ($r = 0.020$, $p = 0{,}353$). In contrast, a significant weak negative Spearman correlation was observed between the number of NAs and the number of chronic conditions ($r = -0.132$, $p < 0.001$) (Figure 3).

The study categorised patients into three groups according to the number of chronic conditions (see Method section). The mean number of NDs and the median number of NAs were then calculated for each group. The results indicate that the mean number of NDs was highest in patients with no chronic conditions (4.36 ± 2.46), slightly decreased in patients with a single chronic condition (3.72 ± 2.53), and then increased in patients with two or more chronic conditions (4.15 ± 3.25). Conversely, the median number of NAs showed a consistent decrease with increasing chronic conditions, starting at 20 (IQR: 9) in patients with no chronic conditions, dropping to 18 (IQR: 9) in patients with one chronic condition, and further decreasing to 17 (IQR: 9) in patients with two or more chronic conditions (Figure 4).

6 | Discussion

This study sought to explore the impact of medical complexity, as defined by the number of chronic conditions, on the complexity of care in paediatric patients. Our findings provide critical insights into the nuanced relationship between chronic conditions and nursing care in a paediatric population. To our knowledge, this research is the first in the literature to describe the

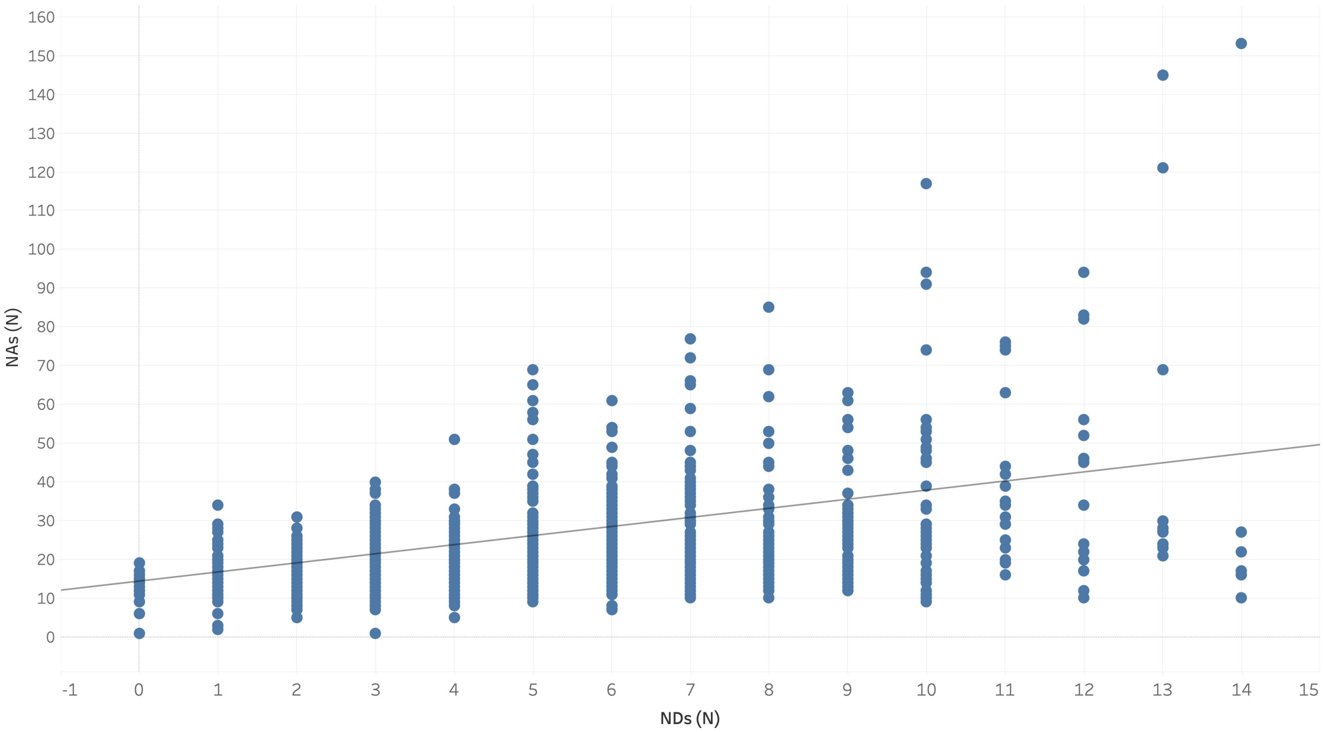

FIGURE 2 | Association between the frequency of NDs and NAs in the general population. NAs, nursing actions; NDs, nursing diagnoses.

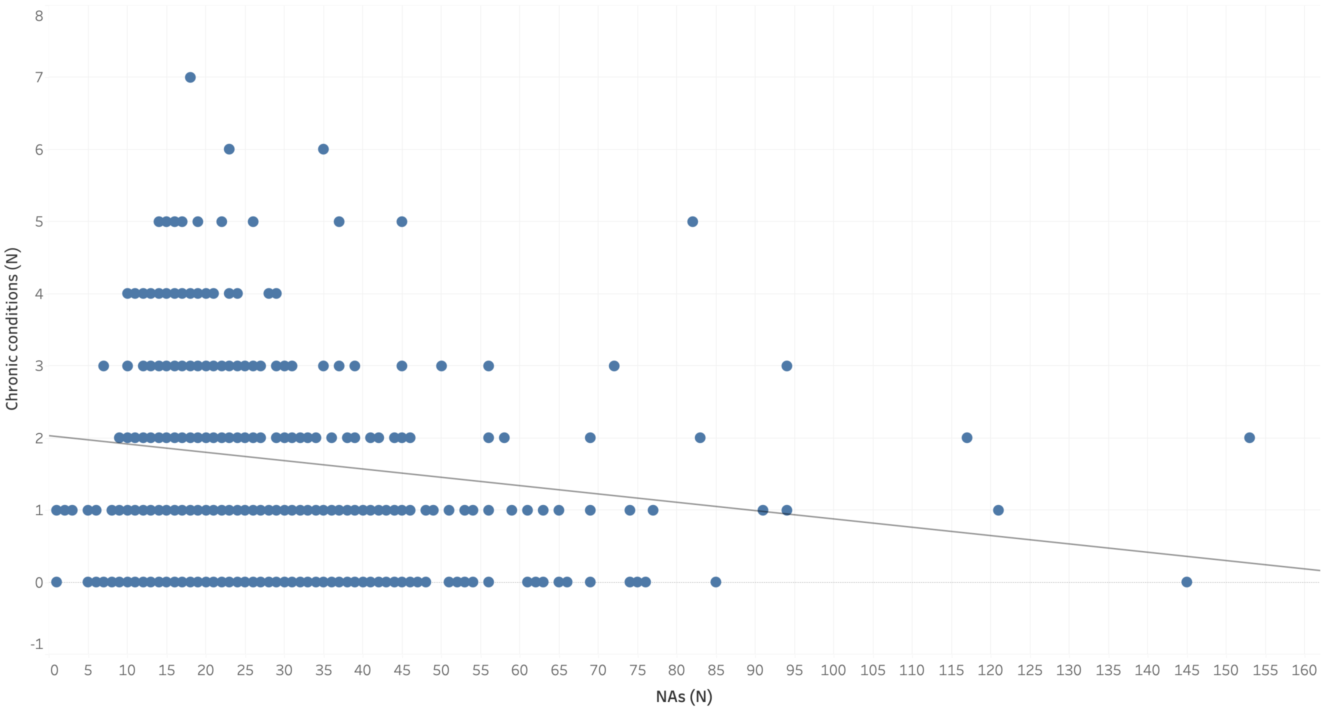

FIGURE 3 | Association between the quantity of NAs and the number of chronic conditions in the general population. NAs, nursing actions.

complexity of care in a general neonatal and paediatric sample (0–18 years) using standardised NDs and NAs.

Previous studies have often used DRG and MDC to represent medical complexity (Cesare et al. 2023; D'Agostino et al. 2017). Our analysis demonstrates that the number of chronic conditions is a reliable proxy for medical complexity, as it correlates significantly with both the frequency of medical procedures and higher DRG weights. These findings support the use of chronic condition counts as an effective measure of patient complexity, particularly in paediatric populations.

Our primary objective was to describe the prevalence of NDs and NAs among paediatric patients with different degrees of medical

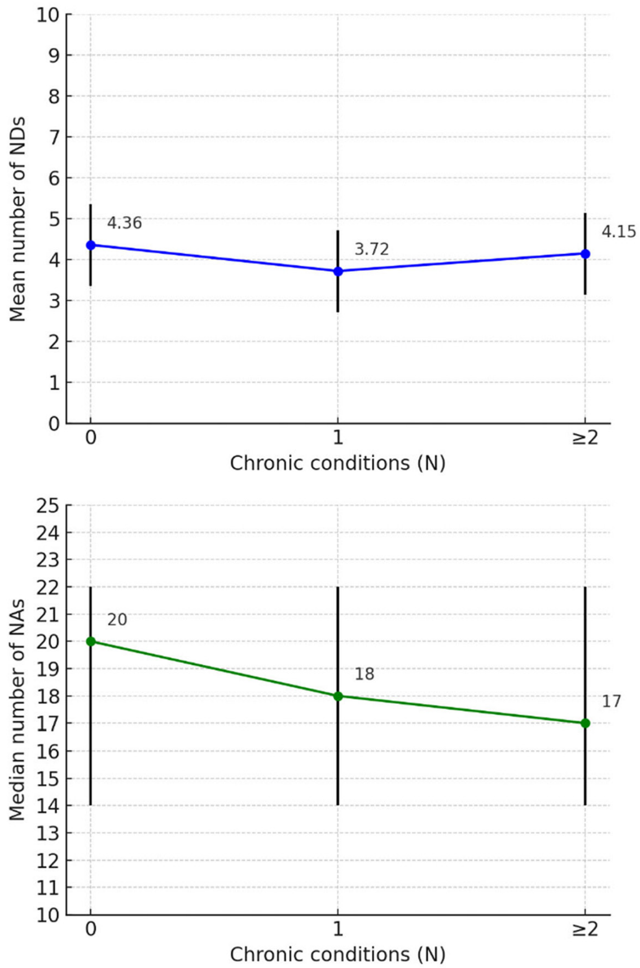

FIGURE 4 | Distribution of NDs and NAs by the number of chronic conditions in the general population. NAs, nursing actions; NDs, nursing diagnoses.

complexity. Our findings demonstrated distinct variations in the prevalence of NDs and NAs across the spectrum of medical complexity analysed. The study revealed that certain NDs, such as *Fall Risk* and *Infection Risk*, are highly prevalent regardless of medical complexity, consistent with findings in adult populations (Cesare et al. 2023; D'Agostino et al. 2017; Sanson et al. 2019). The predominance of these NDs underscores the importance of clinical risk prevention strategies in paediatric care, particularly in environments where falls and infections are significant contributors to morbidity and mortality (Wang et al. 2022). The high frequency of NDs like *Acute Pain* and *Sleep Pattern Disturbance* further highlights the multifaceted nature of paediatric nursing care, where early identification related to pain and sleep disorders is crucial for improving patient outcomes and reducing overall burden (Gai et al. 2020; Pandey, Bhattarai, and Bhatta 2020). The varying presence of HF-NDs observed across our samples may serve as a signal for nurses and nursing managers, highlighting the need to prioritise certain groups of patients based on these specific issues. This variability suggests that appropriate allocation of staff resources is essential to address the identified needs effectively (D'Agostino et al. 2017).

The literature indicates a significant gap in the detailed description and prevalence of NAs for paediatric patients, especially those with chronic and multimorbid conditions. This gap is compounded by methodological inconsistencies across studies, which often use qualitative designs and report NAs in broad categories rather than using SNTs (Poitras et al. 2018). Additionally, much of the existing research on NAs focuses on adult populations and settings outside of hospitals, further complicating the comparison and integration of our findings with the current evidence base (Poitras et al. 2018; Zeffiro et al. 2020). The prevalence of NAs, particularly the focus on sleep assessment and safety measures, demonstrates a strong nursing response to the unique challenges faced by paediatric patients. The high frequency of NAs related to sleep/rest quality, especially among patients with chronic conditions, aligns with existing literature that highlights sleep disturbances as a common issue in this population. Compared to healthy children, those with chronic conditions experience persistent and more frequent sleep disorders, including sleep-disordered breathing, nocturnal enuresis and insomnia (Adavadkar et al. 2022). Despite sleep difficulties being frequently underrecognised in paediatric settings (Adavadkar et al. 2022), our results suggest that nurses are attentive to this issue. By assessing and addressing sleep disturbances, nurses can mitigate associated problems, including poor brain development, emotional disorders, depression and obesity (Hybschmann et al. 2021). Similarly, the frequent implementation of individual safety measures, such as the use of patient identification wristbands, which emerged as one of the most common NAs in our sample, underscores the continuous emphasis on prioritising patient safety in paediatric settings. Health institutions and nursing practices are increasingly prioritising safety initiatives to reduce preventable medical errors, which are a leading cause of medical injuries worldwide (Hoffmeister and de Moura 2015). The use of wristbands for patient identification, especially during clinical procedures, medication administrations, patient transfers or allergy recognitions, enhances patient safety by minimising the risk of adverse events (Escobar Castellanos et al. 2021). The nurses in our sample are likely aware of this issue due to their affiliation with a healthcare organisation accredited by the Joint Commission International (JCI), which emphasises patient identification as a fundamental aspect of patient safety (Joint Commission International 2024).

Our second objective was to investigate the relationship between the frequency of NDs, NAs and the number of chronic conditions. A key finding of this study is the moderate positive correlation between the number of NDs and NAs, indicating that as the patient complexity of care increases, so does the intensity and scope of nursing care required. This relationship aligns with the nursing process, where patient needs identified through NDs directly inform the planning and execution of NAs (Cocchieri et al. 2018).

However, the study also uncovered a surprising trend: patients with a higher number of chronic conditions presented a reduced quantity of NAs compared to non-chronic patients. This finding challenges the assumption that higher medical complexity inherently demands more NAs. Several hypotheses could explain this counterintuitive result. The observed decrease in NAs as the number of chronic conditions increases could be influenced by a range of factors related to the patients, their families and the healthcare organisations involved (Sheng et al. 2019). First, improved self-care practices among patients and their families may reduce the need for documented NAs, as effective management of daily health tasks could lessen the reliance on hospital-based nursing care (Spitaletta et al. 2023). Self-care involves individuals, families and communities taking an active role in the health and illness management (World Health Organization 2024). Improved self-care practices among our patient cohort might reduce the need for NAs. If patients and their caregivers are effectively managing daily tasks like diet, physical activity and sleep, this could decrease the documented NAs. While this hypothesis aligns with existing literature on chronic conditions and self-care (Lee et al. 2022), it remains speculative without direct data on self-care from our study. Future research should examine the relationship between self-care levels and the provision of care by examining standardised NAs. This investigation could provide valuable insights into how self-care abilities influence the complexity and approach to care delivery.

Second, the concept of missed nursing care—where essential care activities are delayed or omitted, particularly under high workload conditions (Ogboenyiya et al. 2020; Tubbs-Cooley et al. 2019)—might also contribute to the observed decline in NAs among more medically complex patients. This could also lead to 'missed nursing documentation', where not all NAs are recorded, potentially explaining the observed trend. Although our study did not specifically measure missed care, existing research indicates that a significant percentage of paediatric nurses report missed care during their work shifts (Lake et al. 2017).

The variability in the nature and severity of chronic conditions may also influence the types and frequency of NAs required. Additionally, differences in healthcare practices—such as the prioritisation of care activities and variations in documentation practices—might contribute to these findings. Future research should explore these factors in greater detail, including specific types of chronic conditions, the effectiveness of care strategies and the role of healthcare systems in managing complex cases. Additionally, alternative definitions of medical complexity should be considered to gain a deeper understanding of nursing care needs and assess how nursing care adapts to different levels of complexity.

6.1 | Strength and Limitations of the Work

The main strength of this study is its original descriptive aim and its robust methodology. To the best of our knowledge, this study is the first in the literature to compare complexity of care and medical complexity in the paediatric population and to utilise analytically a globally known taxonomy through a CNIS on hospitalised children. Additionally, this study is the first to demonstrate to the scientific community how NDs and NAs are distributed among different medical groupings based on the number of chronic conditions indicative of medical complexity. Furthermore, our study included a large sample size, which, despite being from a single centre, allowed us to draw more accurate and reliable conclusions, contributing to the generalisability of the results.

However, several limitations have been identified. They include the use of a retrospective study design, which considers data recorded into one or more clinical databases and not collected for research in a preplanned method, and for the specific requirements of the study (Talari and Goyal 2020). Moreover, while our study utilised a consecutive sampling approach to enhance the representativeness of the sample, this method is not without limitations. Specifically, consecutive sampling, while ensuring broad representation over time, may introduce temporal variability and potential biases, which could affect the generalisability of the findings. We recommend that future research consider alternative sampling methods or extended study periods to further validate and refine these results. Furthermore, some confounding factors emerged after data collection and during the manuscript draft, such as patient and caregiver self-care levels which were not collected because they were not part of our original objectives. This choice may limit the ability to verify the hypotheses suggested in the discussion section that, however, can be confirmed in other research thanks to the summary and background provided by our study.

6.2 | Recommendations for Further Research

Our study offers several interesting insights and hypotheses that warrant further investigation, particularly regarding the unexpected decline in NAs as chronic conditions increase. This finding raises questions about the adequacy of care delivery, documentation and the role of factors such as self-care, caregiver contributions and the potential for missed care. Future research should explore these factors to understand their impact on nursing care in complex cases. Additionally, studies should investigate the specific types of chronic conditions and their interactions with nursing care to better support paediatric patients with varying levels of complexity. Incorporating alternative definitions of medical complexity—such as the DRG system, the Charlson Comorbidity Index and scoring systems like the American Society of Anesthesiologists (ASA) physical status score or Early Warning Scores (e.g., Paediatric Early Warning Score—PEWS and Modified Early Warning Score—MEWS) (Cesare et al. 2023; Nicolaus et al. 2022)—could offer a more comprehensive understanding of how these factors influence nursing care across various settings and populations. To advance knowledge in this area, robust studies on larger populations are necessary. This research will enhance patient and organisational safety and contribute to the development and dissemination of SNTs in clinical practice.

6.3 | Implications for Policy and Practice

Our findings have significant implications for clinical practice. The variation in NDs and NAs across different levels of medical complexity suggests that nursing care strategies must be highly adaptable to meet the diverse needs of paediatric patients. Given the significant clinical and research implications that SNTs bring to healthcare systems, nursing managers should actively support the implementation of CNISs able to represent standardised NDs and NAs in clinical practice. The adoption of these specific systems guarantees the timely representation of the complexity of care in different clinical population and diseases.

To collect real data that accurately represents patient conditions and needs, nurses must receive ongoing training about their use and functioning. Multi-level (clinical, managerial and political) use of SNT terminologies will cover the description of care, management of staffing resources and reimbursement of care costs. The understanding of the relationship between complexity of care and medical complexity, two distinct but interconnected and allied entities, is critical for developing suitable health policies, governance and strategies to ensure proper and safe patient care.

7 | Conclusions

This study offers valuable insights into the nursing complexity of care in paediatric patients, particularly those with chronic conditions. We discovered a distinctive variation in the complexity of care across different levels of medical complexity. The identified pattern suggests that while the frequency of NDs may not vary linearly with the number of chronic conditions, the quantity of NAs tends to decrease as the medical complexity increases. Based on our findings, we can assume that the complexity of care does not necessarily correspond to increased medical complexity in paediatric patients. This observation is consistent with general literature (D'Agostino et al. 2019; Rossetti et al. 2016) and aligns with the definitions of medical and nursing complexity of care provided in our study. The observed relationships highlight the need for further research to replicate the analyses from our study in diverse populations and care settings to confirm these findings given their important implications for clinical practice.

Author Contributions

Conceptualisation, study design and collection of data: Manuele Cesare, Antonello Cocchieri, Fabio D'Agostino. Statistical data analysis and interpretation: Manuele Cesare, Antonello Cocchieri, Mario Cesare Nurchis. Study supervision and writing of the manuscript: Manuele Cesare, Antonello Cocchieri, Fabio D'Agostino. Revising the manuscript critically for important intellectual content, and final approval of the version to be published: Manuele Cesare, Antonello Cocchieri, Fabio D'Agostino, Gianfranco Damiani, Mario Cesare Nurchis, Walter Ricciardi, and the Nursing and Public Health Group. All the authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The dataset generated and analysed during this study is not publicly available due to participants' privacy, confidentiality and ethical restrictions. The data that support the results of this study are available on reasoned request to the corresponding author.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.

Appendix A

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